Document A1: Pre-Alternatives Analysis and Keys to Success for the Tacoma Link Extension Project *(September 2011)*

Final Report

Pre-Alternatives Analysis and Keys to Success for the Tacoma Link Extension Project

Prepared for

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Contents

SECTION 1

Introduction

This report summarizes the work conducted for the Tacoma Link Pre-Alternatives Analysis (Pre-AA) and lays the groundwork for items to be addressed in the next phase of the project. The Pre-AA was conducted from November 2010 through May of 2011 and provides an initial analysis of a set of alternatives under consideration for an extension of the Tacoma Link system. Figure 1-1 is a diagram of the existing Tacoma Link System.

FIGURE 1-1
Existing Tacoma Link System

The existing Tacoma Link system is 1.6 miles long and contains five at-grade stations with an additional station due to open in late summer 2011. It serves downtown Tacoma and connects the Theater District, the Convention Center, Union Station, the University of Washington-Tacoma, and the Tacoma Dome. The new station will be located at S. 11th Street and Commerce Street. The system has been in operation since 2003. The Pre-AA built upon work completed in 2004, 2005, and 2008 for extending the Tacoma Link streetcar and evaluated eight potential extensions of the Tacoma Link system. The evaluation included an assessment of potential benefits and impacts of each corridor, engineering constraints, design assumptions, preliminary cost estimates, and potential funding sources.

The major conclusions reached during the Pre-AA are that there appear to be several alternative corridors that meet community and Sound Transit objectives and are feasible to construct. A full alternatives analysis (AA) could reasonably be completed within 12 to

14 months. Citizen involvement for this project is off to a strong start and should be expanded and continued as the project moves forward.

SECTION 2

Previous Tacoma Link Extension Studies

Sound Transit, in partnership with other stakeholders, conducted six studies between 2004 and 2008 that evaluated the feasibility of potential extensions of the Tacoma Link system. These studies are summarized below.

The **Tacoma Extension Feasibility Study Prepared for the Puyallup Tribe of Indians** was prepared by Sound Transit, Puget Sound Transit Consultants, and LTK Engineering Services in March 2004. Based on the successful start of service on the initial Tacoma Link line, the Puyallup Tribe of Indians voted to study the potential extension of the line from the Tacoma Dome Station to the Tribe's Cascades Casino complex (Cascades Casino) south of Interstate 5 (I-5) and east of Portland Avenue, a distance of approximately 1.5 miles. The study examined four alternative routes. All the alternatives began at the existing Tacoma Link track at East 25th and East G Streets and used a common segment on Puyallup Avenue that could be extended north to meet the Central Link light rail line, as envisioned in Sound Transit's Long Range Plan (Sound Transit, 2005). Three of the alternatives traveled south on Portland Avenue and then east to the Casino via East 28th, East 29th, or East 32nd Street. The fourth alternative traveled south from Puyallup Avenue to the Casino via Bay Street. The study concluded that all four alternatives had no fatal flaws and were feasible but entailed various tradeoffs.

The following four papers were prepared by Parsons Brinckerhoff Quade & Douglas, Inc. (PBQD), in March 2005. They were part of a series of reports designed to inform the Sound Transit Board of Directors in its decision-making on the Regional Transit Long-Range Plan (Sound Transit, 2005) update to the 1996 plan for the Sound Transit service area. Sound Transit adopted the Regional Transit Long-Range Plan update in July 2005.

Sound Transit Long-Range Plan Update Issue Paper S.1: Tacoma Link Integration with Central Link (PBQD, 2005) evaluated options and issues associated with how Tacoma Link might ultimately be integrated with Central Link. The key findings were:

- Depending on lengths of light rail transit (LRT) trains accessing downtown Tacoma from the north, minor to major changes would be required to allow multi-car operations beyond Tacoma Dome Station.
- Ridership models that indicate ridership is lower between Tacoma and Federal Way than between Federal Way and Seattle.
- Four-car operations on the Tacoma Link corridor would require major revisions, potentially as extensive as complete replacement of current stations and some track segments.
- Consideration should be given to identifying the best transfer point for Tacoma Link to Central Link, either at Tacoma Dome Station or in the Federal Way area.

- Additional capacity for light rail maintenance and operations would be required to accommodate additional and larger vehicles.

Sound Transit Long-Range Plan Update Issue Paper S.3: HCT System Development Issues in the South Corridor (PBQD, 2005) discussed issues and considerations that may need to be addressed as high-capacity transit (HCT) services operated by Sound Transit are implemented in various phases in Sound Transit's South Corridor. The key findings were:

- Some Sound Transit services will operate for a significant period of time at service levels lower than what is fully envisioned in the Long-Range Plan.
- Sound Transit Express bus services have the potential to support the South corridor rail markets during interim phases of implementation and could be restructured to provide direct connecting service to Sounder commuter rail and Central Link light rail, as well as serving new markets.
- Sound Transit HCT services provided in an earlier implementation phase could be redundant when later-phase services are implemented, providing opportunities for the agency to make choices about restructuring and/or reductions.
- In planning of interim-phase HCT services, the useful life of supporting capital facilities should be considered and weighed against the anticipated full implementation of the Long-Range Plan to avoid investing in infrastructure that could become underutilized or obsolete.

Sound Transit Long-Range Plan Update Issue Paper S.4: Potential Tacoma Link Extension – West (PBQD, 2005) analyzed several corridor options for extending Tacoma Link west to the Tacoma Community College (TCC) Transit Center. All the options were assumed to operate in mixed traffic. The interrelationship between ridership demand, operational characteristics to meet demand, and station sizing was evaluated. The three options evaluated were:

- **The 6th Avenue Corridor**, a 5.7-mile line extending northwest on Division Avenue and west on 6th Avenue to South Pearl Street, then traveling south to S 19th Street and west to the TCC Transit Center.
- **The S 19th Street Corridor**, a 5.7-mile line extending northwest on Division Avenue to S Sprague Avenue and south to S 19th Street, continuing west to the TCC Transit Center.
- **The N 21st Street/S 12th Street Corridors**, a 6.5-mile line extending northwest on Division Avenue to N I Street, then continuing west on N 21st Street to Proctor Street, turning south to S 12th Street, then turning west to South Pearl Street and south to S 19th Street, and continuing west to the TCC Transit Center. Alternatively, this option could continue on N 21st Street to Orchard Street, turn south to S 12th Street, and continue to the TCC Transit Center in the same manner.

The key findings were that the options studied traversed a diverse mix of land uses and would complement and support the neighboring communities. The concept-level cost estimates ranged from $400 million to $600 million (2005 dollars). Projected ridership was approximately 15,500 daily trips, with 10-minute headways in peak periods, connections to local service at the TCC Transit Center, transfer opportunities with future Tacoma/Federal

Way/Seattle LRT service at Tacoma Dome Station, and park-and-ride access to the rail line at Tacoma Dome Station.

Sound Transit Long-Range Plan Update Issue Paper S.6: Potential Tacoma Link Extension – East analyzed whether the Tacoma Link should be extended east. The alternative corridors considered in the 2004 Tacoma Extension Feasibility Study prepared for the Puyallup Tribe of Indians were included in this issue paper. Key findings included those identified in the 2004 feasibility study and additional findings on how a potential east extension would relate to long-term light rail service operating in the downtown Tacoma area. These additional findings were:

- There was a lack of information on potential ridership for an East Tacoma extension because there were no long-term development plans available for the Cascades Casino.
- Passenger demand levels for the service could require rail vehicles and stations larger than those identified in the 2004 study.
- The range of costs was estimated to be between $38 million and $71.5 million (2004 dollars) for an extension of Tacoma Link to Cascades Casino, including added contingencies.
- The potential need for larger vehicles and stations identified in the 2004 feasibility study required that the cost estimates for the extension to Cascades Casino be regarded as low-end estimates.

Sound Transit Phase 2 – South Corridor LRT Design Report: SR99 and I-5 Alignment Scenarios (S 200th Street to Tacoma Dome Station) and Tacoma Link Extension to West Tacoma was updated in 2008 to present cost estimates in 2007 dollars. The purpose of the planning effort behind this report was to define a Sound Transit 2 LRT project between S 200th Street and Tacoma Dome Station. The definition was the primary source of information used in preparing conceptual cost estimates for potential LRT systems to serve the South Corridor. For the S 200th Street to Tacoma Dome Station corridor, two prototypical alignments were developed for LRT extensions. One alignment would follow the SR 99 alignment in general; the second would follow the I-5 corridor. Extension of the Link LRT system into the South Corridor would include the extension of Tacoma Link from its north terminus in Downtown Tacoma to Tacoma General Hospital. A prototypical alignment was discussed for the potential Tacoma Link extension. The extension would include 1.3 miles of double track and serve two new, at-grade stations. Stadium High School Station would serve the high school and surrounding commercial area. The General Hospital Station would serve Tacoma General Hospital, Mary Bridge Children's Hospital, and nearby residential and commercial areas.

SECTION 3

Summary of the Pre-alternatives Analysis

The Pre-AA was conducted to provide Sound Transit with information about the feasibility of several Tacoma Link extension corridor alternatives to help inform future decision-making and to further the goals of the 2005 Regional Long-Range Plan and the 2008 Sound Transit 2 Plan. The Pre-AA has included the following major deliverables. The outcomes of these deliverables are described in sections 3.2 through 3.4.

- An assessment of potential **economic, social, and environmental benefits and impacts** from a given set of alternative corridors
- An assessment of potential **engineering constraints** from each alternative corridor
- A set of **streetcar design assumptions** for the project and a comparison of design characteristics of streetcar and light rail projects
- An analysis of potential **capital funding sources**
- Preliminary **cost estimates** for the alternative corridors

The Pre-AA evaluated eight potential corridors, which are depicted in Figure 3-1. These corridors were developed through coordination with the Tacoma Link Stakeholder Group and in consultation with Sound Transit staff. The outcomes of the Stakeholder Group's evaluation of these corridors are discussed in the Stakeholder Group Final Report which is attached as Appendix A.

- **The Eastside Corridor** extends east from Tacoma Dome Station on 25th Street and continues south along Portland Avenue to 72nd Street.
- **The North Downtown Central Corridor** extends north from the 9th/Theater District Station via Stadium Way; continues northwest and west via N E Street, N First Street, and Division Avenue; and continues south on Martin Luther King Jr. Way to S 19th Street.
- **The North End Corridor** extends north from 9th/Theater District Station via Stadium Way; continues northwest and west via N E Street, N First Street, and Division Avenue; and continues west to Alder Street via I Street/N 21st Street.
- **The North End Central Corridor** extends north from 9th/Theater District Station via Stadium Way; continues northwest and west via N E Street, N 1st Street, and Division Avenue; and continues southwest and west via Division Avenue to S 6th Avenue to Alder/Cedar Streets.
- **The Pacific Highway Corridor** extends east from the Tacoma Dome Station to Pacific Highway South to Fife, at 54th Avenue East.
- **The South Downtown Central Corridor** extends west from Union Station on S 19th Street and continues west on S 19th Street to Mildred Street.

- **The South Downtown to MLK Corridor** extends west from Union Station on S 19th Street, continues north on MLK Boulevard to Division Avenue, and potentially could loop back to the 9th/Theater District Station.
- **The South End Corridor** extends from S 25th Street Station south via Pacific Avenue and continues west on 38th Street to Tacoma Mall Boulevard.

Table 3-1 summarizes the conclusions presented in the Pre-AA for each corridor. More detail is provided in the sections that follow.

3.1 Benefits and Impacts of Each Corridor

The Pre-AA evaluated the potential benefits and impacts from each corridor. The purpose of this evaluation was to provide information that can begin to differentiate between the eight corridors, but not to complete the entirety of technical analyses that will be required of these corridors during the AA. Benefits were defined as either benefits to transit accessibility or as economic benefits, and impacts were defined as potential impacts to parks, potential impacts to historic features, and potential impacts to natural resources. The results of the analyses of benefits and impacts from each corridor are summarized below. (Detailed information on the methodology for the analyses and the specific evaluation measures used is provided in the memorandum, "Tacoma Link Extension: Potential Benefits and Impacts of the Proposed Corridors," (CH2M HILL, 2011) attached as Appendix B. More information on the feasibility of constructing each corridor can be found in the memorandum, "Tacoma Link Extension: Engineering Considerations," (HDR Engineering, 2011a) attached as Appendix C.

- The **Eastside Corridor** would serve a high percentage of low-income and minority residents and would utilize a corridor that has an existing, high-performing bus route. The corridor travels through an existing habitat corridor and is adjacent to the Portland Avenue Park.
- Of all eight corridors, the **North Downtown Central Corridor** would serve the largest population in 2040. It would also serve a high number of existing and forecast jobs, as well as a high percentage of low-income and minority residents. This corridor would also serve a large number of community institutions. It would travel through four historic districts (Old City Hall, Wright Park and Seymour Conservatory, Stadium-Seminary, and North Slope).
- The **North End Corridor** would serve a high existing and projected population and employment. It would also serve a high number of community institutions. It would travel through four historic districts (Old City Hall, Wright Park and Seymour Conservatory, Stadium-Seminary, and North Slope).
- The **North End Central Corridor** would serve a high existing and projected population and includes an existing high-performing bus route. It would travel through four historic districts (Old City Hall, Wright Park and Seymour Conservatory, Stadium-Seminary, and North Slope).

FIGURE 3-1
Tacoma Link Extension Potential Corridors

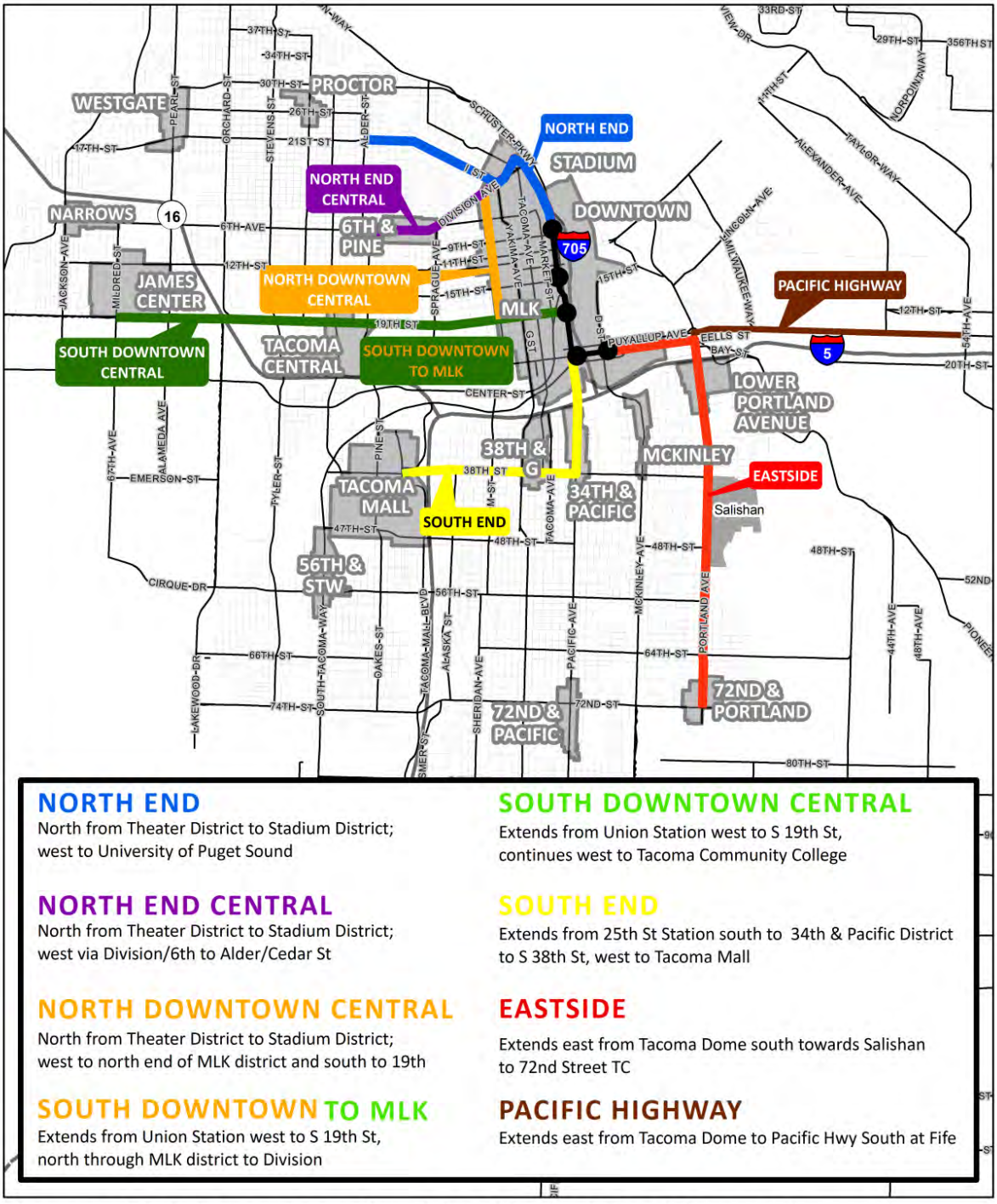


TABLE 3-1
Key Findings of the Pre-alternatives Analysis by Corridor

Corridor		Key Findings
Eastside	Length	4.1 miles.
	Feasible to construct?	Yes.
	Benefits	Would serve a high percentage of low-income residents.
		Would serve the highest percentage of minority residents.
		Includes an existing high-performing bus route.
	Impacts	Potential impact to Portland Avenue Park.
		Potential impact to a habitat corridor.
	Estimated capital cost (2015)	$230.6 million.
North Downtown Central	Length	2.3 miles.
	Feasible to construct?	Yes.
	Benefits	Would serve the largest forecast population.
		Would serve the largest number of existing and forecast jobs.
		Would serve a high percentage of low-income residents.
		Would serve a high number of community institutions.
	Impacts	Potential impact to Old City Hall Historic District, Wright Park and Seymour Conservatory, Stadium-Seminary Historic District, and North Slope Historic District.
	Estimated capital cost (2015)	$138.9 million.
North End	Length	2.7 miles.
	Feasible to construct?	Yes.
	Benefits	Would serve a high number of existing and projected population.
		Would serve a high number of existing and forecast jobs.
		Would serve a high number of community institutions.
	Impacts	Potential impact to Old City Hall Historic District, Wright Park and Seymour Conservatory, Stadium-Seminary Historic District, and North Slope Historic District.
	Estimated capital cost (2015)	$155.3 million.
North End	Length	2.5 miles.

TABLE 3-1
Key Findings of the Pre-alternatives Analysis by Corridor

Corridor		Key Findings
Central	Feasible to construct?	Yes.
	Benefits	Would serve a high existing and projected population.
		Includes an existing high-performing bus route.
	Impacts	Potential impact to Old City Hall Historic District, Wright Park and Seymour Conservatory, Stadium-Seminary Historic District, and North Slope Historic District.
	Estimated capital cost (2015)	$152.3 million.
Pacific Highway	Length	3.3 miles.
	Feasible to construct?	Yes.
	Benefits	Would serve an area with fewer investments in 2008-2010 than would be required for other corridors.
		Is located in a manufacturing and industrial center.
		Has a high existing percentage of vacant land.
	Impacts	Potential impact to a habitat corridor.
	Estimated capital cost (2015)	$178.1 million.
South Downtown Central	Length	4.2 miles.
	Feasible to construct?	This corridor presents construction challenges along Pacific Ave to Jefferson Street through the UW-Tacoma campus because of excessively steep grades (it is a 14 percent grade, which is too steep for a streetcar). An alternative corridor would extend north from the 9th/Theater District Station via Stadium Way, continue northwest and southwest via North E Street, North 1st Street, and Division Avenue to North I Street; then continue from North I Street/Division Avenue to MLK Jr. Way, then south on MLK Jr. Way to South 19th Street. Further evaluation of alternative alignments for this corridor would be required during future phases of the project.
	Benefits	Would serve the largest existing population.
		Would serve an area with fewer investments in 2008-2010 than would be required for other corridors.
		Includes an existing high-performing bus route.
		Would serve the highest number of community institutions.
	Impacts	Potential impact to Sewell Park, Allenmore Golf Club, Tacoma Nature Park, and China Lake Park.
		Potential impact to Union Depot-Warehouse Historic District.
		Potential impact to a habitat corridor.
	Estimated capital cost (2015)	$349.6 million.

TABLE 3-1
Key Findings of the Pre-alternatives Analysis by Corridor

Corridor		Key Findings
South Downtown to MLK	Length	1.8 miles.
	Feasible to construct?	This corridor presents construction challenges along Pacific Ave to Jefferson Street through the UW-Tacoma campus because of excessively steep grades (it is a 14 percent grade, which is too steep for a streetcar).
	Benefits	Would serve the highest percentage of low-income residents.
		Would serve a high percentage of minority residents.
		Would serve an area with fewer investments in 2008-2010 than would be required for other corridors.
		Would serve a high number of community institutions.
	Impacts	Potential impact to Union Depot-Warehouse Historic District, Wright Park and Seymour Conservatory, S J Street Historic District, and North Slope Historic District.
	Estimated capital cost (2015)	$118.8 million.
South End	Length	3.1 miles.
	Feasible to construct?	Yes.
	Benefits	Would serve a high existing and projected population.
		Would serve an area with fewer investments in 2008-2010 than would be required for other corridors.
		Includes an existing, high-performing bus route.
		Would serve a high number of community institutions, including two regional growth centers.
	Impacts	Potential impact to a habitat corridor.
	Estimated capital cost (2015)	$184.7 million.

- The **Pacific Highway Corridor** would serve an area that has received fewer transportation infrastructure investments in 2008-2010 than other areas have received. The corridor would travel through a manufacturing and industrial center and would be located near a high percentage of existing vacant land. It would travel through a habitat corridor.
- Of the eight corridors, the **South Downtown Central Corridor** would serve the largest existing population. The corridor would serve an area that has received fewer transportation infrastructure investments in 2008-2010 than other areas have received. It includes an existing, high-performing bus route and would serve a high number of community institutions. The corridor would be adjacent to four parks, would travel

through the Union Depot-Warehouse historic district, and would travel through a habitat corridor.

- The **South Downtown to MLK Corridor** would serve a high percentage of low-income and minority residents. It would serve an area that has received fewer transportation infrastructure investments in 2008-2010 than other areas have received and would serve a high number of community institutions. It would travel through four historic districts (Union Depot-Warehouse, Wright Park and Seymour Conservatory, S J Street, and North Slope).
- The **South End Corridor** would serve a high existing and projected population and a high number of community institutions. It would serve an area that has received fewer transportation infrastructure investments in 2008-2010 than other corridors have received and would utilize an existing high-performing bus route. This corridor would serve two regional growth centers and would serve a large amount of existing vacant land. It would travel through an existing habitat corridor.

3.2 Design Characteristics

The existing Tacoma Link is a physical and operational combination of streetcar and LRT modes. Physically, the portion of Tacoma Link from its northern/eastern terminus at Freighthouse Square/Tacoma Dome Station to the Tacoma Convention Center is more light-rail-like because it operates in a semi-exclusive guideway in 25th Street and Pacific Avenue. However, the vehicles currently in use on the Tacoma Link are streetcar vehicles similar to those used in other streetcar systems. The portion of the link from the Tacoma Convention Center to the 9th Avenue terminus is more like a typical modern streetcar system because it operates streetcar vehicles in mixed traffic. The Pre-AA compared design characteristics of light rail and streetcar modes and potential design assumptions for the Tacoma Link extension were prepared. This set of assumptions should be discussed and agreed upon in the early phases of the next level of study. More detail on these assumptions is provided in the memorandum, "Tacoma Link Extension: Streetcar and Light Rail Characteristics and Extension Configuration Assumptions" (HDR Engineering, 2011b), which is attached as Appendix D.

Table 3-2 lists the potential design assumptions that were developed.

TABLE 3-2
Tacoma Link Extension System Configuration Assumptions

System Characteristic	Assumption
Guideway	Shared use
Vehicle	Typical modern streetcar similar to the current Tacoma Link vehicles
Stops	45 feet long, raised bump-out curb for side stops, raised median for center stops; ADA-compliant; minimal furnishings
Traffic signals and street lights	Most modified to raise or shorten cobra heads and mast arms or replace wire-mounted traffic signals
Utilities	Relocation determined by relative density of utilities in the corridor

TABLE 3-2
Tacoma Link Extension System Configuration Assumptions

System Characteristic	Assumption
Traction power system	Trolley wire, dual-use poles, substations approximately 20 feet x 12 feet, voltage in 240/480 VAC, voltage out: 750 VDC
Maintenance and storage facility	One-bay expansion of the existing facility

ADA = Americans with Disabilities Act
VAC = volts alternating current
VDC = volts direct current

3.3 Preliminary Cost Estimates for Each Corridor

Preliminary cost estimates were developed for each alternative, providing capital cost information that can be tracked and audited and is consistent with the Standard Cost Categories developed by the Federal Transit Administration (FTA). These estimates can be used as a tool for comparing alternatives, as well as setting budgets moving forward.

The estimates of probable capital cost were developed based on the assumptions listed in Table 3-2 and discussed in more detail in the memorandum, "Tacoma Link Extension: Streetcar and Light Rail Characteristics and Extension Configuration Assumptions" (HDR Engineering, 2011b), attached as Appendix D.

The cost-estimating methodology was as follows:

1. The route and other project components were broken down into segments with common endpoints (nodes).
2. Project cost components were identified and quantified for each segment.
3. Unit costs were developed for each of the cost components, based on HDR's past project experience and other project-specific factors.
4. The cost components, unit costs, and unit quantities were assembled in a spreadsheet, and the extended cost for each component was calculated and summed into the major cost categories.
5. Additional factors such as contingencies, engineering and administration, and year-of-expenditure escalation were applied to the summed cost subtotals to complete the cost estimates.
6. The segments were assembled to create the full corridor alternatives.

Table 3-3 summarizes the estimate of probable capital cost. More detail on the cost estimates, including assumptions and methodology, is provided in the memorandum, "Tacoma Link Extension: Opinion of Probable Capital Cost and Estimating Methodology" (HDR Engineering, 2011c), attached as Appendix E.

TABLE 3-3
Tacoma Link Extension Estimate of Probable Capital Cost

Corridor	Estimated Cost ($millions)	
	Current Year (2011)	Year of Estimate (assumed 2015)
North End	$136.5	$155.3
North End – Central	$133.8	$152.3
North Downtown Central	$122.1	$138.9
South Downtown to MLK	$104.4	$118.8
South Downtown Central	$375.1	$426.7
South Downtown Central (modified)[1]	$307.3	$349.6
South End	$162.3	$184.7
East Side	$202.7	$230.6
Pacific Highway	$156.5	$178.1

[1]This alternative was created as a feasible option for reaching Tacoma Community College in response to challenging construction conditions in the South Downtown Central alternative. This alternative would travel north from the 9th/Theater District Station via Stadium Way, continue northwest and southwest via North E Street, North 1st Street, and Division Avenue to North I Street; then continue from North I Street/Division Avenue to MLK Jr. Way, then south on MLK Jr. Way to South 19th Street. .

3.4 Potential Funding Strategy

Sound Transit intends to pursue federal funding through the Small Starts program to provide support for capital expenses associated with the Tacoma Link extension. The Small Starts program was first authorized under the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) and began evaluating projects in the fall of 2006. The intent of the Small Starts program is to provide a relatively quick evaluation and funding process for smaller projects and those projects in cities with existing transit service and implementation experience.

The overall project rating process for Small Starts projects comprises two categories of criteria: project justification and local financial commitment. Each of these constitutes 50 percent of the overall project rating. There are several programmatic items that, as part of other federal requirements and good planning practice, are also required to accompany an application to enter project development. These items include compliance with metropolitan planning and programming requirements, demonstrating project management technical capacity, adhering to requirements of the National Environmental Policy Act (NEPA), and completion of an AA. Adherence and attention to the Small Starts programmatic requirements will increase Sound Transit's chances of successfully obtaining federal funding for the Tacoma Link Extension. More detail on potential funding sources is provided in the memorandum, "FTA's Small Starts and Other Funding Mechanisms for Streetcar Projects" (HDR Engineering, 2011c), attached as Appendix F.

SECTION 4

Keys to Success

The Tacoma Link Extension is an important investment for Sound Transit, the City of Tacoma, and Pierce Transit. It will enhance transit mobility in the Puget Sound region and will help the City of Tacoma to achieve land use and economic development goals. However, like other major infrastructure projects, transit projects present challenges to transit agencies and local governments as they move their projects though planning, design, and construction. The experience of Sound Transit and other major transit agencies has shown that the following elements will be essential for a successful project that is supported by the community and capable of securing local and federal funding.

- **Substantial community involvement.** An emphasis on community involvement throughout the project is critical. Federal funding is highly competitive, and communities will not receive it unless there is consensus among local stakeholders about the project and its importance to the region. One of the initial items prepared for the AA must be a comprehensive public involvement strategy.
- **Agreement on decision-making process.** An understanding of how local governing bodies will work with Sound Transit to adopt a locally preferred alternative (LPA) is key. A suggested decision-making process for the AA phase of the project is discussed in section 4.2**.**
- **Competent technical work that complies with FTA requirements.** Ensuring that the process and the technical work completed within the AA are designed specifically to meet FTA requirements will eliminate the need for any re-work in the future. The requirements for an AA under FTA are described in Section 4.3.
- **Adherence to schedule to maintain momentum**. A process designed to utilize federal funding can take several years to complete. This long timeframe creates the risk of losing momentum and community support for the project – local leadership may change and priorities may shift. In addition to robust community involvement, one way to mitigate this risk is to develop a project schedule and adhere to it as closely as possible, and to establish clear milestones within the project schedule that are easy to communicate to and celebrate with project stakeholders. A conceptual schedule for the AA is provided in Section 4.3.

4.1 Substantial Community Involvement

The citizens served by Sound Transit are deeply committed to maintaining and improving the livability of their communities. The citizens want and expect to have a role in shaping major community investments that produce enhancements as well as impacts. The experience of Sound Transit and its partner cities has shown that, when citizens have a meaningful opportunity to participate in the design and implementation of projects, the

value added is substantial. Participation by the citizenry also is a requirement of a federally compliant AA process.

Sound Transit has experience with many techniques for involving the public. The key characteristics of successful involvement of the general public are adequate notice of participation opportunities, multiple communication opportunities through in-person or electronic means, dissemination of complete and easy-to-understand materials, and responsiveness to questions and input from the public.

In addition to the public at large, Sound Transit should involve major stakeholders in project decisions. Stakeholders are typically organizations or interest groups with significant interest in the outcome of the project. The interest may be based on the entity's mission and can have either a civic or a financial character. For the Tacoma Link AA, stakeholders include, at minimum, the following:

- The City of Tacoma
- The business community, as represented by the Tacoma Chamber of Commerce
- Business owners, property owners and residents along the corridors being studied
- The Puyallup Tribe
- Environmental and transit advocacy groups
- Neighborhood organizations
- Pierce Transit
- Institutions and major organizations, such as hospitals, the University of Washington-Tacoma, the property administrators of the Tacoma Mall, and Tacoma Community College

An effective way to provide for stakeholder participation in the project is to create a committee of community representatives that serves in an advisory capacity to Sound Transit. Section 4.2 below describes a suggested way for this type of committee to integrate with other project committees.

4.2 Transparent Decision-making

Sound Transit has two key partners for the proposed extension of Tacoma Link—the City of Tacoma and Pierce Transit—and many other stakeholders in the process and outcomes. These partners, other key stakeholders, and the public at-large will want to understand how decisions will be made. Moreover, being transparent about decision-making will build trust and help to create a sense of ownership for the project. Because Tacoma residents may be asked to help pay for the project and it will physically affect their community, a feeling of ownership will be very valuable to the successful delivery of the project.

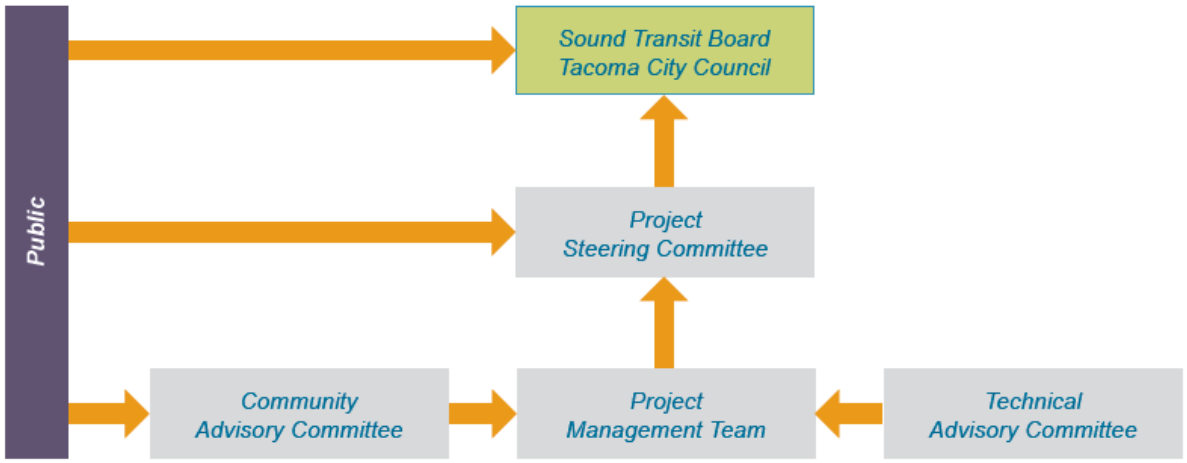
A decision-making process can be constructed in several ways. One approach that has proven effective is to provide opportunities for all technical and public interests to

contribute to decisions both large and small. Components of such a process would include the following:

- The **Project Steering Committee** would be composed of decision-makers who represent Sound Transit, Pierce Transit, and the City of Tacoma. This committee would be responsible for reviewing recommendations from the Community Advisory Committee and adopting official recommendations for the project to forward to the Tacoma City Council and the Sound Transit Board of Directors.
- The **Project Management Team** would be composed of the day-to-day managers of the project from Sound Transit, as well as any appropriate consultant staff. Team members would be responsible for ensuring that the project moves forward on the agreed-upon timeline, and for quality assurance of all project deliverables. The team would prepare agendas for the Project Steering Committee and generally help to prepare key decisions that are made by the Project Steering Committee and advanced to the Sound Transit Board and Tacoma City Council.
- The **Technical Advisory Committee** would be composed of staff members from other local agencies such as Pierce Transit and the City of Tacoma that may not need to be involved in the day-to-day management of the project, but whose knowledge and technical expertise may be needed. A technical advisory committee would help to promote collaboration among all the partners and would render advice to the Project Management Team.
- The **Community Advisory Committee** would be composed of representatives of the local community, including residents, business owners, local organizations, and the Puyallup Tribe. This committee also would ideally include strong representation from minority and low-income residents. The Community Advisory Committee would be responsible for adopting recommendations on key project decisions that would then be forwarded to the Project Steering Committee.

Figure 4-1 is a diagram of how the decision process would work under this committee structure.

FIGURE 4-1
Proposed Project Decision-making Process



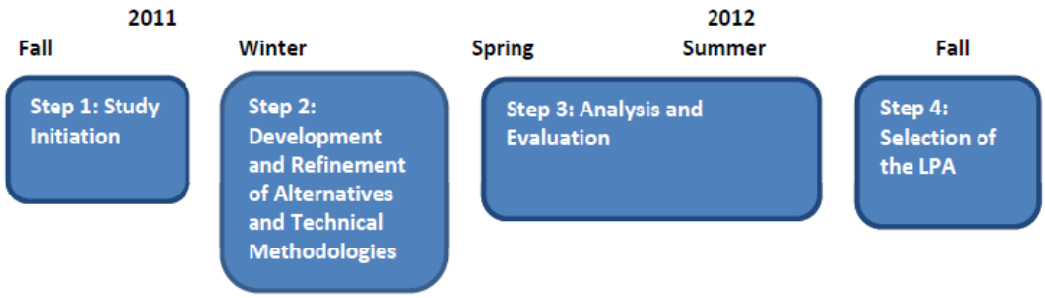
Most committee meetings for the groups described above should be considered open, public meetings. Other meaningful involvement of the public and local jurisdictions may take many forms, as appropriate, including the following:

- A comprehensive and up-to-date, interactive project website that provides background on the project, ways to submit comment, details of upcoming meetings, and contact information for project staff. The web site should offer opportunities for two-way communication such as online questionnaires or blog features.
- Public meetings at meaningful locations in the project corridor and at key milestones within the project schedule. Meaningful locations for the Tacoma Link extension project would depend on the corridors studied within the AA, but would likely include major institutions and centers such as the University of Washington–Tacoma, Tacoma Mall, Tacoma Community College, Freighthouse Square, and Emerald Queen Casino.
- Public information including postal and electronic project mailing list, social media outreach, and traditional media outreach. E-mails and postcards sent to interested parties can help to advertise upcoming public meetings and milestones within the project. Press releases to traditional media sources and email blasts to blogs and social media sites with relevant audiences can also help to engage the broad public.

4.3 Compliance with Federal Transit Authority Alternatives Analysis Requirements

The Pre-AA for the Tacoma Link Extension provides information on the characteristics of the corridors, on the design assumptions inherent in a streetcar system, on preliminary cost estimates of the potential corridors, and on funding strategies for capital costs of the project. This work sets the stage for a complete analysis of alternatives for extension of Tacoma Link. The next step is to complete a full AA consistent with the requirements for federal funding. The basic elements of an AA and a conceptual schedule are included in Figure 4-2.

FIGURE 4-2
Conceptual Schedule for Tacoma Link Alternatives Analysis



An AA for a transit project must include:

- **Clear definition of the purpose and need for the project.** Collaboration between the project stakeholders and Sound Transit decision-makers to reach consensus on a vision for the project will set the stage for everything else that follows. Defining the project as

either a local circulator or a regional, commuter-oriented system is important step and should be completed as soon as possible.

- **Relative importance of key destinations.** One way to help frame the decisions about potential corridors is to work with project stakeholders to determine which destinations are most important to serve through a transit investment.
- **Agreement on the mode.** The decision on whether or not the Tacoma Link Extension will be a typical streetcar system or will be a streetcar vehicle system operating on light rail tracks should be made during the AA.
- **Environmental impacts.** This project will be required to document compliance with the National Environmental Policy Act (NEPA) and Washington State Environmental Policy Act (SEPA). This documentation can occur during or after the AA phase of the project. Whenever it occurs, the environmental document should pay particular attention to impacts to historic districts from the proposed corridors as well as service to minority and low-income communities.

The purpose of an AA for FTA is "to identify and compare the costs, benefits, and impacts of a range of transportation alternatives as a means of providing local decision-makers with the information necessary to implement the most appropriate transportation solutions in priority corridors."[1] The FTA 2005 manual, *Procedures and Technical Methods for Transit Project Planning*, recommends that AAs be conducted in four major steps: study initiation, development and refinement of alternatives and technical methodologies, analysis and evaluation, and selection of the LPA. The general requirements for each step are listed below. It is important that the AA for the Tacoma Link Extension closely follow FTA requirements. Public involvement for the project must be initiated in Step 1 and conducted throughout the subsequent steps.

- **Step 1: Study initiation**
  - Define the purpose and need for the project
  - Define agency roles and responsibilities
  - Define issues to be addressed in the study
  - Identify availability of data and models to address the issues
- **Step 2: Development and refinement of alternatives and technical methodologies**
  - Develop range of alternative corridors and modes
  - Define evaluation framework and evaluation measures
  - Document technical methodologies for evaluating alternatives
  - Conduct a preliminary analysis to screen alternatives (if appropriate)
- **Step 3: Analysis and evaluation**
  - Evaluate alternative corridors and modes, and document the evaluation

1 http://www.fta.dot.gov/planning/newstarts/planning_environment_2599.html

- **Step 4: Selection of the LPA**
  - Engage the community in selecting an corridor and mode that has strong support and meets the purpose and need for the project

A typical AA requires 12 to 18 months to complete. Figure 4-2 shows a conceptual timeline for the Tacoma Link AA, assuming that the project begins in the fall of 2011. Given the work that has been conducted in the Pre-AA, this AA could reasonably be completed within 12 to 14 months. If delays occur, they would likely be caused by a need for longer periods of coordination among the many local stakeholders.

4.4 Adherence to Schedule

A major risk for transit projects everywhere is the time required to move through planning, design, and construction. When projects extend over a long period of time, there can be changes in local government and agency leadership, changes in stakeholder representation, and, along with those changes, shifts in expectations and support. Projects that seek federal funding are more vulnerable because of the time required to move through federal environmental and funding processes.

Staying on schedule requires good project management to ensure that tasks are completed on time and on budget. It also requires that the project be set up for success from the start. Elements that can reduce schedule risk include:

- Agreement among major partners and stakeholders on the decision-making process for the project
- A complete and meaningful public involvement process
- A competent, experienced technical team of consultants and agency staff

SECTION 5

Next Steps

One of the characteristics of successful transit projects is maintaining momentum by moving forward with project tasks and keeping project stakeholders fully informed. Assuming that Sound Transit desires to initiate a full AA for this project, there are four actions that should be taken as soon as possible.

1. **Develop a full scope of work for the next phase**: The scope of work should include all tasks required for a successful project, including tasks to be performed by Sound Transit, the City of Tacoma, and a consultant team. Thus, the scope of work should address requirements for an FTA AA (as outlined in Section 4.3), public involvement tasks needed for project success, intergovernmental coordination tasks, and other elements that Sound Transit identifies as being part of the work program. Drafting a broad scope of work will help the agency partners and the consultants understand the responsibilities of each other and smooth project implementation.

2. **Obtain agreement on a decision-making process**: Working with its partners at the City of Tacoma and Pierce Transit, Sound Transit should develop a decision-making process. Putting this process in place soon will force resolution of disagreements about process before entrance into the AA, environmental, and design stages.

3. With a decision framework in place, Sound Transit should focus on **securing agreement from partners on scope and decision-making process**. This is the beginning of ownership for the project. By beginning the process with agreement on scope, schedule, and decision-making, the chances of success are greatly enhanced.

4. **Continue communications during this time with members of the former stakeholder group**: This will help to maintain momentum, even while Sound Transit takes time to write the scope and schedule and arrange funding.

SECTION 6

Conclusion

The Tacoma Link Extension is an important investment that could help to meet several goals of Sound Transit and the City of Tacoma. The Pre-AA phase of this project has provided key sets of information that lay the groundwork for a full AA. The AA phase of the project will be a critical juncture for project stakeholders to work together to define the vision of the project and for the project to gain momentum within the region. The AA could potentially be completed within 12 to 14 months, and there are several key technical and process considerations to be taken into account to ensure that the project is compliant with FTA procedures.

SECTION 7

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Appendix A
Stakeholder Group Final Report

FEB 2011

Tacoma Link Expansion

STAKEHOLDER GROUP **FINAL REPORT**

SOUNDTRANSIT

Tacoma

PIERCE TRANSIT

TACOMA LINK EXPANSION
STAKEHOLDER GROUP: DRAFT FINAL REPORT

INTRODUCTION

This document details the work of the Tacoma Link Expansion Stakeholder Group (see Appendix A for list of group members) and their recommendations on potential corridors for expanding Tacoma Link. Formed by the City of Tacoma, Sound Transit, and Pierce Transit in July 2010, this group included diverse representation of Tacoma and the region. The mission of this group was to provide commentary and feedback on potential corridors using their expertise as representatives of diverse constituencies. This qualitative, community-focused report should help guide decision-makers and further technical planning.

From July 2010 to January 2011, stakeholders met monthly (see Appendix B for meeting schedule and descriptions) to discuss a variety of issues related to the expansion of Tacoma Link including:

- Determining community-wide objectives to use as a lens when analyzing corridors;
- Relating those objectives to measures;
- Brainstorming and discussing potential corridors for expansion (see map, Page 4); and
- Describing the degree to which the corridors responded to objectives and measures.

This report is organized into six sections: Introduction, General Observations, Corridor Discussion, Key Issues for Policy Makers to Explore, Conclusions, and Next Steps, with major outcomes being:

1. The group identified six objectives as most important to the Tacoma community. Two of these objectives, Serving Underserved Communities and Serving Tacoma Neighborhoods, were prioritized over others, and economic development was an overarching priority.
2. The group identified six corridors for potential Tacoma Link expansion. Of these, three were more responsive to the group's measures than the other three: Orange (North Downtown-Central), Red (Eastside), and Purple (North End-Central; for a full description, see Corridor Evaluation Exercise, Page 5).
3. Significant policy issues remain, including reconciling qualitative and quantitative information, defining the scope of the final project, and funding. The group urges decision makers to explore these as part of the projects next steps.

GENERAL OBSERVATIONS

Several themes emerged as the Stakeholder Group analyzed potential corridors with respect to community objectives:

1. **Objectives:** The group identified six objectives, with two prioritized over others (denoted by *). These objectives are not mutually exclusive, nor are they always complementary (see Corridor Evaluation Exercise, Page 5, for further description of objectives and measures). They are:

- Serving Underserved Communities*
    - Historically do not receive infrastructure investments – using transit investment to spur other investment
    - Not connected to greater Tacoma community
    - Diverse in terms of economics and ethnicity
    - Serving areas ripe for transit oriented redevelopment
    - Developing new transit markets
- Serving Tacoma Neighborhoods*
    - Attracting business and retaining existing business
    - Serving existing housing stock as well as attracting new housing around the transit line through increased density
    - Attracting visitors, especially residents of other neighborhoods
    - Encouraging transportation choices within, to, and from the downtown core
- Serving Downtown Tacoma
    - Attracting business and retaining existing business
    - Attracting visitors and new residents
    - Levering pending investments and enhancing investments that have already been made
    - Encouraging transportation choices within, to, and from the downtown core
- High Ridership
    - Because it's user-friendly, reliable, timely, and goes where people want to go
    - Serve existing high ridership areas
    - Reduction in vehicle miles traveled (VMT)
    - Competitive for federal funding
- Regional Connections
    - Connecting to Sound Transit's Central Link and SeaTac Airport
    - Connecting to areas of transit emphasis (ie: transit centers or large employees)
- Low Cost
    - Leveraging other current transportation investments
    - Low cost of construction
    - Avoid additional costs

2. **Corridors:** Each of the corridors identified by the Stakeholder Group has pros and cons; three of the identified corridors (North Downtown – Central, Orange; Eastside, Red; and North End – Central, Purple) respond better to the group's objectives and measures than the other three (South End, Yellow; South Downtown – Central, Green; and North End, Blue; see Corridor Evaluation Exercise, Page 5, for corridor evaluations).

3. **Connection to Central Link:** Regional transit connections, especially to SeaTac Airport, are critically important to the Tacoma community. However, given the long term phasing of such a project (ST2 only contemplates an expansion of Central Link to the Redondo/Star Lake area of Federal Way), the group agreed that the priority should be on a Tacoma Link expansion that serves the people of Tacoma in the near term.

4. **Economic Development:** The concept of economic development underlies all other values and objectives identified by the group.
    a. The group defines economic development in a number of ways:
        i. Connecting residential areas to employment centers.

ii. Connecting activity centers and mixed-use centers (which is a stated goal of the City of Tacoma).
iii. Using the expansion as a catalyst for additional development and investment in an area.
iv. Directing investment to underserved neighborhoods.

b. Different corridors respond to different facets of economic development in different ways.

5. **Cost, Technology, and Geography:** The Stakeholder Group did not extensively discuss potential project costs, preferred transit technology, or feasibility of rail under certain geographic constraints (this was not in the scope of this group). They did, however, acknowledge the importance and potentially determinative nature of both cost and feasibility. Furthermore, this final report assumes that the expansion project connects to and extends the existing Tacoma Link line, although transit technology – including cost and feasibility – is a subject that will and should be explored further during the technical phase of the planning phase.

6. **Reducing Trips:** The Stakeholder Group puts a premium on reducing car trips; it should be a consideration in choosing an alignment. In particular, Commute Trip Reduction (CTR) is a goal of the City of Tacoma and region and could be enhanced with the expansion of Tacoma Link.

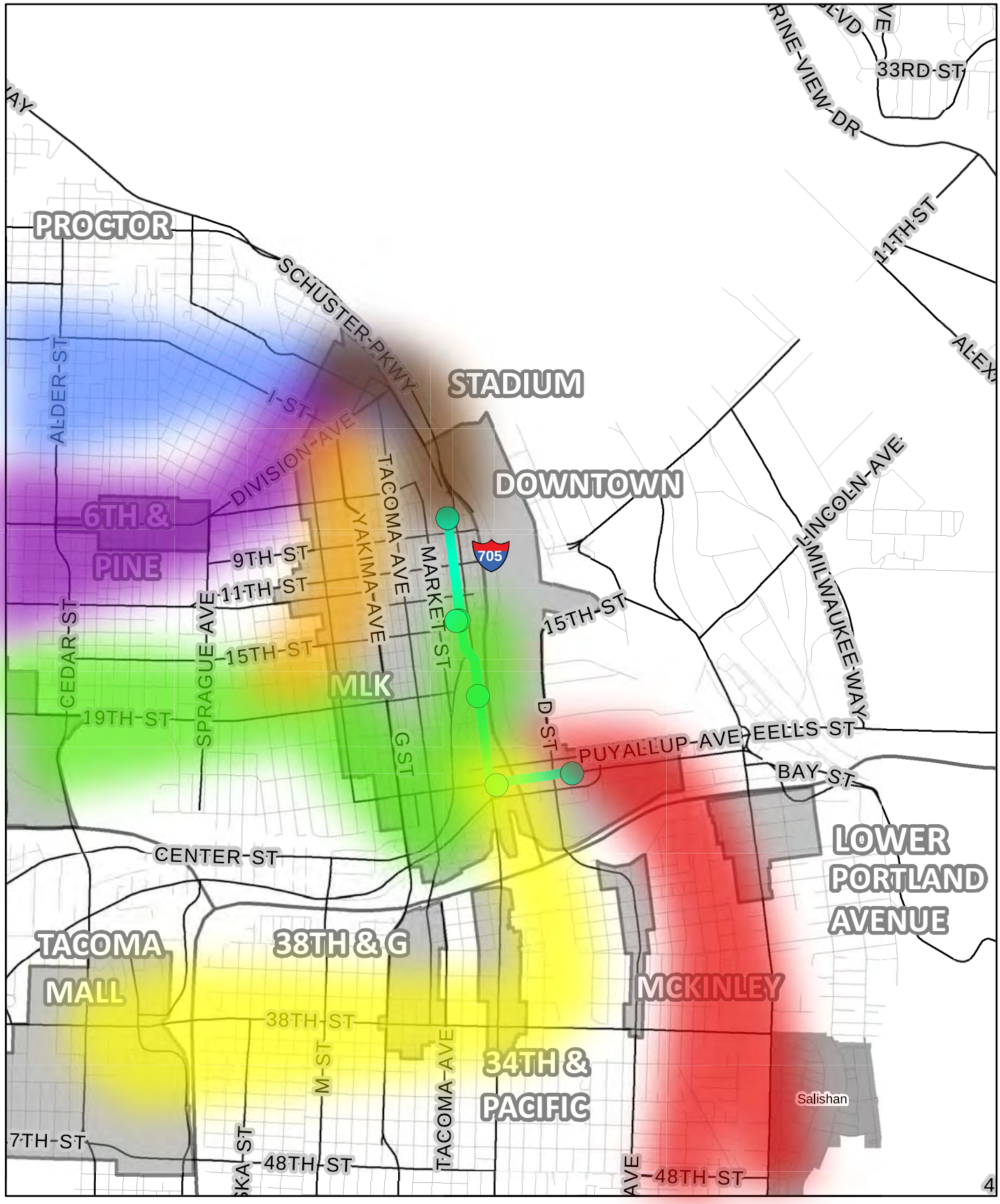
7. **Benefits and Impacts:** To different degrees, all corridors will have benefits and impacts. For example, in corridors with few vacant properties, business displacement may be a significant concern if the expansion required the widening of a road or elimination of parking. Conversely, an investment of a rail or streetcar line could help bring customer traffic to the businesses in a corridor and could raise the community value of an area with a major public investment.

8. **Other Factors:** Other factors, such as station spacing / location, headways, transit-oriented development potential, fares, and parking policies could greatly add to or detract from the success of the expansion.

I. Corridor Discussion

Of the six corridors identified by the stakeholder group for potential expansion of Tacoma Link, three responded to the measures better than the other three. Issues related to neighborhood connectivity, serving underserved communities, and ridership were discussed at length. This report also includes highlights of possible coordination with existing state and local projects and/or investments. A desire to connect multi-use centers, connect people to jobs, and use the expansion as a tool for economic development are main themes in this discussion.

Three corridors, Orange, Purple, and Blue, can all be approached in the same way through the Stadium District (although the Orange Corridor can also be approached via South Downtown; see below); for this reason, the Stadium District Corridor is highlighted as "Brown" on the map on Page 4.



Tacoma Link Expansion: Stakeholder Group Evaluation Corridors

Existing Tacoma LINK

Link Stations

Mixed Use Center

Other Area of Interest

0 0.5 1 Miles

SOUNDTRANSIT

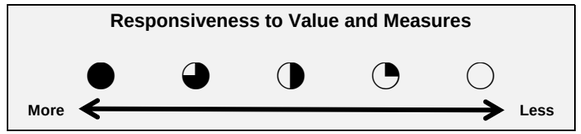
Tacoma

CH2MHILL

TBG120810082213PDX

Tacoma Link Expansion Stakeholder Group
01/24/11 meeting
Corridor Evaluation Exercise

KEY:



	Corridor:	Orange	Red	Purple	Yellow	Green	Blue
	Description:	(North Downtown - Central)	(Eastside)	(North End - Central)	(South End)	(South Downtown - Central)	(North End)

Community Values	Criteria	Measure	Rating	Rating	Rating	Rating	Rating	Rating
1. Serving Underserved Communities a. Historically do not receive infrastructure investments – using transit investment to spur other investment b. Not connected to greater Tacoma Community c. Diverse in terms of economics and ethnicity d. Serving areas ripe for transit oriented redevelopment e. Developing new transit markets	Equity	Ability to generate economic development.	●	●	◑	◕	◑	◔
2. Serving Tacoma Neighborhoods a. Attracting business and retaining existing b. Serving existing housing stock as well as attracting new housing around the transit line through increased density c. Attracting visitors, especially residents of other neighborhoods d. Encouraging transportation choices within, to and from the downtown core	Neighborhood connectivity	Degree to which neighborhoods are connected to each other and the core. Number of neighborhood commercial areas connected to each other and the core.	◕	◑	●	◕	◑	◑
3. Serving Downtown Tacoma a. Attracting business and retaining existing b. Attracting visitors and new residents c. Leveraging pending investments and enhancing investments that have already been made d. Encouraging transportation choices within, to and from the downtown core	Mobility	Ability to connect Tacoma activity centers with the core – providing more connections to more places. Number of activity centers connected to the core.	●	◕	◑	◔	◕	◔
4. High Ridership a. Because it's user-friendly, reliable, timely, and goes where b. Serve existing high ridership areas c. Reduction in vehicle miles traveled (VMT) d. Competitive for federal funding	Ridership	Relative likelihood of attracting riders. Relative likelihood of attracting <u>new</u> riders.	●	◑	●	◕	◑	◑
5. Regional Connections a. Connecting to Sound Transit's Central Link and SeaTac b. Connecting to areas of transit emphasis (e.g. transit centers)	Access to the region's core	Degree to which regional connectivity is advanced. Transit travel time from downtown Tacoma to	◕	●	●	◕	◑	○
6. Low Cost a. Leveraging other current transportation investments b. Low cost of construction c. Avoid additional costs	Affordability	Relative cost based on route length.	◕	◕	◑	◔	◑	◑
Comments:			► Combines reaching higher population density, underserved communities and major employers (i.e. two hospitals).	► Reaches multiple underserved communities and potentially a unique activity center.	► Central orientation of corridor through western Tacoma provides ability to serve multiple neighbors.	► Reaches some underserved communities but most effective if reaches Tacoma Mall area.	► Reaches underserved community and one major employer, but bypasses others.	► Traverses an area of relatively higher population density, but beyond this area the density quickly diminishes.

Orange Corridor: North Downtown-Central

Corridor description:
This corridor extends up the hill from Downtown and serves the MLK District. It can be approached in two ways:

- *Via the Stadium District (see "Brown" portion of corridor on map, Page 4)*
  Extending from the 9th and Commerce Station, through the Stadium District and then moving though the E Street / 1st Street / Division Street / MLK District corridor (description identified in Sound Transit's Long Range Plan Update Issue Paper S.4: Potential Tacoma Link Expansion – West, March 2005).

- *Via South Downtown (see lower section of "Green" corridor on map, Page 4)*
  Extending from one of the mid-line stations (such as Union Station), through the southern portion of Downtown and the Brewery District, and connecting up to 19th Street / MLK District corridor.

Responsiveness to objective and measures:
This corridor responds very highly to all of the objectives and measures, specifically:

- *Serving underserved communities*
  There are many vacant properties in this corridor and, thus, much opportunity for relatively easy redevelopment and economic development within the MLK corridor. There is much consensus in the group that this area is ripe for redevelopment and that an expansion of Tacoma Link would support this redevelopment.

- *Serving Tacoma neighborhoods*
  The corridor connects two of Tacoma's mixed-use centers: the Stadium District and the MLK mixed-use center, which includes two of Tacoma's major employers, Multicare's Tacoma General Hospital and St Joseph Medical Center. It has high potential for serving close-to-downtown neighborhoods and to make better connections to and from Downtown.

Coordination with pending investments:

- *State Department of Commerce grant*
  $100,000 has been awarded to the City of Tacoma to conduct environmental and pre-development work – of the same nature as is being conducted in the south half of downtown through the PSRC HUD Sustainable Communities grant – in the MLK mixed-use center. Pre-approved new floor space will improve permit processing times to incent and attract local and regional investment.

- *Stadium Way Arterial Project*
  Stadium Way is being rebuilt from the intersection of Commerce and 9th St. to the intersection of N. 1st St. and Tacoma Ave. Construction is scheduled to begin in July of 2011 and conclude by year's end 2012. Reconstruction of the arterial will include necessary repair or replacement of the 1920's retaining wall at Schuster Parkway and incorporation of "Complete Streets" concepts as much as possible.

Leveraging other investments
LID within the MLK Corridor

- $400,000 has been allocated by the Tacoma City Council to fund the exploration of forming a comprehensive Local Improvement District (LID) to improve the streetscape, utilities and other infrastructure within the MLK corridor from Division to South 25th Street. The intent of the funding is to complete design and environmental work, community outreach, and economic benefit analysis to the point at which a complete improvement package can be presented to the affected property owners for their consideration and approval.

Red Corridor: Eastside

Corridor description:
This corridor extends from the Tacoma Dome Station along the Puyallup Avenue corridor, then through the Lower Portland Avenue corridor towards Salishan and can reach the 72nd Street Transit Center.

Responsiveness to objective and measures:
This corridor responds highly to the objectives and measures, specifically:

- *Serving underserved communities (and partnership potential)*
  The Puyallup Tribe owns much of the property in and adjacent to the Lower Portland Avenue mixed-use center including the Emerald Queen Casino I-5. The Tribe has and is continuing to invest intensely in redevelopment of these properties – many of which are vacant – with housing, community services and commercial activities. This would provide a unique community partnership for expanding Tacoma Link.

  In addition, the Eastside area is poised for redevelopment and an expansion of Tacoma Link would support this redevelopment.

Coordination with pending investments:
PSRC grant from HUD Sustainable Communities Initiative

- Tacoma is the recipient of $500,000 grant awarded to the Puget Sound Regional Council from the HUD Sustainable Communities Initiative. Tacoma, recognized by the region as a key population and employment center, will use the award to fund environmental and pre-development work in the 500-acre southern half of downtown – an area that includes the Tacoma Dome District and the Brewery District. A minimum of 30 million square feet of new floor space will be pre-approved to improve permit processing times (for large projects reduced from years to weeks) and incent and attract regional investment.

Leveraging other investments:

- *Salishan redevelopment*
  Expected to be completed in 2011, will have increased housing units from 855 to 1,200-1,300. An approximate $225 million investment, the new Salishan – a mixed-income, mixed-use neighborhood of affordable and market rate rental housing, single family homes for sale, commercial buildings and community buildings, and parks, all on brand new infrastructure – is transforming the whole surrounding community.

- *Swan Creek*
  Citizens of Tacoma approved $1,000,000 for improvements to Swan Creek. Included in those improvements is the development of a master plan that will transform Swan Creek into a regional destination. Development of the plan will happen in 2011 with construction commencing and concluding in 2012.

Purple Corridor: North End-Central

Corridor description:
This corridor extends from the 9th and Commerce Station, through the Stadium District and then moving though the E Street / 1st Street / Division Street / MLK District corridor (see the "Brown" corridor; description identified in Sound Transit's Long Range Plan Update Issue Paper S.4: Potential Tacoma Link Expansion – West, March 2005) and then to the 6th Avenue District.

Responsiveness to objective and measures:
This corridor responds highly to the objectives and measures, particularly if it reaches Tacoma Community College (TCC); specifically:

- *Serving Tacoma neighborhoods*
  Sixth Avenue is currently a developed corridor (although zoning allows for additional growth), so there is high potential for benefits (providing additional traffic for businesses) and / or impacts (construction impacts and needs for street space, such as current parking).

- *Ridership*
  The corridor connects two of Tacoma's mixed-use centers: the Stadium District and the 6th Avenue mixed-use center. Through these centers, transit ridership is presently strong, and a streetcar would presumably capture this existing ridership and make the redeployment of bus hours to other parts of the city possible. This strong current ridership could, but does not necessarily, translate directly into new ridership.

Coordination with pending investments:
Stadium Way Arterial Project

- Stadium Way is being rebuilt from the intersection of Commerce and 9th St. to the intersection of N. 1st St. and Tacoma Ave. Construction is scheduled to begin in July of 2011 and conclude by year's end 2012. Reconstruction of the arterial will include necessary repair or replacement of the 1920's retaining wall at Schuster Parkway and incorporation of "Complete Streets" concepts as much as possible.

Yellow Corridor: South End

Corridor description:
Extending from one of the mid-line stations (such as the S. 25th Street Station), through the 34th and Pacific corridor, connecting to the 38th Street corridor, and to the Tacoma Mall.

Responsiveness to objective and measures:
Overall, this corridor was not a priority as it didn't respond to objectives as highly as other corridors did. Moreover, responsiveness to these objectives and measures is predicated on reaching Tacoma Mall; specifically:

- *Serving underserved communities*
  The Lincoln District small business community that struggles with storefront vacancy could receive a boost in traffic from a Link extension.

- *Serving Tacoma neighborhoods*
  The corridor connects several of Tacoma's mixed-use centers including 34th & Pacific (includes the Tacoma-Pierce County Health Department), 38th & G (Lincoln District), and the Tacoma Mall, also recognized as a growth center for the Puget Sound region. If this extension reaches Tacoma Mall, the corridor is in better position to fulfill neighborhood connectivity, regional connection, and ridership goals; without Tacoma Mall, the corridor falls far short of serving these objectives. In addition, a Link extension between downtown Tacoma and the Tacoma Mall may encourage competition between the two regional destinations.

Coordination with pending investments:
PSRC grant from HUD Sustainable Communities Initiative

- Tacoma is the recipient of $500,000 from a grant awarded to the Puget Sound Regional Council from the HUD Sustainable Communities Initiative. Tacoma, recognized by the region as a key center of population and employment, will use the award to fund environmental and pre-development work in the 500-acre south half of downtown – an area that includes the Tacoma Dome District and the Brewery District. A minimum of 30 million square feet of new floor space will be pre-approved to improve permit processing times (for large projects reduced from years to weeks) and incent and attract regional investment.

Green Corridor: South Downtown-Central

Corridor description:
Extending from one of the mid-line stations (such as Union Station), through the southern portion of Downtown and the Brewery District, connecting up to 19th Street / MLK District, and continuing along the 19th Street corridor towards TCC.

Responsiveness to objective and measures:
This corridor responds moderately to almost all objectives and measures; responsiveness to these objectives and measures is predicated on either reaching TCC or connecting to the Orange corridor; specifically:

- *Serving Tacoma neighborhoods*
  This corridor connects the Brewery District and MLK mixed-use center to Downtown, and in general responds somewhat favorably to the objectives and measures in the Downtown Core area. Beyond the MLK mixed-use center, however, it does not connect to any additional centers until past Cedar Street. Beyond Cedar Street, Tacoma Community College is a regional center that could be connected. If the extension includes TCC, the corridor is in better position to fulfill neighborhood connectivity, regional connection, and ridership goals; without TCC, the corridor falls far short of serving these objectives.

Coordination with pending investments:
PSRC grant from HUD Sustainable Communities Initiative

- Tacoma is the recipient of $500,000 from a grant awarded to the Puget Sound Regional Council from the HUD Sustainable Communities Initiative. Tacoma, recognized by the region as a key center of population and employment, will use the award to fund environmental and pre-development work in the 500-acre south half of downtown – an area that includes the Tacoma Dome District and the Brewery District. A minimum of 30 million square feet of new floor space will be pre-approved to improve permit processing times (for large projects reduced from years to weeks) and incent and attract regional investment.

Blue Corridor: North End

Corridor description:
This corridor extends from the 9th and Commerce Station, through the Stadium District and then moving though the E Street / 1st Street / Division Street / MLK District corridor (see the "Brown" corridor; description identified in Sound Transit's Long Range Plan Update Issue Paper S.4: Potential Tacoma Link Expansion – West, March 2005) and then through the North Tacoma area towards the University of Puget Sound (UPS).

Responsiveness to objective and measures:
This corridor responds moderately to poorly on all objectives and measures; responsiveness to these objectives and measures is predicated on reaching UPS; specifically:

- *Serving Tacoma neighborhoods*
  This corridor does not connect to particularly dense areas of the city. It does connect the Stadium District to downtown, but beyond the Stadium District the corridor leads to primarily single-family neighborhoods and does not lead to any mixed-use centers or destinations of noted significance (unless it is connected to the University of Puget Sound).

- *Ridership*
  The corridor connects a mixed-use center (the Stadium District) to Downtown which could produce some higher ridership.

Coordination with pending investments:
Stadium Way Arterial Project

- Stadium Way is being rebuilt from the intersection of Commerce and 9th St. to the intersection of N. 1st St. and Tacoma Ave. Construction is scheduled to begin in July of 2011 and conclude by year's end 2012. Reconstruction of the arterial will include necessary repair or replacement of the 1920's retaining wall at Schuster Parkway and incorporation of "Complete Streets" concepts as much as possible.

II. Key Issues for Policy Makers to Explore:

While there are many questions to be answered as the expansion of Tacoma Link moves forward (some of which are identified in the *General Observations* section of this report), the Stakeholder Group identified three key issues for the consideration of policy makers:

1. *Reconciling Qualitative and Quantitative Information:* Three corridors – Orange, Red, and Purple – responded best to the Stakeholder Group's objectives and measures; however these corridors are very different and there are pros and cons to each. Policy makers will need to carefully consider the qualitative measures identified in this report with the quantitative measures of rigorous, technical planning work before choosing a final alignment.

2. *Defining the Scope of the Final Project:* The stakeholder group prefers delivering a project that can reach its desired location or fulfill its potential; they encourage policy makers to consider a complete project, which can – but does not have to – be part of a larger transit system in Tacoma.

3. *Funding:* The stakeholder group did not extensively discuss the issue of funding. While the group acknowledges the importance of funding, there is limited information available at this time regarding the cost or possible funding plans for the various corridors. The group does acknowledge that the issue of funding needs to be addressed, and that the ST2 plan states that the Tacoma Link expansion must be a robust partnership between Sound Transit and some or all of the following: the City of Tacoma, the Puyallup Tribe, the federal government, private interests, and other governmental entities. There is also acknowledgement that the community needs to focus on identifying the right project(s) for Tacoma and then determine how to fund them.

III. Conclusions

1. The group identified six objectives, with two prioritized over others: Serving underserved Communities and Serving Tacoma Neighborhoods. They also identified Economic Development as a running theme.

2. Three of the identified corridors –Orange (North Downtown-Central), Red (Eastside), and Purple (North End-Central) – responded best to the group's objectives and measures.

3. There are three key issues for policy makers to consider as they move forward: reconciling qualitative and quantitative information, defining the scope of the final project, and funding.

IV. Next steps summary

The stakeholder group report is intended to be the first step in the process for expanding Tacoma Link, and this group's work will better position the project to move expeditiously and successfully through the next phases of planning and project delivery. Following the completion of this group's work, planning will begin for this project including an alternatives analysis, public outreach, environmental work, preliminary engineering, final alignment decision, and construction.

Appendix A: Membership of the Tacoma Link Stakeholder Group:

- Andrew Austin, Transportation Choices Coalition
- Jennifer Burley, University of Washington, Tacoma
- Eric Crittendon, New Tacoma Neighborhood Council
- Ryan Dicks, Pierce County Sustainability
- Chris Green, Economic Development Board for Tacoma-Pierce County
- Phyllis Harrison, The Art Stop / LeRoy Jewelers
- Jesse Hart / Mark McIntire, Eastside Neighborhood Council
- Rollie Herman, Hillside Development Council
- Cheryl Jones, Allen Renaissance / MLK District
- Chelsea Levy, Tacoma-Pierce County Chamber of Commerce
- Mark Martinez, Pierce County Building and Construction Trades Council
- Evette Mason, Port of Tacoma
- Michael Mirra, Tacoma Housing Authority
- Whitney Rhodes, Downtown Merchant's Group
- Lois Stark, MetroParks Tacoma / Tacoma Area Commission on Disabilities
- Chad Wright, Marine View Ventures

Appendix B: Meeting Overviews

The Stakeholder Group met approximately once a month from July 2010 to January 2011. Jointly facilitated by the City of Tacoma, Sound Transit, and Pierce Transit, the Stakeholder Group developed a set of community objectives, articulated possible corridor alignments, analyzed the pros and cons of each corridor with respect to community objectives, and developed a set of consensus recommendations for policymakers.

Specific content of each meeting was as follows:

Meeting #1 – July 26, 2010:
- Tour of Tacoma neighborhoods and mixed-use centers
- Goal: Visualize existing neighborhoods with an expansion of Tacoma Link; share their collective knowledge of community development activities; hear from City of Tacoma staff on current and future zoning and planning efforts

Meeting #2 – August 23, 2010:
- Streetcar Objectives Activity ("The Button Exercise")
- Goal: Prioritize the community objectives heard most frequently in individual meetings

Meeting #3 – September 20, 2010:
- Read and discuss previous studies associated with expansion of Tacoma Link
- Goal: Educate members of the group on all previous studies and planning efforts to expand Tacoma Link (including Sound Transit's long range planning, Sound Transit's study for the Puyallup Tribe, the City of Tacoma's 2005 Streetcar Group, and Pierce Transit's system redesign)

Meeting #4 – October 18, 2010:
- Draw potential alignments ("Drawing Exercise")
- Goal: Articulate all possible alignments (these alignments would later be turned into corridors and refined)

Meeting #5 – November 15, 2010:

- Develop criteria and reviewing data maps
- Goal: Overlay possible streetcar corridors with maps of data such as density and zoning; turn objectives into measures

Meeting #6 – December 13, 2010:

- Corridor evaluation ("Matrix Exercise")
- Goal: Share pros and cons of all corridors in small groups

Meeting #7 – January 24, 2011:

- Develop final report
- Goal: Come to group consensus on the message that will be delivered to the policy makers

Appendix B
Tacoma Link Extension: Potential Benefits and Impacts of the Proposed Corridors

Tacoma Link Extension: Potential Benefits and Impacts of the Proposed Corridors

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Kevin Collins, HDR
Julia Walton, Inova

DATE: March 23, 2011 [revised September 7, 2011]

1. Introduction

The purpose of this memorandum is to discuss potential benefits and impacts of eight proposed alternative alignments for an extension of the Tacoma Link streetcar system. The existing Tacoma Link system is 1.6 miles long and contains five at-grade stations. It has been in operation since 2003. This memorandum begins by summarizing the findings provided in the memo and then continues by providing background on the project and an overview of each corridor that is analyzed. It then defines "benefits" and "impacts" and discusses how each of those is measured. Results of each evaluation of potential benefits and impacts from the eight alignments are provided following the definitions. The relationship between the results of the analyses to the stakeholder objectives is discussed in section 5. The memo ends by summarizing comparisons between the eight corridors and providing some guidance on next steps in the project.

1.1 Summary of Findings

The conclusions presented for each corridor discussed in this memorandum are as follows:

- **Eastside:** This corridor would serve a high percentage of low-income and minority residents, and would utilize an alignment that has an existing high-performing bus route. It travels through an existing habitat corridor and is adjacent to the Portland Avenue Park.
- **North Downtown Central:** This corridor would serve the largest population in 2040 of all eight corridors. It would also serve a high number of existing and forecasted jobs, as well as a high percentage of low-income and minority residents. This corridor would also serve a large number of community institutions. It would travel through four historic districts (Old City Hall, Wright Park and Seymour Conservatory, Stadium-Seminary, and North Slope).
- **North End:** This corridor would serve a high existing and projected population and employment. It would also serve a high number of community institutions. It would

travel through four historic districts (Old City Hall, Wright Park and Seymour Conservatory, Stadium-Seminary, and North Slope).

- **North End Central:** This corridor would serve a high existing and projected population and would utilize an existing high-performing bus route. It would travel through four historic districts (Old City Hall, Wright Park and Seymour Conservatory, Stadium-Seminary, and North Slope).
- **Pacific Highway:** This corridor would serve an area that has received fewer transportation infrastructure investments in 2008-2010 than other areas. It would travel through a manufacturing and industrial center, and would be located near a high percentage of existing vacant land. It would travel through a habitat corridor.
- **South Downtown Central:** This corridor serves the largest existing population of the eight corridors. It would serve an area that has received fewer transportation infrastructure investments in 2008-2010 than other areas. It would utilize an existing high-performing bus route and would serve a high number of community institutions. This corridor would be adjacent to four parks, would travel through the Union Depot-Warehouse historic district, and would travel through a habitat corridor.
- **South Downtown to MLK:** This corridor would serve a high percentage of low-income and minority residents. It would serve an area that has seen fewer transportation infrastructure investments in 2008-2010 than other areas, and it would serve a high number of community institutions. It would travel through four historic districts (Union Depot-Warehouse, Wright Park and Seymour Conservatory, South J Street, and North Slope).
- **South End:** This corridor would serve a high existing and projected population and a high number of community institutions. It would serve an area that has seen fewer transportation infrastructure investments in 2008-2010 than other corridors and would utilize an existing high-performing bus route. This corridor would serve two Regional Growth Centers and would serve a large amount of existing vacant land. It would travel through an existing habitat corridor.

1.2 Purpose and Context of the Tacoma Link Extension

This study builds upon work completed in 2004, 2005 and 2008 on extending the Tacoma Link streetcar. This previous work evaluated extensions that would serve Puyallup Tribal land, as well as extensions both west and east of the existing line. Sound Transit has re-opened this project to both incorporate feedback from the stakeholder group on community values for the project and to prepare the project for a formal Federal Transit Administration (FTA)-appropriate Alternatives Analysis.

This analysis provides enough detail to differentiate between the corridors on key items. It also provides the groundwork for a more detailed Alternatives Analysis to be completed in the future. This analysis does not include an exhaustive list of information that will be required for an Alternatives Analysis; rather, it provides some initial data that can be used to compare the corridors under consideration.

1.3 Corridors Considered

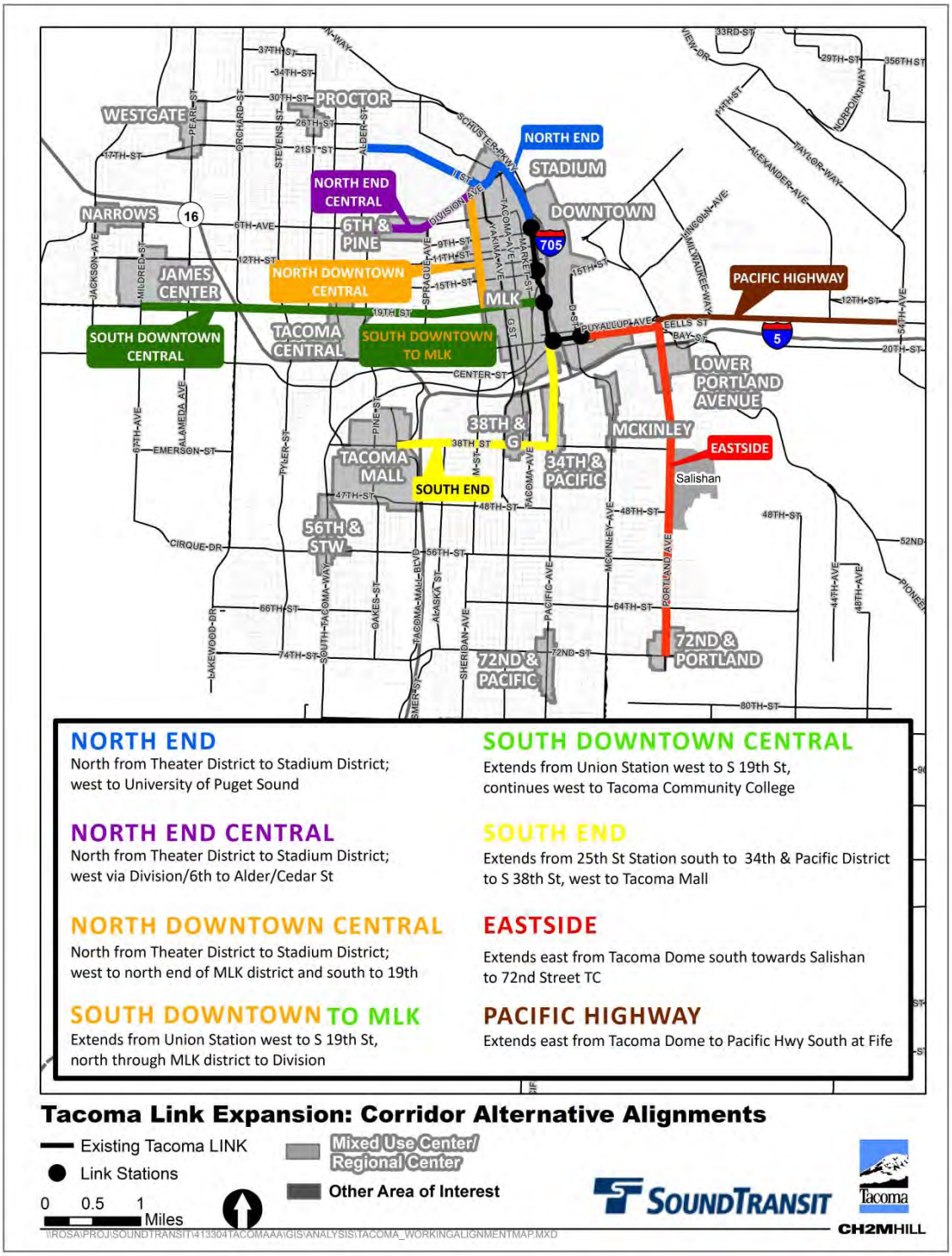
Eight potential corridors are analyzed in this memo. These corridors are described in further detail in Table 1-1, and shown together on Figure 1. The key features listed in Table 1-1 are generally those that are within ¼ mile of each potential alignment. A longer list of community features that are adjacent to each alignment is provided in section 2.

Table 1-1: Corridors Considered, Alignment Descriptions and Key Features

Corridor	Alignment Description	Key Features
1. Eastside *(Red)*	• Extends east from Tacoma Dome Station on 25th Street • Continues south along Portland Avenue to 72nd Street.	• Serves the Salishan area • Serves Puyallup Tribal land • Serves the Lower Portland Avenue Mixed-Use Center • Connects to the 72nd Street Transit Center and the 72nd and Portland Avenue Mixed-Use Center
2. North Downtown Central *(Orange)*	• Extends north from the 9th/Theater District Station via Stadium Way • Continues northwest and west via N E Street, N 1st St, and Division Avenue • Continues south on Martin Luther King Jr. Way to S 19th Street	• Serves the MLK Mixed-Use Center • Serves Mary Bridge Children's Hospital and St. Joseph's Medical Center • Serves Bates Technical College
3. North End *(Blue)*	• Extends north from the 9th/Theater District Station via Stadium Way • Continues northwest and west via N E Street, N 1st Street, and Division Avenue • Continues west to Alder Street via I Street/N 21st Street	• Serves the University of Puget Sound • Serves Stadium High School • Serves the Stadium Mixed-Use Center
4. North End Central *(Purple)*	• Extends north from 9th/Theater District Station via Stadium Way • Continues northwest and west via N E Street, N 1st Street, and Division Avenue • Continues southwest and west via Division to S 6th	• Serves Mary Bridge Children's Hospital • Serves Stadium High School • Serves Evergreen State College • Serves the University of Puget Sound (campus is within ½ mile)

Corridor	Alignment Description	Key Features
	Avenue to Alder/Cedar Streets	
5. Pacific Highway *(Brown)*	• Extends east from the Tacoma Dome Station to Pacific Highway South to Fife, at 54th Ave East	• Serves Fife • Serves Port of Tacoma Manufacturing and Industrial Center area (regional designation)
6. South Downtown Central *(Green)*	• Extends west from Union Station on S 19th Street • Continues west on S 19th Street to Mildred Street	• Serves Tacoma Community College • Serves the James Center Mixed-Use Center • Serves the Tacoma Central Mixed-Use Center • Serves the Tacoma Community College Park and Ride
7. South Downtown to MLK *(Green/Orange)*	• Extends west from Union Station on S 19th Street • Continues north on MLK Boulevard to Division Avenue • Could potentially loop back to the 9th/Theater District Station	• Serves St. Joseph Medical Center and Mary Bridge Children's Hospital • Serves the MLK Mixed-Use Center • Serves the University of Washington-Tacoma • Serves Bates College
8. South End *(Yellow)*	• Extends from S 25th Street Station south via Pacific Avenue • Continues west on 38th Street to Tacoma Mall Boulevard	• Serves the 34th and Pacific Mixed-Use Center • Serves the 38th and G Mixed-Use Center • Serves the Tacoma Mall Regional Growth Center

Figure 1: Corridor Overview



2. Potential Benefits of Each Corridor

2.1 Introduction

This section discusses potential benefits from an extension of the Tacoma Link system. Potential benefits are divided into two categories – benefits to transit accessibility and economic benefits. Table 2-1 depicts each benefit category and its evaluation measures.

Table 2-1: Potential Benefits and Evaluation Measures

Benefit category	Evaluation Measure
1. Benefits to transit accessibility	- Total population and employment within ¼ mile of the route - Low-income and minority population within ¼ mile of the route - Community institutions within ¼ mile of the route. - Level of transportation infrastructure investment in the past 3 years - Assessment of route's relationship to high performing Pierce Transit routes
2. Economic Benefits	- Acres of mixed use centers served - Acres of existing vacant land within ¼ mile of each alignment

The following sections describe the methodology and results for the two benefit categories.

2.2 Potential Benefits to Transit Accessibility

2.2.1 Introduction and Methodology

Potential benefits to transit accessibility are measured by comparing five key data points:

1) The total existing and projected population and employment within a quarter-mile buffer of each alignment
2) The total number and percentage of low-income and minority residents within a quarter-mile of each alignment
3) The number and type of community institutions within a quarter-mile of each alignment
4) The level of recent city investment within a quarter-mile of each alignment
5) The relationship of proposed corridors to existing high-performing Pierce Transit bus routes

The process of performing each of the five analyses in this section was begun by digitizing the proposed eight alignments in ArcGIS (GIS). Following that, a ¼ mile buffer around each alignment was developed. Table 2-2 describes the key data sources and methodology for each data point listed above. Each analysis was conducted using the digitized alignments and ¼ mile buffers.

Table 2-2: Methodologies and Data Sources for Analyzing Benefits to Transit Accessibility

Total population and employment within ¼ mile of the corridor	
Key Data Source	Puget Sound Regional Council 2009 Population and Housing Estimates by Forecast Analysis Zone (FAZ) http://psrc.org/data/pophousing/pophousing-estimates
Methodology	• Intersect the FAZ GIS layer with the ¼ mile buffer of each corridor • Calculate the percentage of the FAZ that is within the ¼ mile buffer • Multiply the 2010 and 2040 population and housing estimates for each FAZ within the buffer by the percentage of the FAZ that falls within the buffer
Low-income and minority population within ¼ mile of the corridor	
Key Data Source	*Census 2000,* Summary File 3. www.census.gov
Methodology	• Intersect the Census 2000 block groups GIS shapefile with the ¼ mile buffer of each corridor • Calculate the percentage of the block group that is within the ¼ mile buffer • Multiply the 2000 counts of low-income and minority residents within each census block group within the ¼ mile buffer by the percentage of the block group that is within the buffer
Community institutions within ¼ mile of the corridor	
Key Data Source	Internet searches via google maps (maps.google.com); field verification
Methodology	Utilizing data gathered from internet searches and field verification, determine which institutions are within ¼ mile of the corridor
Level of transportation infrastructure investment in the past three years	
Key Data Source	Database for 2006, 2008, and 2010 completed projects within the City of Tacoma. Sent from Jennifer Kammerzell at the City of Tacoma to Val Batey at Sound Transit on 2/28/11
Methodology	Utilize data (in spreadsheet form) to determine which projects were completed within ¼ mile buffers of proposed alignments
Relationship of alignments to high-performing bus routes	
Key Data Source	Pierce Transit Monthly Operational Summary Report, January 2010; GIS Shapefile of Pierce Transit routes, provided by Sound Transit in March 2011
Methodology	• Add an attribute to the GIS shapefile of Pierce Transit routes specifying which route had more than 1,000 daily boardings, according to the 1/10 report • Overlay high-performing bus routes on the proposed

alignments to determine where there is overlap

2.2.2 Results

Population and Employment. The eight corridors vary widely in the number of residents and jobs they serve. As shown in Table 2-3, the South Downtown Central corridor currently serves the largest population. However, the North Downtown Central corridor would serve the largest population in 2040. The North End corridor would serve the largest current and future number of households. The North Downtown Central corridor would serve the largest number of existing and future jobs, followed closely by the North End corridor.

Table 2-3: Existing and Forecasted Population and Households by Corridor

	Population		Households		Employment	
	2010	2040	2010	2040	2010	2040
Eastside	8,659	10,952	2,835	4,021	2,169	3,134
North Downtown Central	9,562	15,265	5,187	9,059	22,996	31,273
North End	9,236	14,259	5,593	9,459	22,349	29,400
North End Central	8,292	12,341	4,725	7,799	17,599	23,078
Pacific Highway	1,405	2,589	592	1,218	2,798	4,831
South Downtown Central	11,707	15,066	4,625	6,546	8,960	12,511
South Downtown to MLK	7,098	11,254	3,083	5,443	14,047	20,178
South End	9,347	13,313	3,477	5,532	6,632	9,724

Source: 2009 Population, Housing, and Employment Forecasts by Forecast Analysis Zone, Puget Sound Regional Council

Low-Income and Minority Population. Table 2-4 provides detail on the numbers of low-income and minority residents within ¼ mile of each corridor. These statistics were derived using the 2000 *U.S. Census. (*At the time of the writing of this memorandum, the 2010 *U.S. Census* was not yet available for use.) "Low-income" residents are defined as those whose income in 1999 was at or below the poverty level. "Minority" residents are defined as those who did not self-report on the 2000 Census as being White and non-Hispanic.

Table 2-4: Low-Income and Minority Population within ¼ mile of each corridor

	Total Population (2000)	Low-Income		Minority	
Eastside	8,237	2,070	25%	4,691	57%
North Downtown	10,303	2,887	28%	4,486	44%

Central					
North End	12,272	2,221	18%	2,479	20%
North End Central	11,126	2,285	21%	2,945	26%
Pacific Highway	809	170	21%	351	43%
South Downtown Central	8,976	1,913	21%	3,950	44%
South Downtown to MLK	7,331	2,247	31%	3,963	54%
South End	6,421	1,999	19%	2,448	38%

Source: Census 2000, SF3, P6, P7, P88.

The South Downtown to MLK corridor serves the highest percentage of low-income residents, followed by the North Downtown Central corridor and the Eastside corridor. The Eastside corridor serves the highest percentage of minority residents, followed by the South Downtown to MLK corridor.

Community Institutions. One of the key considerations for the eventual selection of the Tacoma Link extension will be the relative importance of the institutions that it serves. Many of the corridors presented in this memorandum were developed to serve one specific major community institution. However, other institutions, such as schools and parks, can help to contribute to the overall ridership of the new investment. For the purposes of this analysis, community institutions are defined as mixed-use centers/regional growth centers, hospitals, schools, and parks. Appendix A contains a map of each proposed corridor and community institutions within its ¼ mile buffer. Table 2-5 discusses schools in two categories. Major schools are defined as secondary, post-secondary, or trade schools. Minor schools are defined as primary schools.

Table 2-5 includes descriptions of the mixed-use centers and regional growth centers that each corridor would serve. The mixed-use centers are a designation provided by the City of Tacoma, and the Regional Growth Centers are a designation provided by the Puget Sound Regional Council.

Table 2-5: Community Institutions within ¼ Mile Buffer of Each Alignment

Corridor	Type of Institution	Name of Institution	Summary
Eastside	Mixed Use Centers/Regional Growth Centers/ Industrial Centers Hospitals Parks Schools	- Downtown Regional Growth Center - Lower Portland Avenue Mixed-Use Center - 72nd and Portland Mixed-Use Center None Portland Avenue Park - Northwest School of Massage - 8 schools	- Mixed-use centers: 2 - Hospitals: 0 - Parks: 1 - Major Schools: 1 - Minor Schools: 8
North	Mixed Use	- Downtown Regional Growth	- Mixed-use

Corridor	Type of Institution	Name of Institution	Summary
Downtown Central	Centers/Regional Growth Centers/Industrial Centers Hospitals Parks Schools	Center - Martin Luther King Mixed-Use Center - Stadium Mixed-Use Center - Mary Bridge Children's Hospital - St. Joseph Medical Center - Ferry Park - Wright Park - Firemans' Park - Western Reformed Seminary - College of Medical Education - Stadium High School - Bates Technical College - Evergreen State College - 5 primary/secondary schools	centers: 3 - Hospitals: 2 - Parks: 3 - Major Schools: 5 - Minor Schools: 5
North End	Mixed Use Centers/Regional Growth Centers/Industrial Centers Hospitals Parks Schools	- Downtown Regional Growth Center - Martin Luther King Mixed-Use Center - Stadium Mixed-Use Center - Mary Bridge Children's Hospital - Firemans' Park - Wright Park - North Slope Historic District Park - Ursich City Park - Stadium High School - Western Reformed Seminary - College of Medical Education - 4 primary/secondary schools	- Mixed-use centers: 3 - Hospitals: 1 - Parks: 4 - Major Schools: 3 - Minor Schools: 4
North End Central	Mixed Use Centers/Regional Growth Centers/Industrial Centers Hospitals Parks Schools	- Downtown Regional Growth Center - Martin Luther King Mixed-Use Center - Stadium Mixed-Use Center - 6th & Pine Mixed-Use Center - Mary Bridge Children's Hospital - Wright Park - Firemans' Park - Western Reformed Seminary	- Mixed-use centers: 4 - Hospitals: 1 - Parks: 2 - Major Schools: 3 - Minor Schools: 4

Corridor	Type of Institution	Name of Institution	Summary
		- College of Medical Education - Stadium High School - Evergreen State College - 6 primary/secondary schools	
Pacific Highway	Mixed Use Centers/Regional Growth Centers/Industrial Centers	- Downtown Regional Growth Center - Lower Portland Avenue Mixed-Use Center - Port of Tacoma Manufacturing/Industrial Center (MIC)	- Mixed-use centers: 2 - Hospitals: 0 - Parks: 0 - Major Schools: 2 - Minor Schools: 0
	Hospitals	None	
	Parks	None	
	Schools	- Everest College - City University	
South Downtown Central	Mixed Use Centers/Regional Growth Centers/Industrial Centers	- Downtown Regional Growth Center - Martin Luther King Mixed-Use Center - 34th & Pacific Mixed-Use Center - 38th & G Mixed-Use Center	- Mixed-use centers: 4 - Hospitals: 2 - Parks: 6 - Major Schools: 5 - Minor Schools: 7
	Hospitals	- St. Joseph Medical Center - Allenmore Medical Center	
	Parks	- Sewell Park - Ferry Park - Peck Field - Allenmore Golf Club - China Lake Park - Snake Lake Park	
	Schools	- University of Washington-Tacoma - Tacoma Community College - Bates Technical College - Foss High School - Bellarmine High School - 7 elementary schools	
South Downtown to MLK	Mixed Use Centers/Regional Growth Centers/Industrial Centers	- Downtown Regional Growth Center - Stadium Mixed-Use Center - Martin Luther King Mixed-Use Center	- Mixed-use centers: 3 - Hospitals: 2 - Parks: 3 - Major Schools: 2
	Hospitals	- St. Joseph Medical Center	

Corridor	Type of Institution	Name of Institution	Summary
		- Mary Bridge Children's Hospital	- Minor Schools: 7
	Parks	- Wright Park	
		- Ferry Park	
	Schools	- Bates Technical College	
		- Evergreen State College	
		- 7 primary/secondary schools	
South End	Mixed Use Centers/Regional Growth Centers	- Downtown Regional Growth Center	- Mixed-use centers: 5
		- Martin Luther King Mixed-Use Center	- Hospitals: 0
		- 34th & Pacific Mixed-Use Center	- Parks: 1
		- 38th & G Mixed-Use Center	- Major Schools: 4
		- Tacoma Mall Regional Growth Center	- Minor Schools: 6
	Hospitals	None	
	Parks	Frontier Park	
	Schools	- Lincoln High School	
		- Everest College	
		- Alexander Massage School	
		- Massage Connections School of Natural Healing	
		- 6 elementary schools	

Community Investment. One way to evaluate the ability of the Tacoma Link streetcar to serve Tacoma equitably is to assess the amount to which it may serve a typically underserved community. "Underserved" communities can be defined in several ways. In addition to analyzing the total numbers of low-income and minority persons within ¼ mile buffer of each alignment, as shown in Table 2-4, the amount of city investment within areas of Tacoma may also indicate areas that might be underserved. Table 2-6 lists the names of transportation projects completed by the City of Tacoma within ¼ mile of each proposed alignment.

Table 2-6: 2008-2010 Transportation Investments by Corridor

Corridor	Transportation Project(s) Completed by the City of Tacoma between 2008-2010 within Each Corridor
Eastside	- D Street Overpass – Puyallup Ave to S 23rd St - L Street E Bridge
North Downtown Central	- Dock St – E 11th to E 15th St - Thea Foss Waterway Public Esplanade – Balfour Dock
North End	- Dock St – E 11th to E 15th St

	- Thea Foss Waterway Public Esplanade – Balfour Dock
North End Central	- Dock St – E 11th to E 15th St - Thea Foss Waterway Public Esplanade – Balfour Dock
Pacific Highway	- L Street E Bridge
South Downtown Central	- Pacific Avenue – Safety Improvements & Enhancements
South Downtown to MLK	- Pacific Avenue – Safety Improvements & Enhancements
South End	- Pacific Avenue – Safety Improvements & Enhancements

Source: Summary of Transportation Projects Completed by the City of Tacoma, 2008-2010; sent by email from Jennifer Kammerzell to Val Batey on 3/1/11

Each corridor had at least one project completed within ¼ mile of it between 2008 and 2010. The North End, North End Central, North Downtown Central, and Eastside corridor areas had two projects completed in this timeframe, while the remaining four corridors only had one project completed within ¼ mile of the proposed alignment.

Relationship to High-Performing Pierce Transit Routes. Four of the proposed alignments would utilize routes that are currently served by high-performing Pierce Transit service. "High-performing" service is defined as routes that have more than 1,000 weekly boardings, as of January 2010. The source of ridership numbers listed below is the Pierce Transit Monthly Operational Summary Report for January 2010, prepared 3/15/10.

- **North End Central:** This alignment would utilize the same route as Pierce Transit's Route #1 along 6th Avenue. There were 7,921 average weekly boardings for Route #1 in January 2010.
- **South Downtown Central:** This alignment would utilize the same route as Pierce Transit's Route #2 along S 19th Street. There were 3,755 average weekly boardings for Route #2 in January 2010.
- **South End:** This alignment would utilize a different section of Route #1, along Pacific Avenue. There were 7,921 average weekly boardings for Route #1 in January 2010.
- **Eastside:** This alignment would utilize the same route as bus #41 along Portland Ave. There were 1,186 average weekly boardings for Route #41 in January 2010.

2.3 Potential Economic Benefits

The ability of the Tacoma Link Extension to benefit the economy of Tacoma and the greater Puget Sound region is an important consideration. Although economic development is difficult to predict and cannot be done solely through quantitative means, the following analyses can help to provide comparative information that can help to distinguish between corridors.

Mixed-Use Centers/Regional Growth Centers. There are two Tacoma Regional Growth Centers (Downtown Tacoma and Tacoma Mall) which are designated by Puget Sound Regional Council to receive the greatest concentrations of residential and employment growth, plus regional funding. The Port of Tacoma Manufacturing and Industrial Center, also designated by Puget Sound Regional Council, is a regional location of designated employment growth. There are also 16 City of Tacoma-designated Mixed-Use Centers which are designated in locations with existing transit and commercial services and which are designated to receive higher concentrations of residential and employment growth. The proposed corridors differ in the number and amount of these centers that they serve.

Table 2-7 provides the results of analyzing the number of acres of mixed-use centers served by each corridor. The corridors are defined as the proposed alignments with a ¼ mile buffer. The location of the centers was obtained from the City of Tacoma GIS Analysis and Data Services website; and it was last updated on 7/29/10.

Table 2-7: Acres of Mixed-Use and Regional Growth Centers Served by Each Corridor

Corridor	Mixed-Use Center/*Regional Growth Center*	Acres	Total
Eastside	Lower Portland Avenue	98	335
	72nd & Portland	76	
	Downtown	161	
North Downtown Central	Stadium	67	588
	Martin Luther King	239	
	Downtown	282	
North End	Martin Luther King	44	440
	Stadium	111	
	Downtown	285	
North End Central	6th Ave & Pine St	86	433
	Stadium	67	
	Martin Luther King	37	
	Downtown	243	
Pacific Highway	Lower Portland Avenue	5	5
South Downtown Central	Tacoma Central	99	472
	James Center	100	
	Martin Luther King	77	
	Downtown	196	
South Downtown to MLK	Stadium	19	505
	Martin Luther King	243	
	Downtown	243	
South End	38th & G	61	432

34th & Pacific	83
Tacoma Mall	115
Downtown	173

The North Downtown Central corridor would serve the greatest amount of mixed-use centers and regional centers, followed by the South Downtown to MLK corridor. The South End corridor is the only corridor that would serve two Regional Growth Centers (Downtown and Tacoma Mall).

Vacant Land. The amount of vacant land within ¼ mile of each alignment is one way to measure the capacity for economic development that may result from a streetcar investment. Table 2-8 depicts the percentage of vacant land within ¼ mile of each alignment. This information was derived from a GIS shapefile of Pierce County parcels, provided by Sound Transit in March 2011.

Table 2-8: Vacant Land within Each Corridor

Corridor	Percentage of parcels within ¼ mile buffer that are vacant
Eastside	18%
North Downtown Central	12%
North End	8%
North End Central	8%
Pacific Highway	19%
South Downtown Central	13%
South Downtown to MLK	9%
South End	7%

The Eastside and Pacific Highway corridors have the largest percentages of vacant land within ¼ mile of their proposed alignments. This could indicate that the potential for economic development may be greatest in these corridors.

3. Potential impacts of each corridor

Similar to potential benefits, the potential impacts of a corridor were developed to help differentiate between the potential corridors. Table 3-1 depicts each impact category and data source(s).

Table 3-1: Potential Impacts and Evaluation Measures

Impact category	Data source(s)
Potential impacts to parks	- City of Tacoma Comprehensive Plan, Open Space Habitat and Recreation element (last updated 12-9-08); internet searches via maps.google.com; field verification
Potential impacts to historic features	- Washington Information System for Architectural and Archaeological Records Data https://fortress.wa.gov/dahp/wisaard/. Accessed late February 2011.
Potential impacts to the natural environment	- City of Tacoma Comprehensive Plan, Open Space Habitat and Recreation Element (last updated 12-9-08)

Potential impacts to parks. As shown in Appendix A, there are many parks within the ¼ mile buffer of each proposed alignment. However, only two of the proposed alignments are adjacent to parks. Although an extension of the Tacoma Link system is likely to run within the existing street right-of-way, it is important to be aware of potential park impacts. Section 4(f) of the U.S. Department of Transportation Act of 1966 would require Sound Transit to avoid taking any park land for transit use. However, further evaluation of potential alignments would evaluate visual, traffic, or other impacts to parks.

- **Eastside corridor.** The proposed alignment for the Eastside Corridor utilizes Portland Avenue, and runs adjacent to the Portland Avenue Park between E Fairbanks Street and E 35th Street.
- **South Downtown Central corridor.** The South Downtown Corridor would travel adjacent to Sewell Park on S 19th Street between S Ainsworth Avenue and S Sprague Avenue. This corridor would also travel adjacent to the Allenmore Golf Club, which is a public golf course, between S Prospect Street and S Cedar Street. The South Downtown Corridor would also travel adjacent to the Tacoma Nature Park between S Madison Street and S Mason Avenue. It would also travel adjacent to China Lake Park between SR 16 and S Winnifred Street.

Potential impacts to historic features. There are five historic districts within the City of Tacoma. They are as follows. Appendix B contains a corresponding map with the numeric keys for the historic districts.

1. Old City Hall Historic District. (DT00060)
2. North Slope Historic District. (DT00185)
3. Stadium-Seminary Historic District (DT00062)
4. Union Depot-Warehouse Historic District (DT00064)
5. South J Street Historic District (DT00150)

In addition, there is one historic feature in the area that encompasses an entire city block. It is the Wright Park and Seymour Conservatory, located between Division and 6th between S G and I Streets. It is labeled on the map as PI00169.

It is important to note that the City of Tacoma contains numerous individually-listed properties on the National Register of Historic Places. It is beyond the scope of this report to provide detail on potential impacts to individual properties. Further analysis on selected corridors would need to closely evaluate proposed streetcar alignments with individually listed properties as well as historic districts.

Table 3-2: Historic Districts within Each Proposed Corridor

Corridor	Historic Districts Contained within ¼ Mile Buffer
Eastside	None
North Downtown Central	Old City Hall Historic District Wright Park and Seymour Conservatory Stadium-Seminary Historic District North Slope Historic District
North End	Old City Hall Historic District Wright Park and Seymour Conservatory Stadium-Seminary Historic District North Slope Historic District
North End Central	Old City Hall Historic District Wright Park and Seymour Conservatory Stadium-Seminary Historic District North Slope Historic District
Pacific Highway	None
South Downtown Central	Union Depot-Warehouse Historic District
South End	None
South Downtown to MLK	Union Depot-Warehouse Historic District Wright Park and Seymour Conservatory South J Street Historic District North Slope Historic District

Potential impacts to the natural environment. The City of Tacoma Comprehensive Plan has designated several areas within the city as habitat corridors. Table 3-3 provides a qualitative assessment of the degree to which each of the Tacoma Link corridors might impact habitat corridors within the city. Appendix C contains the City of Tacoma's map depicting habitat corridors.

Table 3-3: Qualitative assessment of potential impacts to habitat corridors

Corridor	Potential Impact Areas	Impact relative order of magnitude
Eastside	Would cross a habitat corridor at Portland Avenue & 38th, Portland Ave & 40th, and would traverse a habitat corridor at Portland Ave & 56th	Medium

North Downtown Central	Would not cross a habitat corridor	Low
North End	Would not cross a habitat corridor	Low
North End Central	Would not cross a habitat corridor	Low
Pacific Highway	Would cross a habitat corridor between Port of Tacoma Rd and 54th Ave	Low-Medium
South Downtown Central	Would touch a habitat corridor on the south side of 19th, east of Sprague Ave Would touch a habitat corridor on south side of 19th between Union and Orchard Street; would cross it at Orchard Street Would touch a habitat corridor on north side of 19th at Pearl	Medium
South Downtown to MLK	Would not cross a habitat corridor	Low
South End	Would traverse a habitat corridor along Pacific Ave between I-5 and 38th	Medium

4. Summary of Key Findings

Each of the eight corridors would benefit Tacoma communities in some way, and may have some degree of impact to the existing built or natural environment. Table 4-1 summarizes the key benefits and impacts for each corridor.

Table 4-1: Summary of Benefits and Impacts

Corridor	Summary of Benefits	Summary of Impacts
Eastside	- Serves a high percentage of low-income residents - Serves the highest percentage of minority residents - Would utilize an alignment with an existing high-performing bus route	- Potential impact to Portland Avenue Park - Potential impact to a habitat corridor
North Downtown Central	- Serves the largest forecasted population - Serves the largest number of existing and forecasted jobs - Serves a high percentage of low-income residents - Serves a high number of community institutions	- Potential impact to Old City Hall Historic District, Wright Park and Seymour Conservatory, Stadium-Seminary Historic District, and North Slope Historic District
North End	- Serves a high number of existing and projected population - Serves a high number of existing and forecasted jobs - Serves a high number of community institutions	- Potential impact to Old City Hall Historic District, Wright Park and Seymour Conservatory, Stadium-Seminary Historic District, and North Slope Historic District
North End Central	- Serves a high existing and projected population - Would utilize an alignment with an existing high-performing bus route	- Potential impact to Old City Hall Historic District, Wright Park and Seymour Conservatory, Stadium-Seminary Historic District, and North Slope Historic District
Pacific Highway	- Serves an area with fewer investments in 2008-2010 than other corridors - Is located in a Manufacturing & Industrial	- Potential impact to a habitat corridor

Corridor	Summary of Benefits	Summary of Impacts
	Center - Has a high existing percentage of vacant land	
South Downtown Central	- Serves the largest existing population - Serves an area with fewer investments in 2008-2010 than other corridors - Would utilize an alignment with an existing high-performing bus route - Serves the highest number of community institutions	- Potential impact to Sewell Park, Allenmore Golf Club, Tacoma Nature Park and China Lake Park - Potential impact to Union Depot-Warehouse Historic District - Potential impact to a habitat corridor
South Downtown to MLK	- Serves the highest percentage of low-income residents - Serves a high percentage of minority residents - Serves an area with fewer investments in 2008-2010 than other corridors - Serves a high number of community institutions	- Potential impact to Union Depot-Warehouse Historic District, Wright Park and Seymour Conservatory, South J Street Historic District, and North Slope Historic District
South End	- Serves a high existing and projected population - Serves an area with fewer investments in 2008-2010 than other corridors - Would utilize an alignment with an existing high-performing bus route - Serves a high number of community institutions, including two Regional Growth Centers	- Potential impact to a habitat corridor

Corridor	Summary of Benefits	Summary of Impacts
	- Has a high existing percentage of vacant land	

5. Relationship to Stakeholder Objectives

The Tacoma Link Stakeholder Group was convened from July 2010 through January 2011. The group identified six key community values for the project. These are as follows:

A. Serving underserved communities
B. Serving Tacoma neighborhoods
C. Serving Downtown Tacoma
D. High ridership
E. Regional connections
F. Low cost

Of the six community values, the first two – serving underserved communities and serving Tacoma neighborhoods – were determined to be the most important. Each of the eight proposed alignments would meet at least one of the stakeholder objectives for the project. The conclusions presented in this memorandum that correspond to each stakeholder objective are as follows:

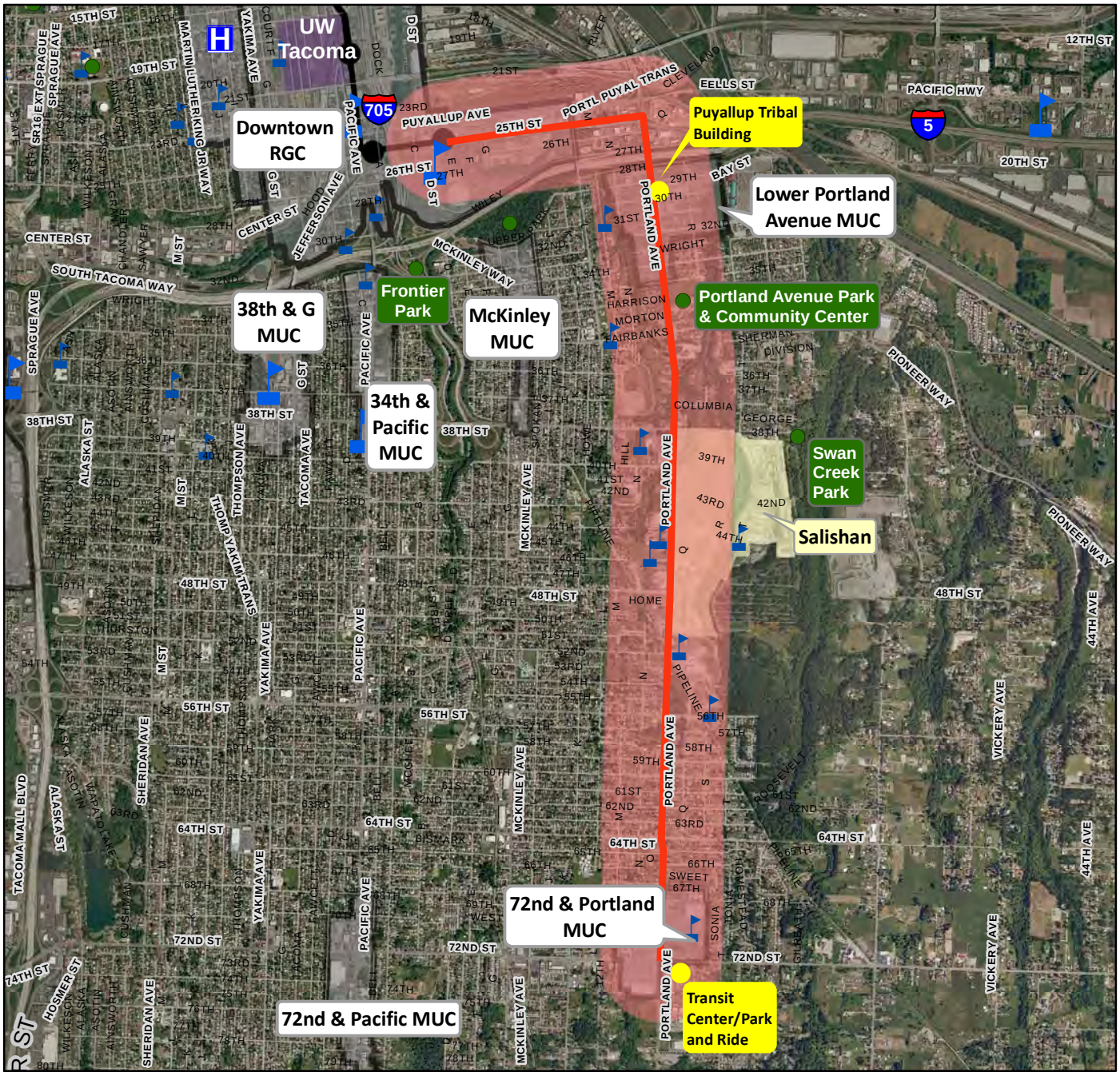
- **Serves Tacoma neighborhoods:** the Eastside, North Downtown Central, North End, North End Central, South Downtown Central, and South Downtown – MLK corridors would have the potential to meet this objective by serving several mixed-use centers and because of their relatively high population and employment.
- **Serves underserved communities:** the Eastside, North Downtown Central, South Downtown Central, and South Downtown – MLK corridors would have the potential to meet this objective by serving existing areas of low-income or minority populations or by serving areas that have received fewer infrastructure investments in the past three years than other areas.
- **Serves downtown Tacoma:** Each of the eight alignments would serve the Downtown Tacoma Regional Growth Center, and would therefore have the potential to meet this objective.
- **High ridership:** the Eastside, North Downtown Central, North End and South Downtown Central may have the ability to generate high ridership, based on preliminary analyses of population and employment within each corridor, and existing high-performing bus routes.
- **Regional connections**: the South End corridor would have the potential to meet this objective due to its connections between two Regional Growth Centers (Downtown and Tacoma Mall).
- **Low cost**: Potential environmental impacts from each corridor are provided in this memorandum in section 3. However, evaluations of how these environmental impacts may translate into costs for the corridors are not provided in this memorandum. Order of magnitude capital costs for each corridor are provided in a separate Cost Estimate document.

6. Next Steps

The information in this memorandum, in combination with the information presented in the Corridor Cost Estimate Memorandum, is intended to be used to help Sound Transit, Pierce Transit, and the City of Tacoma guide the discussion for which corridors to forward into a more detailed alternatives analysis.

The next product from this project will be a detailed work plan for moving the project into a full Alternatives Analysis. This document will provide guidance to Sound Transit on how to work with both FTA and the project stakeholders in a more rigorous analysis of potential corridors for the Tacoma Link Extension.

Appendix A: Corridor and Community Institutions Maps



Tacoma Link Expansion: Eastside Corridor

Community Facilities

- Proposed Alignment
- 1/4 Mile Buffer
- Existing Tacoma LINK
- Link Stations
- Mixed Use Center (MUC)/ Regional Growth Center (RGC)
- Park
- Primary School
- Secondary/ Post-secondary/ Vocational School
- Hospital
- Other Community Institution

0 0.5 Miles

Sources:
1) Mixed Use Center/Regional Centers, Existing Tacoma Link, and Link Stations - City of Tacoma GIS Analysis and Data Services
2) 2009 Aerial Photography of Tacoma and Fife - Sound Transit, 2011
3) Proposed Alignment, 1/4 Mile Buffer, Schools, Parks, and Hospitals - Digitized by CH2M HILL, 2011

SOUNDTRANSIT

Tacoma

CH2MHILL

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Tacoma Link Expansion: South Downtown to MLK Corridor

Community Facilities

- Proposed Alignment
- 1/4 Mile Buffer
- Existing Tacoma LINK
- Link Stations
- Mixed Use Center (MUC)/ Regional Growth Center (RGC)
- Park
- Primary School
- Secondary/ Post-secondary/ Vocational School
- Hospital

0 — 0.5 Miles

Sources:
1) Mixed Use Center/Regional Centers, Existing Tacoma Link, and Link Stations - City of Tacoma GIS Analysis and Data Services
2) 2009 Aerial Photography of Tacoma and Fife - Sound Transit, 2011
3) Proposed Alignment, 1/4 Mile Buffer, Schools, Parks, and Hospitals - Digitized by CH2M HILL, 2011

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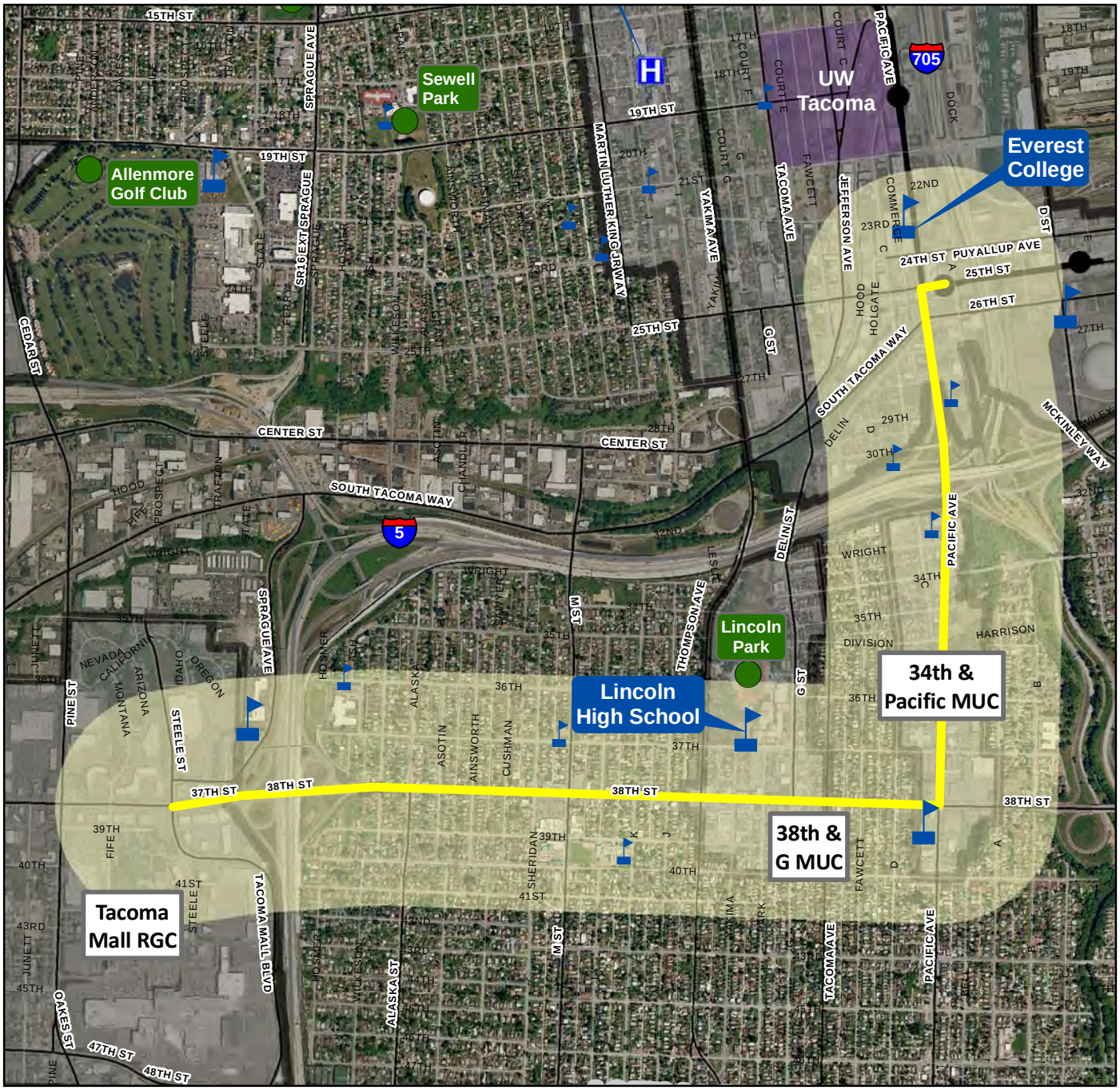

Tacoma Link Expansion: South End Corridor

Community Facilities

- Proposed Alignment
- 1/4 Mile Buffer
- Existing Tacoma LINK
- Link Stations
- Mixed Use Center (MUC)/ Regional Growth Center (RGC)
- Park
- Primary School
- Secondary/ Post-secondary/ Vocational School
- Hospital

0 0.5 Miles

Sources:
1) Mixed Use Center/Regional Centers, Existing Tacoma Link, and Link Stations - City of Tacoma GIS Analysis and Data Services
2) 2009 Aerial Photography of Tacoma and Fife - Sound Transit, 2011
3) Proposed Alignment, 1/4 Mile Buffer, Schools, Parks, and Hospitals - Digitized by CH2M HILL, 2011

SOUNDTRANSIT

Tacoma

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Tacoma Link Expansion: South Downtown Central Corridor

Community Facilities

- Proposed Alignment
- 1/4 Mile Buffer
- Existing Tacoma LINK
- Link Stations
- Mixed Use Center (MUC)/ Regional Growth Center (RGC)
- Park
- Primary School
- Secondary/ Post-secondary/ Vocational School
- Hospital

0 0.5 Miles

Sources:
1) Mixed Use Center/Regional Centers, Existing Tacoma Link, and Link Stations - City of Tacoma GIS Analysis and Data Services
2) 2009 Aerial Photography of Tacoma and Fife - Sound Transit, 2011
3) Proposed Alignment, 1/4 Mile Buffer, Schools, Parks, and Hospitals - Digitized by CH2M HILL, 2011

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Tacoma Link Expansion: Pacific Highway Corridor

Community Facilities

- Proposed Alignment
- 1/4 Mile Buffer
- Existing Tacoma LINK
- Link Stations
- Mixed Use Center (MUC)/ Regional Growth Center (RGC)
- Park
- Primary School
- Secondary/ Post-secondary/ Vocational School
- Hospital

0 0.5 Miles

Sources:
1) Mixed Use Center/Regional Centers, Existing Tacoma Link, and Link Stations - City of Tacoma GIS Analysis and Data Services
2) 2009 Aerial Photography of Tacoma and Fife - Sound Transit, 2011
3) Proposed Alignment, 1/4 Mile Buffer, Schools, Parks, and Hospitals - Digitized by CH2M HILL, 2011

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Tacoma Link Expansion: North End Corridor

Community Facilities

- Proposed Alignment
- 1/4 Mile Buffer
- Existing Tacoma LINK
- Link Stations
- Mixed Use Center (MUC)/ Regional Growth Center (RGC)
- Park
- Primary School
- Secondary/ Post-secondary/ Vocational School
- Hospital

0 0.5 Miles

Sources:
1) Mixed Use Center/Regional Centers, Existing Tacoma Link, and Link Stations - City of Tacoma GIS Analysis and Data Services
2) 2009 Aerial Photography of Tacoma and Fife - Sound Transit, 2011
3) Proposed Alignment, 1/4 Mile Buffer, Schools, Parks, and Hospitals - Digitized by CH2M HILL, 2011

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Tacoma Link Expansion: North End Central Corridor

Community Facilities

- Proposed Alignment
- 1/4 Mile Buffer
- Existing Tacoma LINK
- Link Stations
- Mixed Use Center (MUC)/ Regional Growth Center (RGC)
- Park
- Primary School
- Secondary/ Post-secondary/ Vocational School
- Hospital

0 0.5 Miles

Sources:
1) Mixed Use Center/Regional Centers, Existing Tacoma Link, and Link Stations - City of Tacoma GIS Analysis and Data Services
2) 2009 Aerial Photography of Tacoma and Fife - Sound Transit, 2011
3) Proposed Alignment, 1/4 Mile Buffer, Schools, Parks, and Hospitals - Digitized by CH2M HILL, 2011

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\\ROSA\PROJ\SOUNDTRANSIT\413304TACOMAAA\GIS\ANALYSIS\CORRIDOR MAPS\NORTH END CENTRAL.MXD

Tacoma Link Expansion: North Downtown Central Corridor

Community Facilities

- Proposed Alignment
- 1/4 Mile Buffer
- Existing Tacoma LINK
- Link Stations
- Mixed Use Center (MUC)/ Regional Growth Center (RGC)
- Park
- Primary School
- Secondary/ Post-secondary/ Vocational School
- Hospital

0 0.5 Miles

Sources:
1) Mixed Use Center/Regional Centers, Existing Tacoma Link, and Link Stations - City of Tacoma GIS Analysis and Data Services
2) 2009 Aerial Photography of Tacoma and Fife - Sound Transit, 2011
3) Proposed Alignment, 1/4 Mile Buffer, Schools, Parks, and Hospitals - Digitized by CH2M HILL, 2011

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Tacoma

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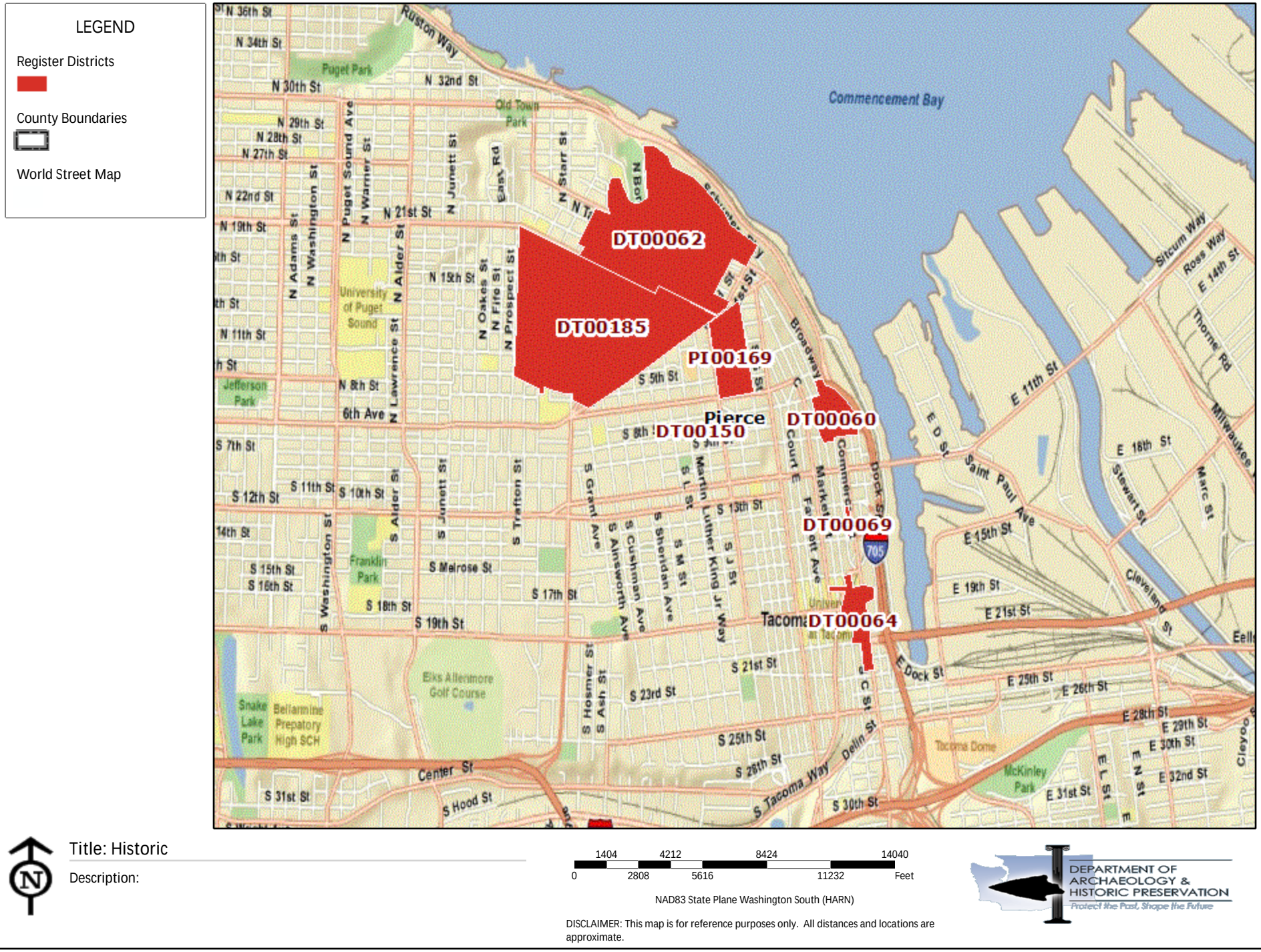
Appendix B: Map of Historic Districts

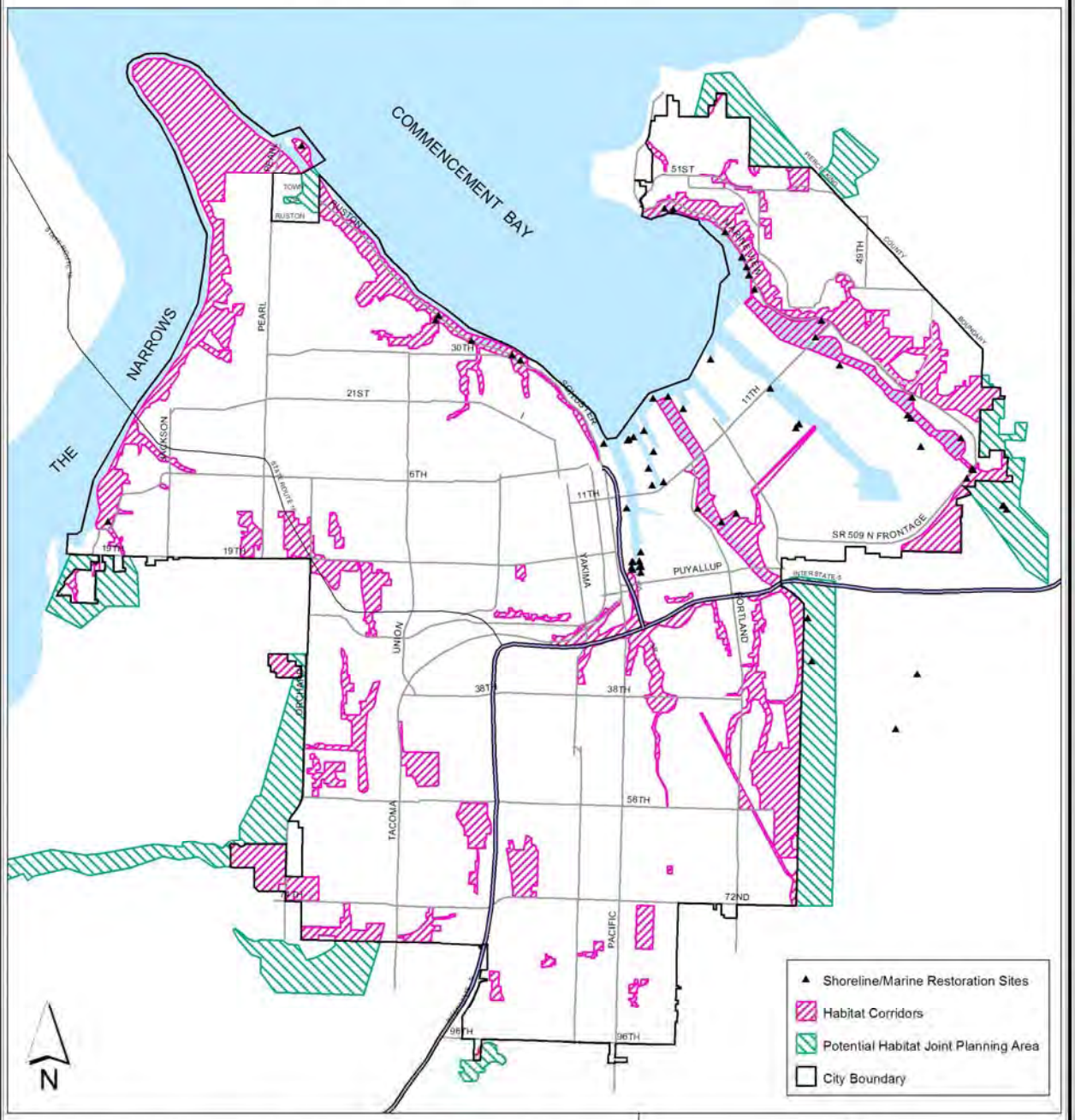


Title: Historic

Description:

Appendix C: City of Tacoma Open Space and Habitat Map

Figure 2 - Habitat Map



Designated Habitat Corridors contain the City's most valuable undeveloped habitat areas - generally areas that are larger, connected or contiguous to other habitat areas, and combining multiple valuable functions and features (such as wetlands, streams, slopes and forests). Habitat Corridors will be the priority areas for Tacoma's habitat conservation and stewardship efforts. The vision is to conserve and restore habitat functions within the Corridors and, where appropriate, foster low-impact access and recreation. Restoration sites in shoreline and marine habitat areas are also shown. Potential Joint Habitat Planning Areas are areas where habitat features span the City's borders, calling for inter-jurisdictional planning and coordination.

City of Tacoma
Community & Economic Development

0 0.5 1 2 3 Miles

NOTE: This map is for reference only.

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Appendix C
Tacoma Link Extension: Engineering Considerations

Tacoma Link Extension: Opinion of Probable Capital Cost and Estimating Methodology

PREPARED FOR: Val Batey, Sound Transit

PREPARED BY: Luke Olson & Kevin Collins, HDR

COPIES: David Knowles, CH2M HILL
Kate Lyman, CH2M HILL

DATE: May 20, 2011; Revised August 5, 2011

1 Introduction

This document provides a brief summary of the opinion of probable capital costs and describes the methodology used in developing estimates for each alternative. HDR Engineering is under contract to develop these estimates for the Sound Transit Tacoma Link Pre-Alternatives Analysis Study. The estimates are complete project estimates including all major components of the project such as civil construction, utilities, structures, stations, traction power and communications systems, vehicles, fare collection equipment, right-of-way, professional services, and contingencies.

All estimates are based on the assumption that any of the Tacoma Link extension(s) being considered will be designed to "streetcar standards" as outlined in the previously submitted technical memorandum titled "*Tacoma Link Extension: System Configuration Assumptions*."

In addition, there are technical challenges and feasibility issues with some of the alignment alternatives being considered. These issues are documented in the previously submitted "*Tacoma Link Extension: Engineering Considerations*" technical memorandum which provides a high-level feasibility assessment for each of the alternatives based on engineering opportunities and constraints along each alignment.

1.1 Project Background

The total route length of the existing Tacoma Link is 1.6 miles end to end. It is mainly single track with a ¾ mile section of double track between Union Station and Theater District Station. It was built for a cost of $80.4 million in 2003 which is on the higher end of the capital cost range for modern streetcar systems built around the same time. This is largely due to the nearly one-mile segment of semi-exclusive guideway and the traction power and train control subsystems. With the proven success of the existing system, Sound Transit and the City of Tacoma are studying the possibility of extending the system. The purpose of the initial study, described as a pre-alternatives analysis, is to get a better understanding of the feasibility and cost of a broad range of alternatives, establish budgets and eliminate alternatives that are fatally flawed from further study.

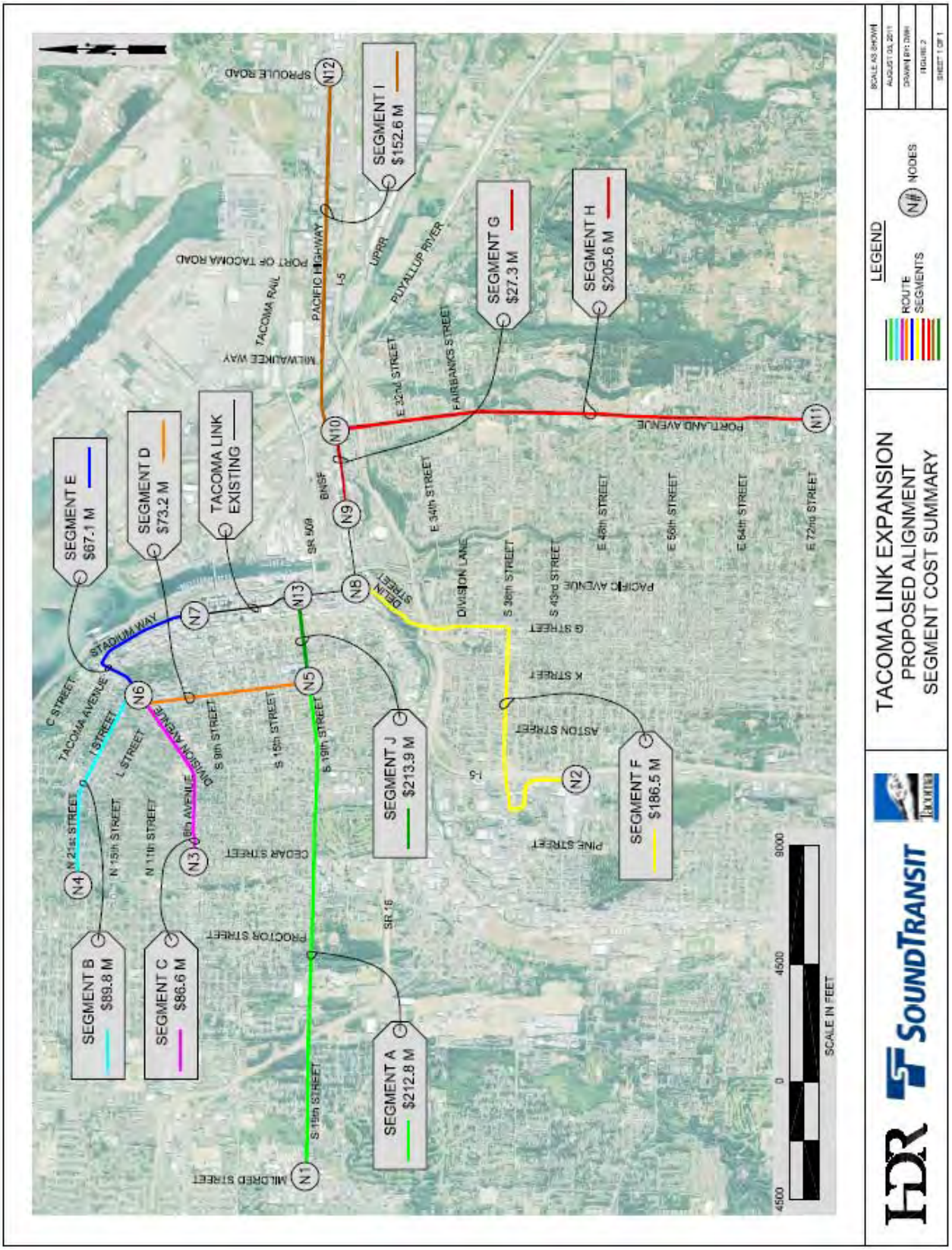
1.2 Streetcar Alignments

Several different streetcar alignments are being considered as possible extensions of the Tacoma Link including extensions to the north, east, west and south of downtown. Because many of the alignment alternatives overlapped or had common elements, they were broken into segments connected by nodes. A node occurs at each point where there is more than one alignment option. A segment is a stretch of an alignment that connects two of the nodes. This was accomplished in order to avoid redundant calculations of overlapping portions of the alignment alternatives and provide flexibility in creating additional alternatives by simply adding up the costs for each segment. Table 1 identifies each alignment for which an opinion of probable capital cost was developed, the segments of the alignment (as shown in Figure 1) and the route length of the alignment. Each alignment is predominantly double track; short stretches of single track occur at terminal stations on all alignments and near the junctions of Segments F and G with the existing Tacoma Link line.

Table 1 - Alignment Alternative Summary

Alignment	Alignment Name	Description	Sgmts	Length
Alignment 1	North End	North From Theater District to Stadium District; west to University or Puget Sound	B, E	2.66 Miles
Alignment 2	North End - Central	North from Theater District to Stadium District; west via Division/6th to Alder/Cedar St	E, C	2.52 Miles
Alignment 3	North Downtown – Central	North from Theater District to Stadium District; west to north end of MLK district and south to 19th	D, E	2.33 Miles
Alignment 4	South Downtown – To MLK	Extends from Union Station West to S 19th St, north through MLK district to Division	J, D	1.83 Miles
Alignment 5	South Downtown – Central	Extends from Union Station West to S 19th St, continues west to Tacoma Community College	J, A	4.20 Miles
Alignment 5a	South Downtown-Central (Modified)	North from Theater District to Stadium District; west to north end of MLK district and south to 19th Street; continues west to Tacoma Community College	A,D, E	5.90 Miles
Alignment 6	South End	Extends from 25th St Station south to 34th & Pacific District to S 38th St, west to Tacoma Mall	F	3.13 Miles
Alignment 7	Eastside	Extends east from Tacoma Dome south towards Salishan to 72nd Street TC	G, H	4.09 Miles
Alignment 8	Pacific Highway	Extends east from Tacoma Dome to Pacific Hwy South at Fife	G, I	3.27 Miles

Figure 1 - Alignment Alternative Segment Overview and Cost *(Costs shown are in YOE 2015)*



1.3 Summary of Costs

An opinion of probable capital cost was developed for each alignment described in section 1.2. The costs for each alignment were developed in current year dollars and then escalated to an assumed year of expenditure of 2015. Table 2 below provides a brief summary of the estimated costs for each alignment considered. A more detailed estimate of each alignment can be found in Appendix A.

Table 2 - Summary of Alignment Alternatives Capital Cost

Alignment	Alignment Description	Current Year *2011.25 (YR)*	YoE *2015.00 (YR)*
Alignment 1	North End (Segments B,E)	$137.9 M	$156.9 M
Alignment 2	North End - Central (Segments E,C)	$135.1 M	$153.7 M
Alignment 3	North Downtown Central (Segments D,E)	$123.3 M	$140.2 M
Alignment 4	South Downtown to MLK (Segments J,D)	$252.3 M	$287.0 M
Alignment 5	South Downtown Central (Segments J,A)	$375.1 M	$426.7 M
Alignment 5a[1]	South Downtown Central Modified (Segments A,D,E)	$310.3 M	$353.1 M
Alignment 6	South End (Segments F)	$163.9 M	$186.5 M
Alignment 7	East Side (Segments G,H)	$204.7 M	$232.9 M
Alignment 8	Pacific Highway (Segments G,I)	$158.1 M	$179.9 M

1) This alignment alternative was created as a feasible option for reaching Tacoma Community College in response to challenging construction conditions in Segment J of the South Downtown Central alternative. It consists of portions of the North End, North Downtown Central and South Downtown Central alignments.

2 Cost Estimate Methodology

The following section outlines the specific approach that was used to develop the opinion of probable capital cost estimates for the Tacoma Link Extension. The methodology herein describes the overall approach used to develop the estimates as well as a detailed description of the cost categories and items that were used to build the estimates.

The costs include provisions for City allowances, including administration, project management, construction management, community relations and involvement, insurance/legal, start up and testing, and training in addition to vehicles, engineering and construction costs. Because of the limited engineering and design many of the items in the cost estimates are represented as allowances. These allowances are based on HDR's experience developing and implementing streetcar projects in other cities, historical data and the engineer's professional judgment.

The estimates were developed following the Federal Transit Administration's Standard Cost Categories (SCC) in order to be easily tracked and audited, and for reporting purposes. A detailed description of the process is described in the following sections.

2.1 Estimate Development

Estimates of project capital costs were developed in four general steps under this methodology.

1. The route and other project components were broken into segments with common end points (nodes).
2. Project cost components, consistent with the level of design, were identified and quantified for each segment.
3. Unit costs were developed for each of the cost components based on HDR's past project experience and other project-specific factors. These cost components were then assembled in a spreadsheet, selective unit costs were applied, and the quantities were summed into the major cost categories.
4. Additional factors such as contingencies, engineering & administration, and year-of-expenditure escalation were applied to the summed cost subtotals to complete the cost estimates.

2.2 Format

The estimate has been prepared using Microsoft Excel spreadsheets. The spreadsheet is organized into three levels. The first level lists the main SCC items and the second level contains the SCC sub-categories. Finally, a third level expands the sub-categories into units of work to provide a level of detail more appropriate for unit pricing. As necessary, the estimate can roll these levels up into a cost summary using the SCC format for reporting purposes.

2.3 Unit Costs

Unit costs were developed from selected historical data, including final engineering estimates, completed projects, standard estimating manuals, and standard estimating practices. A mix of historical data from both local and national roadway and streetcar projects were used in developing the appropriate unit costs and allowances to be applied to the cost estimate. In many cases, due to the lack of detailed engineering, allowances had to be established based on the engineer's and firm's experience. This allowance serves as a place holder until further analysis and design can provide for more accurate and quantifiable units of work.

2.4 Escalation Factor

In order to establish accurate project budgets an escalation factor must be used. The purpose of an escalation factor is to account for anticipated inflation and increase in the cost of construction, materials and labor over time. The escalation factor is used to take the current year estimate and project it to a future base year or year of expenditure (YoE). For the purpose of this study, the YoE is the year in which the mid point of construction is anticipated. HDR Engineering has assumed 2015 as the year of expenditure for all estimates.

The factor by which the current year estimate was escalated to the YoE was assumed to be 3.5%. This value was not established using any scientific method or publications and should be reviewed by Sound Transit for concurrence. It is a reasonable estimate of the possible inflation that could be expected given the constant fluctuation in the economy and

cost of material, fuel and labor. The actual inflation or escalation realized over the next several years could be more or less than the assumed value.

2.5 Cost Categories

Cost categories consistent with the FTA Standard Cost Categories (SCC) and sub-categories were used to summarize the unit prices into a comprehensive total estimate for each segment or alternative. The major cost categories are listed and described in greater detail below:

SCC 10: Guideway and Track Elements

SCC 20: Stations, Stops, Terminals, Intermodal

SCC 30: Support Facilities: Yards, Shops, Admin Buildings

SCC 40: Sitework & Special Conditions

SCC 50: Systems

SCC 60: ROW, Land, Existing Improvements

SCC 70: Vehicles

SCC 80: Professional Services

SCC 90: Unallocated Contingency

SCC 100: Finance Charges

Capital costs for the first seven categories (SCC 10-70) were calculated by using known unit costs and measured quantities for each component. System-wide costs and allowances are calculated based on route length and not from measured quantities. A per track-foot unit cost is developed from historical data to apply to the track length. The final three categories (SCC 80-100) are calculated as a percentage of construction costs (excluding vehicle procurement).

2.5.1 Quantifiable Cost Components (SCC 10-70)

The assumptions included in each cost components quantified in SCC categories 10-70 are detailed in Table 3 below. All cost items include material, labor and delivery costs for procuring and installing the item.

Table 3 - SCC Items 10 through 70 Key Assumptions

Item #	Item Description	Unit	Item Assumptions
10.04.01	Alignment Over Existing Bridge	TF	This item is for any alignment which crosses an existing structure. It assumes the existing structure only requires minor improvements. The item assumes all costs for track, deck improvements and an overlay (~20ft width)
10.04.02	New Streetcar Viaduct	TF	This item is for any new structure that may be required for a potential alternative. It is assumed to be a transit only structure approximately 26ft wide.

Item #	Item Description	Unit	Item Assumptions
10.06.01	Cut-and-Cover Tunnel with Soldier Pile Walls	LS	This item is for the cut-and-cover tunnel required along S 19th Street as a result of existing grades in excess of the 9% maximum a streetcar can operate upon. Cost assumes an excavated trench supported by soldier pile walls, a reinforced concrete floor slab, a reinforced concrete cast-in-place box girder tunnel ceiling, and backfill to existing ground level. The possible need for emergency egress, fire safety and/or ventilation systems was not evaluated and this item does not cover such potential extra costs.
10.08.01	Retaining Wall <10ft Tall	LF	This item is for any potential areas where retaining walls may be required. Cost is assuming a MSE or cantilever wall type is used. (<10ft)
10.08.02	Retaining Wall >10ft Tall	LF	This item is for any potential areas where retaining walls may be required. Cost is assuming a MSE or cantilever wall type is used. (>10ft)
10.10.01	Furnish Rail - Assume 112TRAM Block Rail	TF	This item is for the rail procurement. It assumes 112 TRAM block rail (a domestic replacement for girder rail).
10.10.02	Embedded Track - Construct Track Slab	TF	This item is for the actual construction and installation of the embedded track. It includes excavation and base rock. All materials and labor are included except for rail counted in item 10.12.01.
10.12.01	Embedded Turnout - Furnish and Install	EA	This item is for any anticipated turnouts to connect the proposed alignments to the existing track or at terminus locations for switching track.
10.12.02	Embedded Crossing - Furnish and Install	EA	This item is for any crossings that may be required to connect the proposed and future track.
20.01.01	Streetcar Stop - Basic 1 Car	EA	This item is for a standard streetcar stop with a simple shelter and next streetcar display. It includes all excavation, construction and furnishing for the stop.
20.01.02	Streetcar Stop - Premium 1 Car	EA	This item is for a premium stop which may be required in some locations. It will not be used unless a particular stop is identified as needing a special canopy or design.
20.02.01	Aerial Streetcar Stop	EA	This item is only needed in the event that a stop will be elevated such as on a structure. It accounts for the additional premium of building on a structure and providing access through ramps and stairs.
30.02.01	Maintenance Facility Expansion: Allowance ($500k/New Vehicle)	EA	This item is an allowance which provides a dollar amount per new vehicle to fund a maintenance facility expansion and/or new facility. It is assumed that 1 stall can maintain approximately 4 vehicles and costs approximately $2 Million per stall.
30.05.01	Yard and Storage Track Expansion: Allowance ($200k/New Vehicle)	EA	This item is an allowance which provides a dollar amount per new vehicle to fund the maintenance yard storage capacity. It assumes approximately 100-200ft of track will be required per vehicle (to account for transition track, turnouts, etc.)

Item #	Item Description	Unit	Item Assumptions
40.02.01	Utility Relocation - High Allowance (Dense Urban)	TF	This item is an allowance for utility relocations that assume a significant number of utility relocations are expected due to the density of existing utilities and/or type of corridor. An average of 2 or more conflicts is expected.
40.02.02	Utility Relocation - Medium Allowance (Moderate Density)	TF	This item is an allowance for utility relocations that assume a moderate number of utility relocations. Impacts may be intermittent with an average of 1 conflict expected.
40.02.03	Utility Relocation - Low Allowance (Minimal Relocation Expected)	TF	This item is an allowance for utility relocations that assume minimal utility conflicts. It assumes that there is less than 1 conflict and it is intermittent.
40.06.01	Pedestrian Improvement Allowance (Per Intersection)	EA	This item is an allowance for upgrades to the existing sidewalk and pedestrian infrastructure. It includes items such as upgrading ADA ramps to be compliant with current regulations. This allowance is based off assuming 3/4 of all existing ramps at an intersection are non-compliant and need to be reconstructed.
40.07.01	Roadway Improvement Allowance	TF	This allowance is intended to cover any additional pavement reconstruction and/or overlay that may be required outside of the track slab. It will be based off experiences and averages from other streetcar projects.
40.07.02	Track Drainage Allowance	TF	This is an allowance for installing track drainage and minor adjustments in the existing storm water system.
40.07.03	Street Lighting Allowance (Adjustments, Relocations, New)	TF	This is an allowance to account for minor conflicts with the existing street lights. Conflicts include direct conflicts or as a result of eliminating access.
40.08.01	Temporary Maintenance of Traffic	LS	This item is to account for the traffic control required during construction. It is taken as a percentage of the direct construction costs
40.08.02	Contractor Indirect (Staff, Office, etc.)	LS	This item is to account for the contractor indirects during construction including staff, field offices, vehicles, etc.
40.08.03	Art in Transit (1% of Construction)	LS	This item is common to all projects with federal funding.
50.01.01	TWC Control for Connection to Existing Streetcar Track	EA	This item is an allowance to account for special wayside controls and controller equipment that will be required for a connection to the existing track including twc loops, train signals, powered switch controls, etc.
50.02.01	Modify Existing Traffic Signal	EA	This is an allowance for modifying any existing signals along the alignment. Because of the OCS wire, modifications such as shortening the mast arm are common for streetcar projects.
50.02.02	New Traffic Signal Allowance	EA	This is an allowance for a new signal. Detailed analysis is not part of the scope of this study, however, for locations where it is clear a new signal will be required, this item will be used.

Item #	Item Description	Unit	Item Assumptions
50.02.03	Signal Priority Allowance	TF	This is an allowance to upgrade any of the existing signal equipment along the alignment to allow for signal priority. It is assumed that much of the equipment is in place today and only minor upgrades will be required.
50.03.01	Traction Power Substation (Assume 1/Track Mile or 1 per 0.5 Rt. Mile)	EA	This item is to account for the cost to procure and install a traction power substation including any feeder lines to connect between the substation and alignment.
50.04.01	Overhead Trolley Wire Allowance (Poles, wires, appurtenances)	TF	This item is an allowance for the procurement and installation of an OCS system assuming a trolley wire. It includes all costs such as poles, wires, supports, etc.
50.05.01	Communications Allowance	LS	It is assumed that no communications system will be installed
50.06.01	Fare Collection	LS	It is assumed that fare collection will occur on the vehicle, not the station.
60.01.01	Right of Way Acquisition	SF	This item accounts for specific ROW acquisition that was identified during quantity takeoff.
60.01.02	Right of Way Allowance	TF	This item is to account for any potential ROW acquisition, easement, lease or license agreement costs that are unknown at this time but may be required as project development advances.
70.01.01	Modern Streetcar Vehicle (Assumes wired system)	EA	This item is for one additional vehicle. It is assumed that approximately 1 new vehicle will be required per track mile for approximately 10-minute headway operation; this value accounts for acquisition of spare vehicles. In order to distribute the cost of the vehicles equally among the alignment alternatives, vehicles will be prorated at a rate of 1vh/mile of total track length.
70.07.01	Spare Parts for New Vehicles (Per Vehicle)	EA	This is an allowance for spare parts for each new vehicle.

2.5.2 Allocated Contingencies (SCC 10-70)

Contingency is typically included in an estimate to address uncertainties based on the current level of engineering design. The contingency allowance addresses the potential for quantity fluctuations and cost variability when items of work are not readily apparent or unknown at the current level of design. Contingency is assigned in two major categories, allocated and unallocated. Unallocated contingencies are covered by SCC 90. Allocated contingencies are line item contingencies applied to each item in SCC 10 through SCC 70.

Based on the extremely limited level of design development of the pre-alternatives analysis, an allocated contingency of 30 percent was selected and applied to the items in cost categories 10-70. The percentage selected is based on professional experience and judgment related to the potential variability of costs within each of these cost categories. The table below lists the percentages that will normally be used for allocated contingencies during early conceptual design.

2.5.3 Professional Services (SCC 80)

This category includes the costs for engineering, administration and construction management services. Costs for these services will be based on a percentage of the total cost of all direct capital cost categories except vehicles and right-of-way. The percentages are

applied individually and not cumulatively. The following percentages were used for this estimate:

Table 4 - Professional Services Cost as a Percentage of Construction Cost

Professional Services Percentages For Estimates	
Description	**Percentage**
80.01 - Preliminary Engineering	3
80.02 - Final Design	7
80.03 - Project Management for Design and Construction	5
80.04 - Construction Administration and Management	6
80.05 - Insurance	3
80.06 - Legal; Permits; Review Fees	2
80.07 - Survey, Testing, Investigation, Inspection	2
80.08 - Start-up Costs	2
Total	30%

2.5.4 Unallocated Contingency (SCC 90)

Both allocated and unallocated contingency are typically used to estimate early level opinion of probable capital costs. Unallocated contingencies are intended to cover the unknowns not yet identified, quantifiable or known at a given stage of project development. Typically the unallocated contingency at the early pre-conceptual engineering stage would be 25% of project costs.

2.5.5 Finance Charges (SCC 100)

This category includes finance charges expected to be incurred to complete the project. Costs are typically derived from the project financial plan which will be developed in future phases of project development. At this stage, Finance Charges are not assumed or included in the estimate.

3 Conclusion and Limitations

The opinion of probable capital costs developed as part of the Pre-Alternatives Analysis are conceptual in nature and based on limited engineering data. HDR accomplished a high level engineering screening (May 3, Engineering Considerations memo), documented system assumptions (April 18, Configuration Assumptions memo) and this cost methodology to support the estimates that were produced. It is important that Sound Transit reviews and understands all three documents as they serve as the basis of the estimate. For convenience, copies of the previous two memoranda mentioned are included in Appendix B.

The primary objective of these estimates is for comparative purposes and to establish an order of magnitude budget as the project moves forward into a more detailed alternatives analysis process. As more detailed design and analysis occur during the alternatives analysis and preliminary engineering, the estimates produced should be reviewed and refined. The project costs estimated as part of the pre-alternatives analysis with limited

engineering and investigation may be higher or lower than actual costs and are intended to only serve for establishing an order of magnitude budget and to compare alternatives.

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Appendix A – Detailed Cost Estimates

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			Alignment 1	North End (Segments B,E)								Current Year		*Inflation Rate*
			5.2 Track Miles	Approximately $30 Million Per Track Mile								*2011.25 (YR)*		*3.50%*
SCC	**SCC Sub**	**Item #**		**Item Description**	**Unit**	**Unit Cost**	**Quantity**	**Item Cost**	**A. Cont.**	**Item Cont.**	**Subtotal**	**YoE**	**Subtotal YoE**
10				**GUIDEWAY & TRACK ELEMENTS (route miles)**				**$12,688,015**		**$3,806,405**	**$16,494,420**		**$18,765,639**
	10.04			Guideway: Aerial structure				$270,900		$81,270	$352,170		**$400,662**
		10.04.01		Alignment Over Existing Bridge	TF	$700	387.0	$270,900	30%	$81,270	$352,170	2015	**$400,662**
		10.04.02		New Streetcar Viaduct	TF	$7,000	0.0	$0	30%	$0	$0	2015	**$0**
	10.06			Guideway: Underground cut & cover				$0		$0	$0		**$0**
		10.06.01		Cut-and-Cover Tunnel with Soldier Pile Walls	LS	$55,521,389	0.0	$0	30%	$0	$0	2015	**$0**
	10.08			Guideway: Retained cut or fill				$0		$0	$0		**$0**
		10.08.01		Retaining Wall <10ft Tall	LF	$800	0.0	$0	30%	$0	$0	2015	**$0**
		10.08.02		Retaining Wall >10ft Tall	LF	$1,600	0.0	$0	30%	$0	$0	2015	**$0**
	10.10			Track: Embedded				$11,517,115		$3,455,135	$14,972,250		**$17,033,872**
		10.10.01		Furnish Rail - Assume 112TRAM Block Rail	TF	$75	27417.8	$2,056,335	30%	$616,901	$2,673,236	2015	**$3,041,330**
		10.10.02		Embedded Track - Construct Track Slab	TF	$350	27030.8	$9,460,780	30%	$2,838,234	$12,299,014	2015	**$13,992,542**
	10.12			Track: Special (switches, turnouts)				$900,000		$270,000	$1,170,000		**$1,331,105**
		10.12.01		Embedded Turnout - Furnish and Install	EA	$250,000	3.0	$750,000	30%	$225,000	$975,000	2015	**$1,109,254**
		10.12.02		Embedded Crossing - Furnish and Install	EA	$150,000	1.0	$150,000	30%	$45,000	$195,000	2015	**$221,851**
20				**STATIONS, STOPS, TERMINALS, INTERMODAL (number)**				**$2,437,138**		**$731,141**	**$3,168,279**		**$3,604,539**
	20.01			At-grade station, stop, shelter, mall, terminal, platform				$2,437,138		$731,141	$3,168,279		**$3,604,539**
		20.01.01		Streetcar Stop - Basic 1 Car	EA	$80,000	30.5	$2,437,138	30%	$731,141	$3,168,279	2015	**$3,604,539**
		20.01.02		Streetcar Stop - Premium 1 Car	EA	$200,000	0.0	$0	30%	$0	$0	2015	**$0**
	20.02			Aerial station, stop, shelter, mall, terminal, platform				$0		$0	$0		**$0**
		20.02.01		Aerial Streetcar Stop	EA	$0	0.0	$0	30%	$0	$0	2015	**$0**
30				**SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS**				$3,634,936		$1,090,481	$4,725,416		**$5,376,088**
	30.02			Light Maintenance Facility				$2,596,383		$778,915	$3,375,297		**$3,840,063**
		30.02.01		Maintenance Facility Expansion: Allowance ($500k/New Vehicle)	EA	$500,000	5.2	$2,596,383	30%	$778,915	$3,375,297	2015	**$3,840,063**
	30.05			Yard and Yard Track				$1,038,553		$311,566	$1,350,119		**$1,536,025**
		30.05.01		Yard and Storage Track Expansion: Allowance ($200k/New Vehicle)	EA	$200,000	5.2	$1,038,553	30%	$311,566	$1,350,119	2015	**$1,536,025**
40				**SITEWORK & SPECIAL CONDITIONS**				**$19,881,308**		**$3,282,292**	**$23,163,600**		**$26,353,140**
	40.02			Site Utilities, Utility Relocation				$7,040,360		$2,112,108	$9,152,468		**$10,412,728**
		40.02.01		Utility Relocation - High Allowance (Dense Urban)	TF	$750	1672.0	$1,254,000	30%	$376,200	$1,630,200	2015	**$1,854,672**
		40.02.02		Utility Relocation - Medium Allowance (Moderate Density)	TF	$350	4764.0	$1,667,400	30%	$500,220	$2,167,620	2015	**$2,466,093**
		40.02.03		Utility Relocation - Low Allowance (Minimal Relocation Expected)	TF	$200	20594.8	$4,118,960	30%	$1,235,688	$5,354,648	2015	**$6,091,963**
	40.06			Pedestrian / bike access and accommodation, landscaping				$375,000		$112,500	$487,500		**$554,627**
		40.06.01		Pedestrian Improvement Allowance (Per Intersection)	EA	$15,000	25.0	$375,000	30%	$112,500	$487,500	2015	**$554,627**
	40.07			Automobile, bus, van accessways including roads, parking lots				$3,525,614		$1,057,684	$4,583,298		**$5,214,401**
		40.07.01		Roadway Improvement Allowance	TF	$100	27030.8	$2,703,080	30%	$810,924	$3,514,004	2015	**$3,997,869**
		40.07.02		Track Drainage Allowance	TF	$20	27417.8	$548,356	30%	$164,507	$712,863	2015	**$811,021**
		40.07.03		Street Lighting Allowance (Adjustments, Relocations, New)	TF	$10	27417.8	$274,178	30%	$82,253	$356,431	2015	**$405,511**
	40.08			Temporary Facilities and other indirect costs during construction				$8,940,334		$0	$8,940,334		**$10,171,384**
		40.08.01		Temporary Maintenance of Traffic	LS	$0	63859530.1	$3,192,977	0%	$0	$3,192,977	2015	**$3,632,637**
		40.08.02		Contractor Indirects (Staff, Office, etc.)	LS	$0	63859530.1	$5,108,762	0%	$0	$5,108,762	2015	**$5,812,220**
		40.08.03		Art in Transit (1% of Construction)	LS	$0	63859530.1	$638,595	0%	$0	$638,595	2015	**$726,527**

50		**SYSTEMS**				**$13,476,295**		**$4,042,888**	**$17,519,183**		**$19,931,508**
	50.01	Train control and signals				$300,000		$90,000	$390,000		**$443,702**
		50.01.01	TWC Control for Connection to Existing Streetcar Track	EA	$300,000	1.0	$300,000	30%	$90,000	$390,000	2015	**$443,702**
	50.02	Traffic signals and crossing protection					$1,648,356		$494,507	$2,142,863		**$2,437,927**
		50.02.01	Modify Existing Traffic Signal	EA	$75,000	8.0	$600,000	30%	$180,000	$780,000	2015	**$887,403**
		50.02.02	New Traffic Signal Allowance	EA	$250,000	2.0	$500,000	30%	$150,000	$650,000	2015	**$739,503**
		50.02.03	Signal Priority Allowance	TF	$20	27417.8	$548,356	30%	$164,507	$712,863	2015	**$811,021**
	50.03	Traction power supply: substations					$4,673,489		$1,402,047	$6,075,535		**$6,912,113**
		50.03.01	Traction Power Substation (Assume 1/Track Mile or 1 per 0.5 Rt. Mile)	EA	$900,000	5.2	$4,673,489	30%	$1,402,047	$6,075,535	2015	**$6,912,113**
	50.04	Traction power distribution: catenary and third rail					$6,854,450		$2,056,335	$8,910,785		**$10,137,766**
		50.04.01	Overhead Trolley Wire Allowance (Poles, wires, appurtenances)	TF	$250	27417.8	$6,854,450	30%	$2,056,335	$8,910,785	2015	**$10,137,766**
	50.05	Communications					$0		$0	$0		**$0**
		50.05.01	Communications Allowance?	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	50.06	Fare collection system and equipment					$0		$0	$0		**$0**
		50.06.01	Fare Collection (On Station or in Vehicle?)	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	Construction Subtotal (10-50)						**$52,117,691**		**$12,953,207**	**$65,070,898**		$74,030,914
60		**ROW, LAND, EXISTING IMPROVEMENTS**					**$904,787**		**$180,957**	**$1,085,745**		**$1,235,248**
	60.01	Purchase or lease of real estate					$904,787		$180,957	$1,085,745		**$1,235,248**
		60.01.01	Right of Way Acquisition	SF	$80	0.0	$0	30%	$0	$0	2015	**$0**
		60.01.02	Right of Way Allowance	TF	$33	27417.8	$904,787	20%	$180,957	$1,085,745	2015	**$1,235,248**
70		**VEHICLES (number)**					$20,771,061		$1,168,372	$21,939,433		**$24,960,410**
	70.01	Light Rail					$20,251,784		$1,012,589	$21,264,373		**$24,192,397**
		70.01.01	Modern Streetcar Vehicle (Assumes wired system)	EA	$3,900,000	5.2	$20,251,784	5%	$1,012,589	$21,264,373	2015	**$24,192,397**
	70.07	Spare parts					$519,277		$155,783	$675,059		**$768,013**
		70.07.01	Spare Parts for New Vehicles (Per Vehicle)	EA	$100,000	5.2	$519,277	30%	$155,783	$675,059	2015	**$768,013**
80		**PROFESSIONAL SERVICES (applies to Cats. 10-50)**					**$22,209,274**		**$0**	**$22,209,274**		**$25,267,407**
	80.01	Preliminary Engineering					$2,220,927		$0	$2,220,927		**$2,526,741**
		80.01.01	Percentage of Direct Costs SCC (10-50)	LS	3%	74030914.5	$2,220,927	0%	$0	$2,220,927	2015	**$2,526,741**
	80.02	Final Design					$5,182,164		$0	$5,182,164		**$5,895,728**
		80.02.01	Percentage of Direct Costs SCC (10-50)	LS	7%	74030914.5	$5,182,164	0%	$0	$5,182,164	2015	**$5,895,728**
	80.03	Project Management for Design and Construction					$3,701,546		$0	$3,701,546		**$4,211,235**
		80.03.01	Percentage of Direct Costs SCC (10-50)	LS	5%	74030914.5	$3,701,546	0%	$0	$3,701,546	2015	**$4,211,235**
	80.04	Construction Administration & Management					$4,441,855		$0	$4,441,855		**$5,053,481**
		80.04.01	Percentage of Direct Costs SCC (10-50)	LS	6%	74030914.5	$4,441,855	0%	$0	$4,441,855	2015	**$5,053,481**
	80.05	Professional Liability and other Non-Construction Insurance					$2,220,927		$0	$2,220,927		**$2,526,741**
		80.05.01	Percentage of Direct Costs SCC (10-50)	LS	3%	74030914.5	$2,220,927	0%	$0	$2,220,927	2015	**$2,526,741**
	80.06	Legal; Permits; Review Fees by other agencies, cities, etc.					$1,480,618		$0	$1,480,618		**$1,684,494**
		80.06.01	Percentage of Direct Costs SCC (10-50)	LS	2%	74030914.5	$1,480,618	0%	$0	$1,480,618	2015	**$1,684,494**
	80.07	Surveys, Testing, Investigation, Inspection					$1,480,618		$0	$1,480,618		**$1,684,494**
		80.07.01	Percentage of Direct Costs SCC (10-50)	LS	2%	74030914.5	$1,480,618	0%	$0	$1,480,618	2015	**$1,684,494**
	80.08	Start up					$1,480,618		$0	$1,480,618		**$1,684,494**
		80.08.01	Percentage of Direct Costs SCC (10-50)	LS	2%	74030914.5	$1,480,618	0%	$0	$1,480,618	2015	**$1,684,494**
	Subtotal (10-80)						**$96,002,814**		**$14,302,537**	**$110,305,350**		$125,493,979
90		**UNALLOCATED CONTINGENCY**		**LS**	**25%**					**$27,576,338**		**$31,373,495**
100		**FINANCE CHARGES**								***Current Year Total***		***YoE Total***
	Segment Totals (10-100)									**$137,881,688**		$156,867,474

		Alignment 2	North End - Central (Segments E,C)							Current Year		*Inflation Rate*
		4.9 Track Miles	Approximately $31 Million Per Track Mile							*2011.25 (YR)*		*3.50%*
SCC	**SCC Sub**	**Item #**	**Item Description**	**Unit**	**Unit Cost**	**Quantity**	**Item Cost**	**A. Cont.**	**Item Cont.**	**Subtotal**	**YoE**	**Subtotal YoE**
10			**GUIDEWAY & TRACK ELEMENTS (route miles)**				**$11,234,465**		**$3,370,340**	**$14,604,805**		**$16,615,831**
	10.04		Guideway: Aerial structure				$0		$0	$0		**$0**
		10.04.01	Alignment Over Existing Bridge	TF	$700	0.0	$0	30%	$0	$0	2015	**$0**
		10.04.02	New Streetcar Viaduct	TF	$7,000	0.0	$0	30%	$0	$0	2015	**$0**
	10.06		Guideway: Underground cut & cover				$0		$0	$0		**$0**
		10.06.01	Cut-and-Cover Tunnel with Soldier Pile Walls	LS	$55,521,389	0.0	$0	30%	$0	$0	2015	**$0**
	10.08		Guideway: Retained cut or fill				$0		$0	$0		**$0**
		10.08.01	Retaining Wall <10ft Tall	LF	$800	0.0	$0	30%	$0	$0	2015	**$0**
		10.08.02	Retaining Wall >10ft Tall	LF	$1,600	0.0	$0	30%	$0	$0	2015	**$0**
	10.10		Track: Embedded				$10,984,465		$3,295,340	$14,279,805		**$16,246,079**
		10.10.01	Furnish Rail - Assume 112TRAM Block Rail	TF	$75	25845.8	$1,938,435	30%	$581,531	$2,519,966	2015	**$2,866,955**
		10.10.02	Embedded Track - Construct Track Slab	TF	$350	25845.8	$9,046,030	30%	$2,713,809	$11,759,839	2015	**$13,379,124**
	10.12		Track: Special (switches, turnouts)				$250,000		$75,000	$325,000		**$369,751**
		10.12.01	Embedded Turnout - Furnish and Install	EA	$250,000	1.0	$250,000	30%	$75,000	$325,000	2015	**$369,751**
		10.12.02	Embedded Crossing - Furnish and Install	EA	$150,000	0.0	$0	30%	$0	$0	2015	**$0**
20			**STATIONS, STOPS, TERMINALS, INTERMODAL (number)**				**$2,297,404**		**$689,221**	**$2,986,626**		**$3,397,873**
	20.01		At-grade station, stop, shelter, mall, terminal, platform				$2,297,404		$689,221	$2,986,626		**$3,397,873**
		20.01.01	Streetcar Stop - Basic 1 Car	EA	$80,000	28.7	$2,297,404	30%	$689,221	$2,986,626	2015	**$3,397,873**
		20.01.02	Streetcar Stop - Premium 1 Car	EA	$200,000	0.0	$0	30%	$0	$0	2015	**$0**
	20.02		Aerial station, stop, shelter, mall, terminal, platform				$0		$0	$0		**$0**
		20.02.01	Aerial Streetcar Stop	EA	$0	0.0	$0	30%	$0	$0	2015	**$0**
30			**SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS**				$3,426,527		$1,027,958	$4,454,484		**$5,067,850**
	30.02		Light Maintenance Facility				$2,447,519		$734,256	$3,181,775		**$3,619,893**
		30.02.01	Maintenance Facility Expansion: Allowance ($500k/New Vehicle)	EA	$500,000	4.9	$2,447,519	30%	$734,256	$3,181,775	2015	**$3,619,893**
	30.05		Yard and Yard Track				$979,008		$293,702	$1,272,710		**$1,447,957**
		30.05.01	Yard and Storage Track Expansion: Allowance ($200k/New Vehicle)	EA	$200,000	4.9	$979,008	30%	$293,702	$1,272,710	2015	**$1,447,957**
40			**SITEWORK & SPECIAL CONDITIONS**				**$21,540,671**		**$3,807,619**	**$25,348,290**		**$28,838,654**
	40.02		Site Utilities, Utility Relocation				$9,002,110		$2,700,633	$11,702,743		**$13,314,166**
		40.02.01	Utility Relocation - High Allowance (Dense Urban)	TF	$750	5295.0	$3,971,250	30%	$1,191,375	$5,162,625	2015	**$5,873,499**
		40.02.02	Utility Relocation - Medium Allowance (Moderate Density)	TF	$350	6138.0	$2,148,300	30%	$644,490	$2,792,790	2015	**$3,177,347**
		40.02.03	Utility Relocation - Low Allowance (Minimal Relocation Expected)	TF	$200	14412.8	$2,882,560	30%	$864,768	$3,747,328	2015	**$4,263,321**
	40.06		Pedestrian / bike access and accommodation, landscaping				$330,000		$99,000	$429,000		**$488,072**
		40.06.01	Pedestrian Improvement Allowance (Per Intersection)	EA	$15,000	22.0	$330,000	30%	$99,000	$429,000	2015	**$488,072**
	40.07		Automobile, bus, van accessways including roads, parking lots				$3,359,954		$1,007,986	$4,367,940		**$4,969,389**
		40.07.01	Roadway Improvement Allowance	TF	$100	25845.8	$2,584,580	30%	$775,374	$3,359,954	2015	**$3,822,607**
		40.07.02	Track Drainage Allowance	TF	$20	25845.8	$516,916	30%	$155,075	$671,991	2015	**$764,521**
		40.07.03	Street Lighting Allowance (Adjustments, Relocations, New)	TF	$10	25845.8	$258,458	30%	$77,537	$335,995	2015	**$382,261**
	40.08		Temporary Facilities and other indirect costs during construction				$8,848,607		$0	$8,848,607		**$10,067,027**
		40.08.01	Temporary Maintenance of Traffic	LS	$0	63204335.4	$3,160,217	0%	$0	$3,160,217	2015	**$3,595,367**
		40.08.02	Contractor Indirects (Staff, Office, etc.)	LS	$0	63204335.4	$5,056,347	0%	$0	$5,056,347	2015	**$5,752,587**
		40.08.03	Art in Transit (1% of Construction)	LS	$0	63204335.4	$632,043	0%	$0	$632,043	2015	**$719,073**

50		**SYSTEMS**				**$13,083,900**		**$3,925,170**	**$17,009,070**		**$19,351,155**
	50.01	Train control and signals				$300,000		$90,000	$390,000		**$443,702**
		50.01.01	TWC Control for Connection to Existing Streetcar Track	EA	$300,000	1.0	$300,000	30%	$90,000	$390,000	2015	**$443,702**
	50.02	Traffic signals and crossing protection					$1,916,916		$575,075	$2,491,991		**$2,835,128**
		50.02.01	Modify Existing Traffic Signal	EA	$75,000	12.0	$900,000	30%	$270,000	$1,170,000	2015	**$1,331,105**
		50.02.02	New Traffic Signal Allowance	EA	$250,000	2.0	$500,000	30%	$150,000	$650,000	2015	**$739,503**
		50.02.03	Signal Priority Allowance	TF	$20	25845.8	$516,916	30%	$155,075	$671,991	2015	**$764,521**
	50.03	Traction power supply: substations					$4,405,534		$1,321,660	$5,727,194		**$6,515,807**
		50.03.01	Traction Power Substation (Assume 1/Track Mile or 1 per 0.5 Rt. Mile)	EA	$900,000	4.9	$4,405,534	30%	$1,321,660	$5,727,194	2015	**$6,515,807**
	50.04	Traction power distribution: catenary and third rail					$6,461,450		$1,938,435	$8,399,885		**$9,556,517**
		50.04.01	Overhead Trolley Wire Allowance (Poles, wires, appurtenances)	TF	$250	25845.8	$6,461,450	30%	$1,938,435	$8,399,885	2015	**$9,556,517**
	50.05	Communications					$0		$0	$0		**$0**
		50.05.01	Communications Allowance?	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	50.06	Fare collection system and equipment					$0		$0	$0		**$0**
		50.06.01	Fare Collection (On Station or in Vehicle?)	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	Construction Subtotal (10-50)						**$51,582,967**		**$12,820,308**	**$64,403,275**		**$73,271,362**
60		**ROW, LAND, EXISTING IMPROVEMENTS**					**$852,911**		**$170,582**	**$1,023,494**		**$1,164,425**
	60.01	Purchase or lease of real estate					$852,911		$170,582	$1,023,494		**$1,164,425**
		60.01.01	Right of Way Acquisition	SF	$80	0.0	$0	30%	$0	$0	2015	**$0**
		60.01.02	Right of Way Allowance	TF	$33	25845.8	$852,911	20%	$170,582	$1,023,494	2015	**$1,164,425**
70		**VEHICLES (number)**					$19,580,152		$1,101,384	$20,681,535		**$23,529,304**
	70.01	Light Rail					$19,090,648		$954,532	$20,045,180		**$22,805,325**
		70.01.01	Modern Streetcar Vehicle (Assumes wired system)	EA	$3,900,000	4.9	$19,090,648	5%	$954,532	$20,045,180	2015	**$22,805,325**
	70.07	Spare parts					$489,504		$146,851	$636,355		**$723,979**
		70.07.01	Spare Parts for New Vehicles (Per Vehicle)	EA	$100,000	4.9	$489,504	30%	$146,851	$636,355	2015	**$723,979**
80		**PROFESSIONAL SERVICES (applies to Cats. 10-50)**					**$21,981,409**		**$0**	**$21,981,409**		**$25,008,165**
	80.01	Preliminary Engineering					$2,198,141		$0	$2,198,141		**$2,500,817**
		80.01.01	Percentage of Direct Costs SCC (10-50)	LS	3%	73271362.0	$2,198,141	0%	$0	$2,198,141	2015	**$2,500,817**
	80.02	Final Design					$5,128,995		$0	$5,128,995		**$5,835,239**
		80.02.01	Percentage of Direct Costs SCC (10-50)	LS	7%	73271362.0	$5,128,995	0%	$0	$5,128,995	2015	**$5,835,239**
	80.03	Project Management for Design and Construction					$3,663,568		$0	$3,663,568		**$4,168,028**
		80.03.01	Percentage of Direct Costs SCC (10-50)	LS	5%	73271362.0	$3,663,568	0%	$0	$3,663,568	2015	**$4,168,028**
	80.04	Construction Administration & Management					$4,396,282		$0	$4,396,282		**$5,001,633**
		80.04.01	Percentage of Direct Costs SCC (10-50)	LS	6%	73271362.0	$4,396,282	0%	$0	$4,396,282	2015	**$5,001,633**
	80.05	Professional Liability and other Non-Construction Insurance					$2,198,141		$0	$2,198,141		**$2,500,817**
		80.05.01	Percentage of Direct Costs SCC (10-50)	LS	3%	73271362.0	$2,198,141	0%	$0	$2,198,141	2015	**$2,500,817**
	80.06	Legal; Permits; Review Fees by other agencies, cities, etc.					$1,465,427		$0	$1,465,427		**$1,667,211**
		80.06.01	Percentage of Direct Costs SCC (10-50)	LS	2%	73271362.0	$1,465,427	0%	$0	$1,465,427	2015	**$1,667,211**
	80.07	Surveys, Testing, Investigation, Inspection					$1,465,427		$0	$1,465,427		**$1,667,211**
		80.07.01	Percentage of Direct Costs SCC (10-50)	LS	2%	73271362.0	$1,465,427	0%	$0	$1,465,427	2015	**$1,667,211**
	80.08	Start up					$1,465,427		$0	$1,465,427		**$1,667,211**
		80.08.01	Percentage of Direct Costs SCC (10-50)	LS	2%	73271362.0	$1,465,427	0%	$0	$1,465,427	2015	**$1,667,211**
	Subtotal (10-80)						**$93,997,439**		**$14,092,274**	**$108,089,712**		**$122,973,256**
90		**UNALLOCATED CONTINGENCY**		**LS**	**25%**					**$27,022,428**		**$30,743,314**
100		**FINANCE CHARGES**								***Current Year Total***		***YoE Total***
	Segment Totals (10-100)									**$135,112,140**		**$153,716,570**

			Alignment 3	North Downton Central (Segments D,E)								Current Year		*Inflation Rate*
			4.5 Track Miles	Approximately $31 Million Per Track Mile								*2011.25 (YR)*		*3.50%*
SCC	**SCC Sub**	**Item #**		**Item Description**	**Unit**	**Unit Cost**	**Quantity**	**Item Cost**	**A. Cont.**	**Item Cont.**	**Subtotal**	**YoE**	**Subtotal YoE**
10				**GUIDEWAY & TRACK ELEMENTS (route miles)**				**$10,853,868**		**$3,256,160**	**$14,110,028**		**$16,052,925**
	10.04			Guideway: Aerial structure				$0		$0	$0		**$0**
		10.04.01		Alignment Over Existing Bridge	TF	$700	0.0	$0	30%	$0	$0	2015	**$0**
		10.04.02		New Streetcar Viaduct	TF	$7,000	0.0	$0	30%	$0	$0	2015	**$0**
	10.06			Guideway: Underground cut & cover				$0		$0	$0		**$0**
		10.06.01		Cut-and-Cover Tunnel with Soldier Pile Walls	LS	$55,521,389	0.0	$0	30%	$0	$0	2015	**$0**
	10.08			Guideway: Retained cut or fill				$0		$0	$0		**$0**
		10.08.01		Retaining Wall <10ft Tall	LF	$800	0.0	$0	30%	$0	$0	2015	**$0**
		10.08.02		Retaining Wall >10ft Tall	LF	$1,600	0.0	$0	30%	$0	$0	2015	**$0**
	10.10			Track: Embedded				$10,203,868		$3,061,160	$13,265,028		**$15,091,572**
		10.10.01		Furnish Rail - Assume 112TRAM Block Rail	TF	$75	24009.1	$1,800,683	30%	$540,205	$2,340,887	2015	**$2,663,219**
		10.10.02		Embedded Track - Construct Track Slab	TF	$350	24009.1	$8,403,185	30%	$2,520,956	$10,924,141	2015	**$12,428,353**
	10.12			Track: Special (switches, turnouts)				$650,000		$195,000	$845,000		**$961,353**
		10.12.01		Embedded Turnout - Furnish and Install	EA	$250,000	2.0	$500,000	30%	$150,000	$650,000	2015	**$739,503**
		10.12.02		Embedded Crossing - Furnish and Install	EA	$150,000	1.0	$150,000	30%	$45,000	$195,000	2015	**$221,851**
20				**STATIONS, STOPS, TERMINALS, INTERMODAL (number)**				**$2,134,142**		**$640,243**	**$2,774,385**		**$3,156,407**
	20.01			At-grade station, stop, shelter, mall, terminal, platform				$2,134,142		$640,243	$2,774,385		**$3,156,407**
		20.01.01		Streetcar Stop - Basic 1 Car	EA	$80,000	26.7	$2,134,142	30%	$640,243	$2,774,385	2015	**$3,156,407**
		20.01.02		Streetcar Stop - Premium 1 Car	EA	$200,000	0.0	$0	30%	$0	$0	2015	**$0**
	20.02			Aerial station, stop, shelter, mall, terminal, platform				$0		$0	$0		**$0**
		20.02.01		Aerial Streetcar Stop	EA	$0	0.0	$0	30%	$0	$0	2015	**$0**
30				**SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS**				$3,183,025		$954,907	$4,137,932		**$4,707,710**
	30.02			Light Maintenance Facility				$2,273,589		$682,077	$2,955,666		**$3,362,650**
		30.02.01		Maintenance Facility Expansion: Allowance ($500k/New Vehicle)	EA	$500,000	4.5	$2,273,589	30%	$682,077	$2,955,666	2015	**$3,362,650**
	30.05			Yard and Yard Track				$909,436		$272,831	$1,182,266		**$1,345,060**
		30.05.01		Yard and Storage Track Expansion: Allowance ($200k/New Vehicle)	EA	$200,000	4.5	$909,436	30%	$272,831	$1,182,266	2015	**$1,345,060**
40				**SITEWORK & SPECIAL CONDITIONS**				**$18,641,510**		**$3,182,086**	**$21,823,596**		**$24,828,622**
	40.02			Site Utilities, Utility Relocation				$7,185,770		$2,155,731	$9,341,501		**$10,627,790**
		40.02.01		Utility Relocation - High Allowance (Dense Urban)	TF	$750	2943.0	$2,207,250	30%	$662,175	$2,869,425	2015	**$3,264,534**
		40.02.02		Utility Relocation - Medium Allowance (Moderate Density)	TF	$350	5102.0	$1,785,700	30%	$535,710	$2,321,410	2015	**$2,641,059**
		40.02.03		Utility Relocation - Low Allowance (Minimal Relocation Expected)	TF	$200	15964.1	$3,192,820	30%	$957,846	$4,150,666	2015	**$4,722,197**
	40.06			Pedestrian / bike access and accommodation, landscaping				$300,000		$90,000	$390,000		**$443,702**
		40.06.01		Pedestrian Improvement Allowance (Per Intersection)	EA	$15,000	20.0	$300,000	30%	$90,000	$390,000	2015	**$443,702**
	40.07			Automobile, bus, van accessways including roads, parking lots				$3,121,183		$936,355	$4,057,538		**$4,616,245**
		40.07.01		Roadway Improvement Allowance	TF	$100	24009.1	$2,400,910	30%	$720,273	$3,121,183	2015	**$3,550,958**
		40.07.02		Track Drainage Allowance	TF	$20	24009.1	$480,182	30%	$144,055	$624,237	2015	**$710,192**
		40.07.03		Street Lighting Allowance (Adjustments, Relocations, New)	TF	$10	24009.1	$240,091	30%	$72,027	$312,118	2015	**$355,096**
	40.08			Temporary Facilities and other indirect costs during construction				$8,034,557		$0	$8,034,557		**$9,140,885**
		40.08.01		Temporary Maintenance of Traffic	LS	$0	57389692.8	$2,869,485	0%	$0	$2,869,485	2015	**$3,264,602**
		40.08.02		Contractor Indirects (Staff, Office, etc.)	LS	$0	57389692.8	$4,591,175	0%	$0	$4,591,175	2015	**$5,223,363**
		40.08.03		Art in Transit (1% of Construction)	LS	$0	57389692.8	$573,897	0%	$0	$573,897	2015	**$652,920**

50		**SYSTEMS**				**$12,024,917**		**$3,607,475**	**$15,632,392**		**$17,784,914**
	50.01	Train control and signals				$300,000		$90,000	$390,000		**$443,702**
		50.01.01	TWC Control for Connection to Existing Streetcar Track	EA	$300,000	1.0	$300,000	30%	$90,000	$390,000	2015	**$443,702**
	50.02	Traffic signals and crossing protection					$1,630,182		$489,055	$2,119,237		**$2,411,047**
		50.02.01	Modify Existing Traffic Signal	EA	$75,000	12.0	$900,000	30%	$270,000	$1,170,000	2015	**$1,331,105**
		50.02.02	New Traffic Signal Allowance	EA	$250,000	1.0	$250,000	30%	$75,000	$325,000	2015	**$369,751**
		50.02.03	Signal Priority Allowance	TF	$20	24009.1	$480,182	30%	$144,055	$624,237	2015	**$710,192**
	50.03	Traction power supply: substations					$4,092,460		$1,227,738	$5,320,198		**$6,052,769**
		50.03.01	Traction Power Substation (Assume 1/Track Mile or 1 per 0.5 Rt. Mile)	EA	$900,000	4.5	$4,092,460	30%	$1,227,738	$5,320,198	2015	**$6,052,769**
	50.04	Traction power distribution: catenary and third rail					$6,002,275		$1,800,683	$7,802,958		**$8,877,395**
		50.04.01	Overhead Trolley Wire Allowance (Poles, wires, appurtenances)	TF	$250	24009.1	$6,002,275	30%	$1,800,683	$7,802,958	2015	**$8,877,395**
	50.05	Communications					$0		$0	$0		**$0**
		50.05.01	Communications Allowance?	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	50.06	Fare collection system and equipment					$0		$0	$0		**$0**
		50.06.01	Fare Collection (On Station or in Vehicle?)	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	Construction Subtotal (10-50)						**$46,837,462**		**$11,640,871**	**$58,478,333**		$66,530,578
60		**ROW, LAND, EXISTING IMPROVEMENTS**					**$807,740**		**$163,092**	**$970,832**		**$1,104,512**
	60.01	Purchase or lease of real estate					$807,740		$163,092	$970,832		**$1,104,512**
		60.01.01	Right of Way Acquisition	SF	$80	193.0	$15,440	30%	$4,632	$20,072	2015	**$22,836**
		60.01.02	Right of Way Allowance	TF	$33	24009.1	$792,300	20%	$158,460	$950,760	2015	**$1,081,676**
70		**VEHICLES (number)**					$18,188,712		$1,023,115	$19,211,827		**$21,857,223**
	70.01	Light Rail					$17,733,994		$886,700	$18,620,694		**$21,184,693**
		70.01.01	Modern Streetcar Vehicle (Assumes wired system)	EA	$3,900,000	4.5	$17,733,994	5%	$886,700	$18,620,694	2015	**$21,184,693**
	70.07	Spare parts					$454,718		$136,415	$591,133		**$672,530**
		70.07.01	Spare Parts for New Vehicles (Per Vehicle)	EA	$100,000	4.5	$454,718	30%	$136,415	$591,133	2015	**$672,530**
80		**PROFESSIONAL SERVICES (applies to Cats. 10-50)**					**$19,959,173**		**$0**	**$19,959,173**		**$22,707,476**
	80.01	Preliminary Engineering					$1,995,917		$0	$1,995,917		**$2,270,748**
		80.01.01	Percentage of Direct Costs SCC (10-50)	LS	3%	66530577.8	$1,995,917	0%	$0	$1,995,917	2015	**$2,270,748**
	80.02	Final Design					$4,657,140		$0	$4,657,140		**$5,298,411**
		80.02.01	Percentage of Direct Costs SCC (10-50)	LS	7%	66530577.8	$4,657,140	0%	$0	$4,657,140	2015	**$5,298,411**
	80.03	Project Management for Design and Construction					$3,326,529		$0	$3,326,529		**$3,784,579**
		80.03.01	Percentage of Direct Costs SCC (10-50)	LS	5%	66530577.8	$3,326,529	0%	$0	$3,326,529	2015	**$3,784,579**
	80.04	Construction Administration & Management					$3,991,835		$0	$3,991,835		**$4,541,495**
		80.04.01	Percentage of Direct Costs SCC (10-50)	LS	6%	66530577.8	$3,991,835	0%	$0	$3,991,835	2015	**$4,541,495**
	80.05	Professional Liability and other Non-Construction Insurance					$1,995,917		$0	$1,995,917		**$2,270,748**
		80.05.01	Percentage of Direct Costs SCC (10-50)	LS	3%	66530577.8	$1,995,917	0%	$0	$1,995,917	2015	**$2,270,748**
	80.06	Legal; Permits; Review Fees by other agencies, cities, etc.					$1,330,612		$0	$1,330,612		**$1,513,832**
		80.06.01	Percentage of Direct Costs SCC (10-50)	LS	2%	66530577.8	$1,330,612	0%	$0	$1,330,612	2015	**$1,513,832**
	80.07	Surveys, Testing, Investigation, Inspection					$1,330,612		$0	$1,330,612		**$1,513,832**
		80.07.01	Percentage of Direct Costs SCC (10-50)	LS	2%	66530577.8	$1,330,612	0%	$0	$1,330,612	2015	**$1,513,832**
	80.08	Start up					$1,330,612		$0	$1,330,612		**$1,513,832**
		80.08.01	Percentage of Direct Costs SCC (10-50)	LS	2%	66530577.8	$1,330,612	0%	$0	$1,330,612	2015	**$1,513,832**
	Subtotal (10-80)						**$85,793,087**		**$12,827,078**	**$98,620,166**		$112,199,789
90		**UNALLOCATED CONTINGENCY**		**LS**	**25%**					**$24,655,041**		**$28,049,947**
100		**FINANCE CHARGES**								***Current Year Total***		***YoE Total***
	Segment Totals (10-100)									**$123,275,207**		$140,249,736

			Alignment 4	South Downtown to MLK (Segments J,D)								Current Year		*Inflation Rate*
			3.6 Track Miles	Approximately $79 Million Per Track Mile								*2011.25 (YR)*		*3.50%*
SCC	**SCC Sub**	**Item #**		**Item Description**	**Unit**	**Unit Cost**	**Quantity**	**Item Cost**	**A. Cont.**	**Item Cont.**	**Subtotal**	**YoE**	**Subtotal YoE**
10				**GUIDEWAY & TRACK ELEMENTS (route miles)**				**$66,977,139**		**$20,093,142**	**$87,070,281**		**$99,059,528**
	10.04			Guideway: Aerial structure				$0		$0	$0		**$0**
		10.04.01		Alignment Over Existing Bridge	TF	$700	0.0	$0	30%	$0	$0	2015	**$0**
		10.04.02		New Streetcar Viaduct	TF	$7,000	0.0	$0	30%	$0	$0	2015	**$0**
	10.06			Guideway: Underground cut & cover				$55,521,389		$16,656,417	$72,177,806		**$82,116,416**
		10.06.01		Cut-and-Cover Tunnel with Soldier Pile Walls	LS	$55,521,389	1.0	$55,521,389	30%	$16,656,417	$72,177,806	2015	**$82,116,416**
	10.08			Guideway: Retained cut or fill				$0		$0	$0		**$0**
		10.08.01		Retaining Wall <10ft Tall	LF	$800	0.0	$0	30%	$0	$0	2015	**$0**
		10.08.02		Retaining Wall >10ft Tall	LF	$1,600	0.0	$0	30%	$0	$0	2015	**$0**
	10.10			Track: Embedded				$8,155,750		$2,446,725	$10,602,475		**$12,062,396**
		10.10.01		Furnish Rail - Assume 112TRAM Block Rail	TF	$75	19190.0	$1,439,250	30%	$431,775	$1,871,025	2015	**$2,128,658**
		10.10.02		Embedded Track - Construct Track Slab	TF	$350	19190.0	$6,716,500	30%	$2,014,950	$8,731,450	2015	**$9,933,738**
	10.12			Track: Special (switches, turnouts)				$3,300,000		$990,000	$4,290,000		**$4,880,717**
		10.12.01		Embedded Turnout - Furnish and Install	EA	$250,000	12.0	$3,000,000	30%	$900,000	$3,900,000	2015	**$4,437,015**
		10.12.02		Embedded Crossing - Furnish and Install	EA	$150,000	2.0	$300,000	30%	$90,000	$390,000	2015	**$443,702**
20				**STATIONS, STOPS, TERMINALS, INTERMODAL (number)**				**$1,128,764**		**$338,629**	**$1,467,394**		**$1,669,448**
	20.01			At-grade station, stop, shelter, mall, terminal, platform				$1,128,764		$338,629	$1,467,394		**$1,669,448**
		20.01.01		Streetcar Stop - Basic 1 Car	EA	$80,000	14.1	$1,128,764	30%	$338,629	$1,467,394	2015	**$1,669,448**
		20.01.02		Streetcar Stop - Premium 1 Car	EA	$200,000	0.0	$0	30%	$0	$0	2015	**$0**
	20.02			Aerial station, stop, shelter, mall, terminal, platform				$0		$0	$0		**$0**
		20.02.01		Aerial Streetcar Stop	EA	$0	0.0	$0	30%	$0	$0	2015	**$0**
30				**SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS**				$2,544,129		$763,239	$3,307,367		**$3,762,779**
	30.02			Light Maintenance Facility				$1,817,235		$545,170	$2,362,405		**$2,687,700**
		30.02.01		Maintenance Facility Expansion: Allowance ($500k/New Vehicle)	EA	$500,000	3.6	$1,817,235	30%	$545,170	$2,362,405	2015	**$2,687,700**
	30.05			Yard and Yard Track				$726,894		$218,068	$944,962		**$1,075,080**
		30.05.01		Yard and Storage Track Expansion: Allowance ($200k/New Vehicle)	EA	$200,000	3.6	$726,894	30%	$218,068	$944,962	2015	**$1,075,080**
40				**SITEWORK & SPECIAL CONDITIONS**				**$30,037,214**		**$3,333,291**	**$33,370,505**		**$37,965,498**
	40.02			Site Utilities, Utility Relocation				$8,301,270		$2,490,381	$10,791,651		**$12,277,620**
		40.02.01		Utility Relocation - High Allowance (Dense Urban)	TF	$750	7762.4	$5,821,800	30%	$1,746,540	$7,568,340	2015	**$8,610,472**
		40.02.02		Utility Relocation - Medium Allowance (Moderate Density)	TF	$350	1293.0	$452,550	30%	$135,765	$588,315	2015	**$669,324**
		40.02.03		Utility Relocation - Low Allowance (Minimal Relocation Expected)	TF	$200	10134.6	$2,026,920	30%	$608,076	$2,634,996	2015	**$2,997,825**
	40.06			Pedestrian / bike access and accommodation, landscaping				$315,000		$94,500	$409,500		**$465,887**
		40.06.01		Pedestrian Improvement Allowance (Per Intersection)	EA	$15,000	21.0	$315,000	30%	$94,500	$409,500	2015	**$465,887**
	40.07			Automobile, bus, van accessways including roads, parking lots				$2,494,700		$748,410	$3,243,110		**$3,689,674**
		40.07.01		Roadway Improvement Allowance	TF	$100	19190.0	$1,919,000	30%	$575,700	$2,494,700	2015	**$2,838,211**
		40.07.02		Track Drainage Allowance	TF	$20	19190.0	$383,800	30%	$115,140	$498,940	2015	**$567,642**
		40.07.03		Street Lighting Allowance (Adjustments, Relocations, New)	TF	$10	19190.0	$191,900	30%	$57,570	$249,470	2015	**$283,821**
	40.08			Temporary Facilities and other indirect costs during construction				$18,926,244		$0	$18,926,244		**$21,532,317**
		40.08.01		Temporary Maintenance of Traffic	LS	$0	135187460.3	$6,759,373	0%	$0	$6,759,373	2015	**$7,690,113**
		40.08.02		Contractor Indirects (Staff, Office, etc.)	LS	$0	135187460.3	$10,814,997	0%	$0	$10,814,997	2015	**$12,304,181**
		40.08.03		Art in Transit (1% of Construction)	LS	$0	135187460.3	$1,351,875	0%	$0	$1,351,875	2015	**$1,538,023**

50		**SYSTEMS**				**$9,643,323**		**$2,892,997**	**$12,536,320**		**$14,262,523**
	50.01	Train control and signals				$300,000		$90,000	$390,000		**$443,702**
		50.01.01	TWC Control for Connection to Existing Streetcar Track	EA	$300,000	1.0	$300,000	30%	$90,000	$390,000	2015	**$443,702**
	50.02	Traffic signals and crossing protection					$1,274,800		$382,440	$1,657,240		**$1,885,436**
		50.02.01	Modify Existing Traffic Signal	EA	$75,000	12.0	$900,000	30%	$270,000	$1,170,000	2015	**$1,331,105**
		50.02.02	New Traffic Signal Allowance	EA	$250,000	0.0	$0	30%	$0	$0	2015	**$0**
		50.02.03	Signal Priority Allowance	TF	$20	18740.0	$374,800	30%	$112,440	$487,240	2015	**$554,331**
	50.03	Traction power supply: substations					$3,271,023		$981,307	$4,252,330		**$4,837,859**
		50.03.01	Traction Power Substation (Assume 1/Track Mile or 1 per 0.5 Rt. Mile)	EA	$900,000	3.6	$3,271,023	30%	$981,307	$4,252,330	2015	**$4,837,859**
	50.04	Traction power distribution: catenary and third rail					$4,797,500		$1,439,250	$6,236,750		**$7,095,527**
		50.04.01	Overhead Trolley Wire Allowance (Poles, wires, appurtenances)	TF	$250	19190.0	$4,797,500	30%	$1,439,250	$6,236,750	2015	**$7,095,527**
	50.05	Communications					$0		$0	$0		**$0**
		50.05.01	Communications Allowance?	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	50.06	Fare collection system and equipment					$0		$0	$0		**$0**
		50.06.01	Fare Collection (On Station or in Vehicle?)	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	Construction Subtotal (10-50)						**$110,330,569**		**$27,421,297**	**$137,751,867**		$156,719,777
60		**ROW, LAND, EXISTING IMPROVEMENTS**					**$1,373,270**		**$348,654**	**$1,721,924**		**$1,959,026**
	60.01	Purchase or lease of real estate					$1,373,270		$348,654	$1,721,924		**$1,959,026**
		60.01.01	Right of Way Acquisition	SF	$80	9250.0	$740,000	30%	$222,000	$962,000	2015	**$1,094,464**
		60.01.02	Right of Way Allowance	TF	$33	19190.0	$633,270	20%	$126,654	$759,924	2015	**$864,563**
70		**VEHICLES (number)**					$14,537,879		$817,756	$15,355,634		**$17,470,047**
	70.01	Light Rail					$14,174,432		$708,722	$14,883,153		**$16,932,507**
		70.01.01	Modern Streetcar Vehicle (Assumes wired system)	EA	$3,900,000	3.6	$14,174,432	5%	$708,722	$14,883,153	2015	**$16,932,507**
	70.07	Spare parts					$363,447		$109,034	$472,481		**$537,540**
		70.07.01	Spare Parts for New Vehicles (Per Vehicle)	EA	$100,000	3.6	$363,447	30%	$109,034	$472,481	2015	**$537,540**
80		**PROFESSIONAL SERVICES (applies to Cats. 10-50)**					**$47,015,933**		**$0**	**$47,015,933**		**$53,489,849**
	80.01	Preliminary Engineering					$4,701,593		$0	$4,701,593		**$5,348,985**
		80.01.01	Percentage of Direct Costs SCC (10-50)	LS	3%	156719776.9	$4,701,593	0%	$0	$4,701,593	2015	**$5,348,985**
	80.02	Final Design					$10,970,384		$0	$10,970,384		**$12,480,965**
		80.02.01	Percentage of Direct Costs SCC (10-50)	LS	7%	156719776.9	$10,970,384	0%	$0	$10,970,384	2015	**$12,480,965**
	80.03	Project Management for Design and Construction					$7,835,989		$0	$7,835,989		**$8,914,975**
		80.03.01	Percentage of Direct Costs SCC (10-50)	LS	5%	156719776.9	$7,835,989	0%	$0	$7,835,989	2015	**$8,914,975**
	80.04	Construction Administration & Management					$9,403,187		$0	$9,403,187		**$10,697,970**
		80.04.01	Percentage of Direct Costs SCC (10-50)	LS	6%	156719776.9	$9,403,187	0%	$0	$9,403,187	2015	**$10,697,970**
	80.05	Professional Liability and other Non-Construction Insurance					$4,701,593		$0	$4,701,593		**$5,348,985**
		80.05.01	Percentage of Direct Costs SCC (10-50)	LS	3%	156719776.9	$4,701,593	0%	$0	$4,701,593	2015	**$5,348,985**
	80.06	Legal; Permits; Review Fees by other agencies, cities, etc.					$3,134,396		$0	$3,134,396		**$3,565,990**
		80.06.01	Percentage of Direct Costs SCC (10-50)	LS	2%	156719776.9	$3,134,396	0%	$0	$3,134,396	2015	**$3,565,990**
	80.07	Surveys, Testing, Investigation, Inspection					$3,134,396		$0	$3,134,396		**$3,565,990**
		80.07.01	Percentage of Direct Costs SCC (10-50)	LS	2%	156719776.9	$3,134,396	0%	$0	$3,134,396	2015	**$3,565,990**
	80.08	Start up					$3,134,396		$0	$3,134,396		**$3,565,990**
		80.08.01	Percentage of Direct Costs SCC (10-50)	LS	2%	156719776.9	$3,134,396	0%	$0	$3,134,396	2015	**$3,565,990**
	Subtotal (10-80)						**$173,257,651**		**$28,587,707**	**$201,845,358**		$229,638,699
90		**UNALLOCATED CONTINGENCY**		**LS**	**25%**					**$50,461,340**		**$57,409,675**
100		**FINANCE CHARGES**								***Current Year Total***		***YoE Total***
	Segment Totals (10-100)									**$252,306,698**		$287,048,374

			Alignment 5 South Downtown Central (Segments J,A)									Current Year		*Inflation Rate*
			8.4 Track Miles Approximately $51 Million Per Track Mile									*2011.25 (YR)*		*3.50%*
SCC	**SCC Sub**	**Item #**	**Item Description**	**Unit**	**Unit Cost**	**Quantity**	**Item Cost**	**A. Cont.**	**Item Cont.**	**Subtotal**	**YoE**	**Subtotal YoE**
10			**GUIDEWAY & TRACK ELEMENTS (route miles)**				**$77,330,221**		**$23,199,066**	**$100,529,288**		**$114,371,790**
	10.04		Guideway: Aerial structure				$323,400		$97,020	$420,420		**$478,310**
		10.04.01	Alignment Over Existing Bridge	TF	$700	462.0	$323,400	30%	$97,020	$420,420	2015	**$478,310**
		10.04.02	New Streetcar Viaduct	TF	$7,000	0.0	$0	30%	$0	$0	2015	**$0**
	10.06		Guideway: Underground cut & cover				$55,521,389		$16,656,417	$72,177,806		**$82,116,416**
		10.06.01	Cut-and-Cover Tunnel with Soldier Pile Walls	LS	$55,521,389	1.0	$55,521,389	30%	$16,656,417	$72,177,806	2015	**$82,116,416**
	10.08		Guideway: Retained cut or fill				$0		$0	$0		**$0**
		10.08.01	Retaining Wall <10ft Tall	LF	$800	0.0	$0	30%	$0	$0	2015	**$0**
		10.08.02	Retaining Wall >10ft Tall	LF	$1,600	0.0	$0	30%	$0	$0	2015	**$0**
	10.10		Track: Embedded				$18,585,433		$5,575,630	$24,161,062		**$27,487,949**
		10.10.01	Furnish Rail - Assume 112TRAM Block Rail	TF	$75	44110.9	$3,308,318	30%	$992,495	$4,300,813	2015	**$4,893,018**
		10.10.02	Embedded Track - Construct Track Slab	TF	$350	43648.9	$15,277,115	30%	$4,583,135	$19,860,250	2015	**$22,594,931**
	10.12		Track: Special (switches, turnouts)				$2,900,000		$870,000	$3,770,000		**$4,289,115**
		10.12.01	Embedded Turnout - Furnish and Install	EA	$250,000	11.0	$2,750,000	30%	$825,000	$3,575,000	2015	**$4,067,264**
		10.12.02	Embedded Crossing - Furnish and Install	EA	$150,000	1.0	$150,000	30%	$45,000	$195,000	2015	**$221,851**
20			**STATIONS, STOPS, TERMINALS, INTERMODAL (number)**				**$3,343,956**		**$1,003,187**	**$4,347,142**		**$4,945,727**
	20.01		At-grade station, stop, shelter, mall, terminal, platform				$3,343,956		$1,003,187	$4,347,142		**$4,945,727**
		20.01.01	Streetcar Stop - Basic 1 Car	EA	$80,000	41.8	$3,343,956	30%	$1,003,187	$4,347,142	2015	**$4,945,727**
		20.01.02	Streetcar Stop - Premium 1 Car	EA	$200,000	0.0	$0	30%	$0	$0	2015	**$0**
	20.02		Aerial station, stop, shelter, mall, terminal, platform				$0		$0	$0		**$0**
		20.02.01	Aerial Streetcar Stop	EA	$0	0.0	$0	30%	$0	$0	2015	**$0**
30			**SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS**				$5,848,036		$1,754,411	$7,602,447		**$8,649,275**
	30.02		Light Maintenance Facility				$4,177,169		$1,253,151	$5,430,319		**$6,178,053**
		30.02.01	Maintenance Facility Expansion: Allowance ($500k/New Vehicle)	EA	$500,000	8.4	$4,177,169	30%	$1,253,151	$5,430,319	2015	**$6,178,053**
	30.05		Yard and Yard Track				$1,670,867		$501,260	$2,172,128		**$2,471,221**
		30.05.01	Yard and Storage Track Expansion: Allowance ($200k/New Vehicle)	EA	$200,000	8.4	$1,670,867	30%	$501,260	$2,172,128	2015	**$2,471,221**
40			**SITEWORK & SPECIAL CONDITIONS**				**$48,593,282**		**$6,527,450**	**$55,120,732**		**$62,710,648**
	40.02		Site Utilities, Utility Relocation				$15,424,950		$4,627,485	$20,052,435		**$22,813,579**
		40.02.01	Utility Relocation - High Allowance (Dense Urban)	TF	$750	8709.4	$6,532,050	30%	$1,959,615	$8,491,665	2015	**$9,660,935**
		40.02.02	Utility Relocation - Medium Allowance (Moderate Density)	TF	$350	12700.0	$4,445,000	30%	$1,333,500	$5,778,500	2015	**$6,574,178**
		40.02.03	Utility Relocation - Low Allowance (Minimal Relocation Expected)	TF	$200	22239.5	$4,447,900	30%	$1,334,370	$5,782,270	2015	**$6,578,467**
	40.06		Pedestrian / bike access and accommodation, landscaping				$645,000		$193,500	$838,500		**$953,958**
		40.06.01	Pedestrian Improvement Allowance (Per Intersection)	EA	$15,000	43.0	$645,000	30%	$193,500	$838,500	2015	**$953,958**
	40.07		Automobile, bus, van accessways including roads, parking lots				$5,688,217		$1,706,465	$7,394,682		**$8,412,902**
		40.07.01	Roadway Improvement Allowance	TF	$100	43648.9	$4,364,890	30%	$1,309,467	$5,674,357	2015	**$6,455,694**
		40.07.02	Track Drainage Allowance	TF	$20	44110.9	$882,218	30%	$264,665	$1,146,883	2015	**$1,304,805**
		40.07.03	Street Lighting Allowance (Adjustments, Relocations, New)	TF	$10	44110.9	$441,109	30%	$132,333	$573,442	2015	**$652,402**
	40.08		Temporary Facilities and other indirect costs during construction				$26,835,115		$0	$26,835,115		**$30,530,209**
		40.08.01	Temporary Maintenance of Traffic	LS	$0	191679392.4	$9,583,970	0%	$0	$9,583,970	2015	**$10,903,646**
		40.08.02	Contractor Indirects (Staff, Office, etc.)	LS	$0	191679392.4	$15,334,351	0%	$0	$15,334,351	2015	**$17,445,833**
		40.08.03	Art in Transit (1% of Construction)	LS	$0	191679392.4	$1,916,794	0%	$0	$1,916,794	2015	**$2,180,729**

50		**SYSTEMS**				**$21,319,846**		**$6,395,954**	**$27,715,800**		**$31,532,161**
	50.01	Train control and signals				$300,000		$90,000	$390,000		**$443,702**
	50.01.01	TWC Control for Connection to Existing Streetcar Track	EA	$300,000	1.0	$300,000	30%	$90,000	$390,000	2015	**$443,702**
	50.02	Traffic signals and crossing protection				$2,473,218		$741,965	$3,215,183		**$3,657,902**
	50.02.01	Modify Existing Traffic Signal	EA	$75,000	18.0	$1,350,000	30%	$405,000	$1,755,000	2015	**$1,996,657**
	50.02.02	New Traffic Signal Allowance	EA	$250,000	1.0	$250,000	30%	$75,000	$325,000	2015	**$369,751**
	50.02.03	Signal Priority Allowance	TF	$20	43660.9	$873,218	30%	$261,965	$1,135,183	2015	**$1,291,494**
	50.03	Traction power supply: substations				$7,518,903		$2,255,671	$9,774,574		**$11,120,496**
	50.03.01	Traction Power Substation (Assume 1/Track Mile or 1 per 0.5 Rt. Mile)	EA	$900,000	8.4	$7,518,903	30%	$2,255,671	$9,774,574	2015	**$11,120,496**
	50.04	Traction power distribution: catenary and third rail				$11,027,725		$3,308,318	$14,336,043		**$16,310,061**
	50.04.01	Overhead Trolley Wire Allowance (Poles, wires, appurtenances)	TF	$250	44110.9	$11,027,725	30%	$3,308,318	$14,336,043	2015	**$16,310,061**
	50.05	Communications				$0		$0	$0		**$0**
	50.05.01	Communications Allowance?	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	50.06	Fare collection system and equipment				$0		$0	$0		**$0**
	50.06.01	Fare Collection (On Station or in Vehicle?)	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	Construction Subtotal (10-50)					**$156,435,341**		**$38,880,068**	**$195,315,409**		$222,209,601
60		**ROW, LAND, EXISTING IMPROVEMENTS**				**$2,243,820**		**$527,580**	**$2,771,400**		**$3,153,011**
	60.01	Purchase or lease of real estate				$2,243,820		$527,580	$2,771,400		**$3,153,011**
	60.01.01	Right of Way Acquisition	SF	$80	9852.0	$788,160	30%	$236,448	$1,024,608	2015	**$1,165,693**
	60.01.02	Right of Way Allowance	TF	$33	44110.9	$1,455,660	20%	$291,132	$1,746,792	2015	**$1,987,318**
70		**VEHICLES (number)**				$33,417,348		$1,879,726	$35,297,074		**$40,157,348**
	70.01	Light Rail				$32,581,915		$1,629,096	$34,211,011		**$38,921,737**
	70.01.01	Modern Streetcar Vehicle (Assumes wired system)	EA	$3,900,000	8.4	$32,581,915	5%	$1,629,096	$34,211,011	2015	**$38,921,737**
	70.07	Spare parts				$835,434		$250,630	$1,086,064		**$1,235,611**
	70.07.01	Spare Parts for New Vehicles (Per Vehicle)	EA	$100,000	8.4	$835,434	30%	$250,630	$1,086,064	2015	**$1,235,611**
80		**PROFESSIONAL SERVICES (applies to Cats. 10-50)**				**$66,662,880**		**$0**	**$66,662,880**		**$75,842,106**
	80.01	Preliminary Engineering				$6,666,288		$0	$6,666,288		**$7,584,211**
	80.01.01	Percentage of Direct Costs SCC (10-50)	LS	3%	222209601.0	$6,666,288	0%	$0	$6,666,288	2015	**$7,584,211**
	80.02	Final Design				$15,554,672		$0	$15,554,672		**$17,696,491**
	80.02.01	Percentage of Direct Costs SCC (10-50)	LS	7%	222209601.0	$15,554,672	0%	$0	$15,554,672	2015	**$17,696,491**
	80.03	Project Management for Design and Construction				$11,110,480		$0	$11,110,480		**$12,640,351**
	80.03.01	Percentage of Direct Costs SCC (10-50)	LS	5%	222209601.0	$11,110,480	0%	$0	$11,110,480	2015	**$12,640,351**
	80.04	Construction Administration & Management				$13,332,576		$0	$13,332,576		**$15,168,421**
	80.04.01	Percentage of Direct Costs SCC (10-50)	LS	6%	222209601.0	$13,332,576	0%	$0	$13,332,576	2015	**$15,168,421**
	80.05	Professional Liability and other Non-Construction Insurance				$6,666,288		$0	$6,666,288		**$7,584,211**
	80.05.01	Percentage of Direct Costs SCC (10-50)	LS	3%	222209601.0	$6,666,288	0%	$0	$6,666,288	2015	**$7,584,211**
	80.06	Legal; Permits; Review Fees by other agencies, cities, etc.				$4,444,192		$0	$4,444,192		**$5,056,140**
	80.06.01	Percentage of Direct Costs SCC (10-50)	LS	2%	222209601.0	$4,444,192	0%	$0	$4,444,192	2015	**$5,056,140**
	80.07	Surveys, Testing, Investigation, Inspection				$4,444,192		$0	$4,444,192		**$5,056,140**
	80.07.01	Percentage of Direct Costs SCC (10-50)	LS	2%	222209601.0	$4,444,192	0%	$0	$4,444,192	2015	**$5,056,140**
	80.08	Start up				$4,444,192		$0	$4,444,192		**$5,056,140**
	80.08.01	Percentage of Direct Costs SCC (10-50)	LS	2%	222209601.0	$4,444,192	0%	$0	$4,444,192	2015	**$5,056,140**
	Subtotal (10-80)					**$258,759,390**		**$41,287,374**	**$300,046,763**		$341,362,066
90		**UNALLOCATED CONTINGENCY**	**LS**	**25%**					**$75,011,691**		**$85,340,516**
100		**FINANCE CHARGES**							***Current Year Total***		***YoE Total***
	Segment Totals (10-100)								**$375,058,454**		$426,702,582

			Alignment 5a South Downtown Central Modified (Segments A,D,E)							Current Year		*Inflation Rate*
			11.7 Track Miles Approximately $30 Million Per Track Mile							*2011.25 (YR)*		*3.50%*
SCC	**SCC Sub**	**Item #**	**Item Description**	**Unit**	**Unit Cost**	**Quantity**	**Item Cost**	**A. Cont.**	**Item Cont.**	**Subtotal**	**YoE**	**Subtotal YoE**
10			**GUIDEWAY & TRACK ELEMENTS (route miles)**				**$27,253,855**		**$8,176,157**	**$35,430,012**		**$40,308,590**
	10.04		Guideway: Aerial structure				$323,400		$97,020	$420,420		**$478,310**
		10.04.01	Alignment Over Existing Bridge	TF	$700	462.0	$323,400	30%	$97,020	$420,420	2015	**$478,310**
		10.04.02	New Streetcar Viaduct	TF	$7,000	0.0	$0	30%	$0	$0	2015	**$0**
	10.06		Guideway: Underground cut & cover				$0		$0	$0		**$0**
		10.06.01	Cut-and-Cover Tunnel with Soldier Pile Walls	LS	$55,521,389	0.0	$0	30%	$0	$0	2015	**$0**
	10.08		Guideway: Retained cut or fill				$0		$0	$0		**$0**
		10.08.01	Retaining Wall <10ft Tall	LF	$800	0.0	$0	30%	$0	$0	2015	**$0**
		10.08.02	Retaining Wall >10ft Tall	LF	$1,600	0.0	$0	30%	$0	$0	2015	**$0**
	10.10		Track: Embedded				$26,030,455		$7,809,137	$33,839,592		**$38,499,175**
		10.10.01	Furnish Rail - Assume 112TRAM Block Rail	TF	$75	61628.6	$4,622,145	30%	$1,386,644	$6,008,789	2015	**$6,836,176**
		10.10.02	Embedded Track - Construct Track Slab	TF	$350	61166.6	$21,408,310	30%	$6,422,493	$27,830,803	2015	**$31,662,999**
	10.12		Track: Special (switches, turnouts)				$900,000		$270,000	$1,170,000		**$1,331,105**
		10.12.01	Embedded Turnout - Furnish and Install	EA	$250,000	3.0	$750,000	30%	$225,000	$975,000	2015	**$1,109,254**
		10.12.02	Embedded Crossing - Furnish and Install	EA	$150,000	1.0	$150,000	30%	$45,000	$195,000	2015	**$221,851**
20			**STATIONS, STOPS, TERMINALS, INTERMODAL (number)**				**$5,478,098**		**$1,643,429**	**$7,121,527**		**$8,102,134**
	20.01		At-grade station, stop, shelter, mall, terminal, platform				$5,478,098		$1,643,429	$7,121,527		**$8,102,134**
		20.01.01	Streetcar Stop - Basic 1 Car	EA	$80,000	68.5	$5,478,098	30%	$1,643,429	$7,121,527	2015	**$8,102,134**
		20.01.02	Streetcar Stop - Premium 1 Car	EA	$200,000	0.0	$0	30%	$0	$0	2015	**$0**
	20.02		Aerial station, stop, shelter, mall, terminal, platform				$0		$0	$0		**$0**
		20.02.01	Aerial Streetcar Stop	EA	$0	0.0	$0	30%	$0	$0	2015	**$0**
30			**SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS**				$8,170,458		$2,451,138	$10,621,596		**$12,084,149**
	30.02		Light Maintenance Facility				$5,836,042		$1,750,813	$7,586,854		**$8,631,535**
		30.02.01	Maintenance Facility Expansion: Allowance ($500k/New Vehicle)	EA	$500,000	11.7	$5,836,042	30%	$1,750,813	$7,586,854	2015	**$8,631,535**
	30.05		Yard and Yard Track				$2,334,417		$700,325	$3,034,742		**$3,452,614**
		30.05.01	Yard and Storage Track Expansion: Allowance ($200k/New Vehicle)	EA	$200,000	11.7	$2,334,417	30%	$700,325	$3,034,742	2015	**$3,452,614**
40			**SITEWORK & SPECIAL CONDITIONS**				**$46,636,679**		**$7,955,306**	**$54,591,985**		**$62,109,095**
	40.02		Site Utilities, Utility Relocation				$17,742,170		$5,322,651	$23,064,821		**$26,240,759**
		40.02.01	Utility Relocation - High Allowance (Dense Urban)	TF	$750	5161.0	$3,870,750	30%	$1,161,225	$5,031,975	2015	**$5,724,859**
		40.02.02	Utility Relocation - Medium Allowance (Moderate Density)	TF	$350	17802.0	$6,230,700	30%	$1,869,210	$8,099,910	2015	**$9,215,237**
		40.02.03	Utility Relocation - Low Allowance (Minimal Relocation Expected)	TF	$200	38203.6	$7,640,720	30%	$2,292,216	$9,932,936	2015	**$11,300,664**
	40.06		Pedestrian / bike access and accommodation, landscaping				$810,000		$243,000	$1,053,000		**$1,197,994**
		40.06.01	Pedestrian Improvement Allowance (Per Intersection)	EA	$15,000	54.0	$810,000	30%	$243,000	$1,053,000	2015	**$1,197,994**
	40.07		Automobile, bus, van accessways including roads, parking lots				$7,965,518		$2,389,655	$10,355,173		**$11,781,042**
		40.07.01	Roadway Improvement Allowance	TF	$100	61166.6	$6,116,660	30%	$1,834,998	$7,951,658	2015	**$9,046,571**
		40.07.02	Track Drainage Allowance	TF	$20	61628.6	$1,232,572	30%	$369,772	$1,602,344	2015	**$1,822,980**
		40.07.03	Street Lighting Allowance (Adjustments, Relocations, New)	TF	$10	61628.6	$616,286	30%	$184,886	$801,172	2015	**$911,490**
	40.08		Temporary Facilities and other indirect costs during construction				$20,118,991		$0	$20,118,991		**$22,889,300**
		40.08.01	Temporary Maintenance of Traffic	LS	$0	143707078.6	$7,185,354	0%	$0	$7,185,354	2015	**$8,174,750**
		40.08.02	Contractor Indirects (Staff, Office, etc.)	LS	$0	143707078.6	$11,496,566	0%	$0	$11,496,566	2015	**$13,079,600**
		40.08.03	Art in Transit (1% of Construction)	LS	$0	143707078.6	$1,437,071	0%	$0	$1,437,071	2015	**$1,634,950**

50		**SYSTEMS**				**$29,744,597**		**$8,923,379**	**$38,667,976**		**$43,992,410**
	50.01	Train control and signals				$300,000		$90,000	$390,000		**$443,702**
	50.01.01	TWC Control for Connection to Existing Streetcar Track	EA	$300,000	1.0	$300,000	30%	$90,000	$390,000	2015	**$443,702**
	50.02	Traffic signals and crossing protection				$3,532,572		$1,059,772	$4,592,344		**$5,224,692**
	50.02.01	Modify Existing Traffic Signal	EA	$75,000	24.0	$1,800,000	30%	$540,000	$2,340,000	2015	**$2,662,209**
	50.02.02	New Traffic Signal Allowance	EA	$250,000	2.0	$500,000	30%	$150,000	$650,000	2015	**$739,503**
	50.02.03	Signal Priority Allowance	TF	$20	61628.6	$1,232,572	30%	$369,772	$1,602,344	2015	**$1,822,980**
	50.03	Traction power supply: substations				$10,504,875		$3,151,463	$13,656,338		**$15,536,763**
	50.03.01	Traction Power Substation (Assume 1/Track Mile or 1 per 0.5 Rt. Mile)	EA	$900,000	11.7	$10,504,875	30%	$3,151,463	$13,656,338	2015	**$15,536,763**
	50.04	Traction power distribution: catenary and third rail				$15,407,150		$4,622,145	$20,029,295		**$22,787,253**
	50.04.01	Overhead Trolley Wire Allowance (Poles, wires, appurtenances)	TF	$250	61628.6	$15,407,150	30%	$4,622,145	$20,029,295	2015	**$22,787,253**
	50.05	Communications				$0		$0	$0		**$0**
	50.05.01	Communications Allowance?	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	50.06	Fare collection system and equipment				$0		$0	$0		**$0**
	50.06.01	Fare Collection (On Station or in Vehicle?)	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	Construction Subtotal (10-50)				**0.0**	**$117,283,687**		**$29,149,409**	**$146,433,096**		$166,596,378
60		**ROW, LAND, EXISTING IMPROVEMENTS**				**$2,112,784**		**$430,461**	**$2,543,245**		**$2,893,440**
	60.01	Purchase or lease of real estate				$2,112,784		$430,461	$2,543,245		**$2,893,440**
	60.01.01	Right of Way Acquisition	SF	$80	988.0	$79,040	30%	$23,712	$102,752	2015	**$116,901**
	60.01.02	Right of Way Allowance	TF	$33	61628.6	$2,033,744	20%	$406,749	$2,440,493	2015	**$2,776,539**
70		**VEHICLES (number)**				$46,688,333		$2,626,219	$49,314,552		**$56,104,979**
	70.01	Light Rail				$45,521,125		$2,276,056	$47,797,181		**$54,378,672**
	70.01.01	Modern Streetcar Vehicle (Assumes wired system)	EA	$3,900,000	11.7	$45,521,125	5%	$2,276,056	$47,797,181	2015	**$54,378,672**
	70.07	Spare parts				$1,167,208		$350,163	$1,517,371		**$1,726,307**
	70.07.01	Spare Parts for New Vehicles (Per Vehicle)	EA	$100,000	11.7	$1,167,208	30%	$350,163	$1,517,371	2015	**$1,726,307**
80		**PROFESSIONAL SERVICES (applies to Cats. 10-50)**				**$49,978,914**		**$0**	**$49,978,914**		**$56,860,821**
	80.01	Preliminary Engineering				$4,997,891		$0	$4,997,891		**$5,686,082**
	80.01.01	Percentage of Direct Costs SCC (10-50)	LS	3%	166596378.4	$4,997,891	0%	$0	$4,997,891	2015	**$5,686,082**
	80.02	Final Design				$11,661,746		$0	$11,661,746		**$13,267,525**
	80.02.01	Percentage of Direct Costs SCC (10-50)	LS	7%	166596378.4	$11,661,746	0%	$0	$11,661,746	2015	**$13,267,525**
	80.03	Project Management for Design and Construction				$8,329,819		$0	$8,329,819		**$9,476,803**
	80.03.01	Percentage of Direct Costs SCC (10-50)	LS	5%	166596378.4	$8,329,819	0%	$0	$8,329,819	2015	**$9,476,803**
	80.04	Construction Administration & Management				$9,995,783		$0	$9,995,783		**$11,372,164**
	80.04.01	Percentage of Direct Costs SCC (10-50)	LS	6%	166596378.4	$9,995,783	0%	$0	$9,995,783	2015	**$11,372,164**
	80.05	Professional Liability and other Non-Construction Insurance				$4,997,891		$0	$4,997,891		**$5,686,082**
	80.05.01	Percentage of Direct Costs SCC (10-50)	LS	3%	166596378.4	$4,997,891	0%	$0	$4,997,891	2015	**$5,686,082**
	80.06	Legal; Permits; Review Fees by other agencies, cities, etc.				$3,331,928		$0	$3,331,928		**$3,790,721**
	80.06.01	Percentage of Direct Costs SCC (10-50)	LS	2%	166596378.4	$3,331,928	0%	$0	$3,331,928	2015	**$3,790,721**
	80.07	Surveys, Testing, Investigation, Inspection				$3,331,928		$0	$3,331,928		**$3,790,721**
	80.07.01	Percentage of Direct Costs SCC (10-50)	LS	2%	166596378.4	$3,331,928	0%	$0	$3,331,928	2015	**$3,790,721**
	80.08	Start up				$3,331,928		$0	$3,331,928		**$3,790,721**
	80.08.01	Percentage of Direct Costs SCC (10-50)	LS	2%	166596378.4	$3,331,928	0%	$0	$3,331,928	2015	**$3,790,721**
	Subtotal (10-80)					**$216,063,718**		**$32,206,088**	**$248,269,806**		$282,455,618
90		**UNALLOCATED CONTINGENCY**	**LS**	**25%**					**$62,067,452**		**$70,613,904**
100		**FINANCE CHARGES**							***Current Year Total***		***YoE Total***
	Segment Totals (10-100)								**$310,337,258**		$353,069,522

			Alignment 6 South End (Segments F)								Current Year		*Inflation Rate*
			6.1 Track Miles Approximately $31 Million Per Track Mile								*2011.25 (YR)*		*3.50%*
SCC	**SCC Sub**	**Item #**	**Item Description**	**Unit**	**Unit Cost**	**Quantity**	**Item Cost**	**A. Cont.**	**Item Cont.**	**Subtotal**	**YoE**	**Subtotal YoE**
10			**GUIDEWAY & TRACK ELEMENTS (route miles)**				**$15,746,075**		**$4,723,823**	**$20,469,898**		**$23,288,525**
	10.04		Guideway: Aerial structure				$1,266,300		$379,890	$1,646,190		**$1,872,864**
		10.04.01	Alignment Over Existing Bridge	TF	$700	1809.0	$1,266,300	30%	$379,890	$1,646,190	2015	**$1,872,864**
		10.04.02	New Streetcar Viaduct	TF	$7,000	0.0	$0	30%	$0	$0	2015	**$0**
	10.06		Guideway: Underground cut & cover				$0		$0	$0		**$0**
		10.06.01	Cut-and-Cover Tunnel with Soldier Pile Walls	LS	$55,521,389	0.0	$0	30%	$0	$0	2015	**$0**
	10.08		Guideway: Retained cut or fill				$152,000		$45,600	$197,600		**$224,809**
		10.08.01	Retaining Wall <10ft Tall	LF	$800	190.0	$152,000	30%	$45,600	$197,600	2015	**$224,809**
		10.08.02	Retaining Wall >10ft Tall	LF	$1,600	0.0	$0	30%	$0	$0	2015	**$0**
	10.10		Track: Embedded				$13,077,775		$3,923,333	$17,001,108		**$19,342,096**
		10.10.01	Furnish Rail - Assume 112TRAM Block Rail	TF	$75	32261.0	$2,419,575	30%	$725,873	$3,145,448	2015	**$3,578,564**
		10.10.02	Embedded Track - Construct Track Slab	TF	$350	30452.0	$10,658,200	30%	$3,197,460	$13,855,660	2015	**$15,763,532**
	10.12		Track: Special (switches, turnouts)				$1,250,000		$375,000	$1,625,000		**$1,848,756**
		10.12.01	Embedded Turnout - Furnish and Install	EA	$250,000	5.0	$1,250,000	30%	$375,000	$1,625,000	2015	**$1,848,756**
		10.12.02	Embedded Crossing - Furnish and Install	EA	$150,000	0.0	$0	30%	$0	$0	2015	**$0**
20			**STATIONS, STOPS, TERMINALS, INTERMODAL (number)**				**$2,867,644**		**$860,293**	**$3,727,938**		**$4,241,261**
	20.01		At-grade station, stop, shelter, mall, terminal, platform				$2,867,644		$860,293	$3,727,938		**$4,241,261**
		20.01.01	Streetcar Stop - Basic 1 Car	EA	$80,000	35.8	$2,867,644	30%	$860,293	$3,727,938	2015	**$4,241,261**
		20.01.02	Streetcar Stop - Premium 1 Car	EA	$200,000	0.0	$0	30%	$0	$0	2015	**$0**
	20.02		Aerial station, stop, shelter, mall, terminal, platform				$0		$0	$0		**$0**
		20.02.01	Aerial Streetcar Stop	EA	$0	0.0	$0	30%	$0	$0	2015	**$0**
30			**SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS**				$4,277,027		$1,283,108	$5,560,134		**$6,325,744**
	30.02		Light Maintenance Facility				$3,055,019		$916,506	$3,971,525		**$4,518,389**
		30.02.01	Maintenance Facility Expansion: Allowance ($500k/New Vehicle)	EA	$500,000	6.1	$3,055,019	30%	$916,506	$3,971,525	2015	**$4,518,389**
	30.05		Yard and Yard Track				$1,222,008		$366,602	$1,588,610		**$1,807,355**
		30.05.01	Yard and Storage Track Expansion: Allowance ($200k/New Vehicle)	EA	$200,000	6.1	$1,222,008	30%	$366,602	$1,588,610	2015	**$1,807,355**
40			**SITEWORK & SPECIAL CONDITIONS**				**$22,676,096**		**$3,609,519**	**$26,285,615**		**$29,905,044**
	40.02		Site Utilities, Utility Relocation				$7,673,700		$2,302,110	$9,975,810		**$11,349,441**
		40.02.01	Utility Relocation - High Allowance (Dense Urban)	TF	$750	527.0	$395,250	30%	$118,575	$513,825	2015	**$584,577**
		40.02.02	Utility Relocation - Medium Allowance (Moderate Density)	TF	$350	8623.0	$3,018,050	30%	$905,415	$3,923,465	2015	**$4,463,711**
		40.02.03	Utility Relocation - Low Allowance (Minimal Relocation Expected)	TF	$200	21302.0	$4,260,400	30%	$1,278,120	$5,538,520	2015	**$6,301,153**
	40.06		Pedestrian / bike access and accommodation, landscaping				$345,000		$103,500	$448,500		**$510,257**
		40.06.01	Pedestrian Improvement Allowance (Per Intersection)	EA	$15,000	23.0	$345,000	30%	$103,500	$448,500	2015	**$510,257**
	40.07		Automobile, bus, van accessways including roads, parking lots				$4,013,030		$1,203,909	$5,216,939		**$5,935,292**
		40.07.01	Roadway Improvement Allowance	TF	$100	30452.0	$3,045,200	30%	$913,560	$3,958,760	2015	**$4,503,866**
		40.07.02	Track Drainage Allowance	TF	$20	32261.0	$645,220	30%	$193,566	$838,786	2015	**$954,284**
		40.07.03	Street Lighting Allowance (Adjustments, Relocations, New)	TF	$10	32261.0	$322,610	30%	$96,783	$419,393	2015	**$477,142**
	40.08		Temporary Facilities and other indirect costs during construction				$10,644,366		$0	$10,644,366		**$12,110,055**
		40.08.01	Temporary Maintenance of Traffic	LS	$0	76031184.4	$3,801,559	0%	$0	$3,801,559	2015	**$4,325,020**
		40.08.02	Contractor Indirects (Staff, Office, etc.)	LS	$0	76031184.4	$6,082,495	0%	$0	$6,082,495	2015	**$6,920,031**
		40.08.03	Art in Transit (1% of Construction)	LS	$0	76031184.4	$760,312	0%	$0	$760,312	2015	**$865,004**

50		**SYSTEMS**				**$16,484,504**		**$4,945,351**	**$21,429,855**		**$24,380,665**
	50.01	Train control and signals				$300,000		$90,000	$390,000		**$443,702**
		50.01.01	TWC Control for Connection to Existing Streetcar Track	EA	$300,000	1.0	$300,000	30%	$90,000	$390,000	2015	**$443,702**
	50.02	Traffic signals and crossing protection					$2,620,220		$786,066	$3,406,286		**$3,875,319**
		50.02.01	Modify Existing Traffic Signal	EA	$75,000	13.0	$975,000	30%	$292,500	$1,267,500	2015	**$1,442,030**
		50.02.02	New Traffic Signal Allowance	EA	$250,000	4.0	$1,000,000	30%	$300,000	$1,300,000	2015	**$1,479,005**
		50.02.03	Signal Priority Allowance	TF	$20	32261.0	$645,220	30%	$193,566	$838,786	2015	**$954,284**
	50.03	Traction power supply: substations					$5,499,034		$1,649,710	$7,148,744		**$8,133,099**
		50.03.01	Traction Power Substation (Assume 1/Track Mile or 1 per 0.5 Rt. Mile)	EA	$900,000	6.1	$5,499,034	30%	$1,649,710	$7,148,744	2015	**$8,133,099**
	50.04	Traction power distribution: catenary and third rail					$8,065,250		$2,419,575	$10,484,825		**$11,928,546**
		50.04.01	Overhead Trolley Wire Allowance (Poles, wires, appurtenances)	TF	$250	32261.0	$8,065,250	30%	$2,419,575	$10,484,825	2015	**$11,928,546**
	50.05	Communications					$0		$0	$0		**$0**
		50.05.01	Communications Allowance?	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	50.06	Fare collection system and equipment					$0		$0	$0		**$0**
		50.06.01	Fare Collection (On Station or in Vehicle?)	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	Construction Subtotal (10-50)						**$62,051,346**		**$15,422,094**	**$77,473,440**		$88,141,239
60		**ROW, LAND, EXISTING IMPROVEMENTS**					**$1,152,773**		**$239,371**	**$1,392,144**		**$1,583,836**
	60.01	Purchase or lease of real estate					$1,152,773		$239,371	$1,392,144		**$1,583,836**
		60.01.01	Right of Way Acquisition	SF	$80	1102.0	$88,160	30%	$26,448	$114,608	2015	**$130,389**
		60.01.02	Right of Way Allowance	TF	$33	32261.0	$1,064,613	20%	$212,923	$1,277,536	2015	**$1,453,447**
70		**VEHICLES (number)**					$24,440,152		$1,374,759	$25,814,910		**$29,369,525**
	70.01	Light Rail					$23,829,148		$1,191,457	$25,020,605		**$28,465,848**
		70.01.01	Modern Streetcar Vehicle (Assumes wired system)	EA	$3,900,000	6.1	$23,829,148	5%	$1,191,457	$25,020,605	2015	**$28,465,848**
	70.07	Spare parts					$611,004		$183,301	$794,305		**$903,678**
		70.07.01	Spare Parts for New Vehicles (Per Vehicle)	EA	$100,000	6.1	$611,004	30%	$183,301	$794,305	2015	**$903,678**
80		**PROFESSIONAL SERVICES (applies to Cats. 10-50)**					**$26,442,372**		**$0**	**$26,442,372**		**$30,083,386**
	80.01	Preliminary Engineering					$2,644,237		$0	$2,644,237		**$3,008,339**
		80.01.01	Percentage of Direct Costs SCC (10-50)	LS	3%	88141239.0	$2,644,237	0%	$0	$2,644,237	2015	**$3,008,339**
	80.02	Final Design					$6,169,887		$0	$6,169,887		**$7,019,457**
		80.02.01	Percentage of Direct Costs SCC (10-50)	LS	7%	88141239.0	$6,169,887	0%	$0	$6,169,887	2015	**$7,019,457**
	80.03	Project Management for Design and Construction					$4,407,062		$0	$4,407,062		**$5,013,898**
		80.03.01	Percentage of Direct Costs SCC (10-50)	LS	5%	88141239.0	$4,407,062	0%	$0	$4,407,062	2015	**$5,013,898**
	80.04	Construction Administration & Management					$5,288,474		$0	$5,288,474		**$6,016,677**
		80.04.01	Percentage of Direct Costs SCC (10-50)	LS	6%	88141239.0	$5,288,474	0%	$0	$5,288,474	2015	**$6,016,677**
	80.05	Professional Liability and other Non-Construction Insurance					$2,644,237		$0	$2,644,237		**$3,008,339**
		80.05.01	Percentage of Direct Costs SCC (10-50)	LS	3%	88141239.0	$2,644,237	0%	$0	$2,644,237	2015	**$3,008,339**
	80.06	Legal; Permits; Review Fees by other agencies, cities, etc.					$1,762,825		$0	$1,762,825		**$2,005,559**
		80.06.01	Percentage of Direct Costs SCC (10-50)	LS	2%	88141239.0	$1,762,825	0%	$0	$1,762,825	2015	**$2,005,559**
	80.07	Surveys, Testing, Investigation, Inspection					$1,762,825		$0	$1,762,825		**$2,005,559**
		80.07.01	Percentage of Direct Costs SCC (10-50)	LS	2%	88141239.0	$1,762,825	0%	$0	$1,762,825	2015	**$2,005,559**
	80.08	Start up					$1,762,825		$0	$1,762,825		**$2,005,559**
		80.08.01	Percentage of Direct Costs SCC (10-50)	LS	2%	88141239.0	$1,762,825	0%	$0	$1,762,825	2015	**$2,005,559**
	Subtotal (10-80)						**$114,086,642**		**$17,036,223**	**$131,122,865**		$149,177,987
90		**UNALLOCATED CONTINGENCY**		**LS**	**25%**					**$32,780,716**		**$37,294,497**
100		**FINANCE CHARGES**								***Current Year Total***		***YoE Total***
	Segment Totals (10-100)									**$163,903,582**		$186,472,484

			Alignment 7	East Side (Segments G,H)								Current Year		*Inflation Rate*
			7.8 Track Miles	Approximately $30 Million Per Track Mile								*2011.25 (YR)*		*3.50%*
SCC	**SCC Sub**	**Item #**		**Item Description**	**Unit**	**Unit Cost**	**Quantity**	**Item Cost**	**A. Cont.**	**Item Cont.**	**Subtotal**	**YoE**	**Subtotal YoE**
10				**GUIDEWAY & TRACK ELEMENTS (route miles)**				**$18,465,290**		**$5,539,587**	**$24,004,877**		**$27,310,258**
	10.04			Guideway: Aerial structure				$0		$0	$0		**$0**
		10.04.01		Alignment Over Existing Bridge	TF	$700	0.0	$0	30%	$0	$0	2015	**$0**
		10.04.02		New Streetcar Viaduct	TF	$7,000	0.0	$0	30%	$0	$0	2015	**$0**
	10.06			Guideway: Underground cut & cover				$0		$0	$0		**$0**
		10.06.01		Cut-and-Cover Tunnel with Soldier Pile Walls	LS	$55,521,389	0.0	$0	30%	$0	$0	2015	**$0**
	10.08			Guideway: Retained cut or fill				$0		$0	$0		**$0**
		10.08.01		Retaining Wall <10ft Tall	LF	$800	0.0	$0	30%	$0	$0	2015	**$0**
		10.08.02		Retaining Wall >10ft Tall	LF	$1,600	0.0	$0	30%	$0	$0	2015	**$0**
	10.10			Track: Embedded				$17,465,290		$5,239,587	$22,704,877		**$25,831,253**
		10.10.01		Furnish Rail - Assume 112TRAM Block Rail	TF	$75	41094.8	$3,082,110	30%	$924,633	$4,006,743	2015	**$4,558,456**
		10.10.02		Embedded Track - Construct Track Slab	TF	$350	41094.8	$14,383,180	30%	$4,314,954	$18,698,134	2015	**$21,272,796**
	10.12			Track: Special (switches, turnouts)				$1,000,000		$300,000	$1,300,000		**$1,479,005**
		10.12.01		Embedded Turnout - Furnish and Install	EA	$250,000	4.0	$1,000,000	30%	$300,000	$1,300,000	2015	**$1,479,005**
		10.12.02		Embedded Crossing - Furnish and Install	EA	$150,000	0.0	$0	30%	$0	$0	2015	**$0**
20				**STATIONS, STOPS, TERMINALS, INTERMODAL (number)**				**$3,652,871**		**$1,095,861**	**$4,748,732**		**$5,402,615**
	20.01			At-grade station, stop, shelter, mall, terminal, platform				$3,652,871		$1,095,861	$4,748,732		**$5,402,615**
		20.01.01		Streetcar Stop - Basic 1 Car	EA	$80,000	45.7	$3,652,871	30%	$1,095,861	$4,748,732	2015	**$5,402,615**
		20.01.02		Streetcar Stop - Premium 1 Car	EA	$200,000	0.0	$0	30%	$0	$0	2015	**$0**
	20.02			Aerial station, stop, shelter, mall, terminal, platform				$0		$0	$0		**$0**
		20.02.01		Aerial Streetcar Stop	EA	$0	0.0	$0	30%	$0	$0	2015	**$0**
30				**SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS**				$5,448,174		$1,634,452	$7,082,627		**$8,057,877**
	30.02			Light Maintenance Facility				$3,891,553		$1,167,466	$5,059,019		**$5,755,627**
		30.02.01		Maintenance Facility Expansion: Allowance ($500k/New Vehicle)	EA	$500,000	7.8	$3,891,553	30%	$1,167,466	$5,059,019	2015	**$5,755,627**
	30.05			Yard and Yard Track				$1,556,621		$466,986	$2,023,608		**$2,302,251**
		30.05.01		Yard and Storage Track Expansion: Allowance ($200k/New Vehicle)	EA	$200,000	7.8	$1,556,621	30%	$466,986	$2,023,608	2015	**$2,302,251**
40				**SITEWORK & SPECIAL CONDITIONS**				**$29,798,022**		**$4,968,325**	**$34,766,347**		**$39,553,541**
	40.02			Site Utilities, Utility Relocation				$10,738,760		$3,221,628	$13,960,388		**$15,882,681**
		40.02.01		Utility Relocation - High Allowance (Dense Urban)	TF	$750	1045.0	$783,750	30%	$235,125	$1,018,875	2015	**$1,159,170**
		40.02.02		Utility Relocation - Medium Allowance (Moderate Density)	TF	$350	12967.0	$4,538,450	30%	$1,361,535	$5,899,985	2015	**$6,712,391**
		40.02.03		Utility Relocation - Low Allowance (Minimal Relocation Expected)	TF	$200	27082.8	$5,416,560	30%	$1,624,968	$7,041,528	2015	**$8,011,120**
	40.06			Pedestrian / bike access and accommodation, landscaping				$480,000		$144,000	$624,000		**$709,922**
		40.06.01		Pedestrian Improvement Allowance (Per Intersection)	EA	$15,000	32.0	$480,000	30%	$144,000	$624,000	2015	**$709,922**
	40.07			Automobile, bus, van accessways including roads, parking lots				$5,342,324		$1,602,697	$6,945,021		**$7,901,324**
		40.07.01		Roadway Improvement Allowance	TF	$100	41094.8	$4,109,480	30%	$1,232,844	$5,342,324	2015	**$6,077,942**
		40.07.02		Track Drainage Allowance	TF	$20	41094.8	$821,896	30%	$246,569	$1,068,465	2015	**$1,215,588**
		40.07.03		Street Lighting Allowance (Adjustments, Relocations, New)	TF	$10	41094.8	$410,948	30%	$123,284	$534,232	2015	**$607,794**
	40.08			Temporary Facilities and other indirect costs during construction				$13,236,938		$0	$13,236,938		**$15,059,614**
		40.08.01		Temporary Maintenance of Traffic	LS	$0	94549556.6	$4,727,478	0%	$0	$4,727,478	2015	**$5,378,434**
		40.08.02		Contractor Indirects (Staff, Office, etc.)	LS	$0	94549556.6	$7,563,965	0%	$0	$7,563,965	2015	**$8,605,494**
		40.08.03		Art in Transit (1% of Construction)	LS	$0	94549556.6	$945,496	0%	$0	$945,496	2015	**$1,075,687**

50		**SYSTEMS**				**$19,800,391**		**$5,940,117**	**$25,740,509**		**$29,284,879**
	50.01	Train control and signals				$300,000		$90,000	$390,000		**$443,702**
		50.01.01	TWC Control for Connection to Existing Streetcar Track	EA	$300,000	1.0	$300,000	30%	$90,000	$390,000	2015	**$443,702**
	50.02	Traffic signals and crossing protection					$2,221,896		$666,569	$2,888,465		**$3,286,195**
		50.02.01	Modify Existing Traffic Signal	EA	$75,000	12.0	$900,000	30%	$270,000	$1,170,000	2015	**$1,331,105**
		50.02.02	New Traffic Signal Allowance	EA	$250,000	2.0	$500,000	30%	$150,000	$650,000	2015	**$739,503**
		50.02.03	Signal Priority Allowance	TF	$20	41094.8	$821,896	30%	$246,569	$1,068,465	2015	**$1,215,588**
	50.03	Traction power supply: substations					$7,004,795		$2,101,439	$9,106,234		**$10,360,128**
		50.03.01	Traction Power Substation (Assume 1/Track Mile or 1 per 0.5 Rt. Mile)	EA	$900,000	7.8	$7,004,795	30%	$2,101,439	$9,106,234	2015	**$10,360,128**
	50.04	Traction power distribution: catenary and third rail					$10,273,700		$3,082,110	$13,355,810		**$15,194,854**
		50.04.01	Overhead Trolley Wire Allowance (Poles, wires, appurtenances)	TF	$250	41094.8	$10,273,700	30%	$3,082,110	$13,355,810	2015	**$15,194,854**
	50.05	Communications					$0		$0	$0		**$0**
		50.05.01	Communications Allowance?	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	50.06	Fare collection system and equipment					$0		$0	$0		**$0**
		50.06.01	Fare Collection (On Station or in Vehicle?)	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	Construction Subtotal (10-50)						**$77,164,749**		**$19,178,343**	**$96,343,092**		$109,609,171
60		**ROW, LAND, EXISTING IMPROVEMENTS**					**$1,385,248**		**$279,962**	**$1,665,210**		**$1,894,503**
	60.01	Purchase or lease of real estate					$1,385,248		$279,962	$1,665,210		**$1,894,503**
		60.01.01	Right of Way Acquisition	SF	$80	364.0	$29,120	30%	$8,736	$37,856	2015	**$43,069**
		60.01.02	Right of Way Allowance	TF	$33	41094.8	$1,356,128	20%	$271,226	$1,627,354	2015	**$1,851,435**
70		**VEHICLES (number)**					$31,132,424		$1,751,199	$32,883,623		**$37,411,573**
	70.01	Light Rail					$30,354,114		$1,517,706	$31,871,819		**$36,260,448**
		70.01.01	Modern Streetcar Vehicle (Assumes wired system)	EA	$3,900,000	7.8	$30,354,114	5%	$1,517,706	$31,871,819	2015	**$36,260,448**
	70.07	Spare parts					$778,311		$233,493	$1,011,804		**$1,151,125**
		70.07.01	Spare Parts for New Vehicles (Per Vehicle)	EA	$100,000	7.8	$778,311	30%	$233,493	$1,011,804	2015	**$1,151,125**
80		**PROFESSIONAL SERVICES (applies to Cats. 10-50)**					**$32,882,751**		**$0**	**$32,882,751**		**$37,410,581**
	80.01	Preliminary Engineering					$3,288,275		$0	$3,288,275		**$3,741,058**
		80.01.01	Percentage of Direct Costs SCC (10-50)	LS	3%	109609170.7	$3,288,275	0%	$0	$3,288,275	2015	**$3,741,058**
	80.02	Final Design					$7,672,642		$0	$7,672,642		**$8,729,136**
		80.02.01	Percentage of Direct Costs SCC (10-50)	LS	7%	109609170.7	$7,672,642	0%	$0	$7,672,642	2015	**$8,729,136**
	80.03	Project Management for Design and Construction					$5,480,459		$0	$5,480,459		**$6,235,097**
		80.03.01	Percentage of Direct Costs SCC (10-50)	LS	5%	109609170.7	$5,480,459	0%	$0	$5,480,459	2015	**$6,235,097**
	80.04	Construction Administration & Management					$6,576,550		$0	$6,576,550		**$7,482,116**
		80.04.01	Percentage of Direct Costs SCC (10-50)	LS	6%	109609170.7	$6,576,550	0%	$0	$6,576,550	2015	**$7,482,116**
	80.05	Professional Liability and other Non-Construction Insurance					$3,288,275		$0	$3,288,275		**$3,741,058**
		80.05.01	Percentage of Direct Costs SCC (10-50)	LS	3%	109609170.7	$3,288,275	0%	$0	$3,288,275	2015	**$3,741,058**
	80.06	Legal; Permits; Review Fees by other agencies, cities, etc.					$2,192,183		$0	$2,192,183		**$2,494,039**
		80.06.01	Percentage of Direct Costs SCC (10-50)	LS	2%	109609170.7	$2,192,183	0%	$0	$2,192,183	2015	**$2,494,039**
	80.07	Surveys, Testing, Investigation, Inspection					$2,192,183		$0	$2,192,183		**$2,494,039**
		80.07.01	Percentage of Direct Costs SCC (10-50)	LS	2%	109609170.7	$2,192,183	0%	$0	$2,192,183	2015	**$2,494,039**
	80.08	Start up					$2,192,183		$0	$2,192,183		**$2,494,039**
		80.08.01	Percentage of Direct Costs SCC (10-50)	LS	2%	109609170.7	$2,192,183	0%	$0	$2,192,183	2015	**$2,494,039**
	Subtotal (10-80)						**$142,565,173**		**$21,209,504**	**$163,774,676**		$186,325,829
90		**UNALLOCATED CONTINGENCY**		**LS**	**25%**					**$40,943,669**		**$46,581,457**
100		**FINANCE CHARGES**								***Current Year Total***		***YoE Total***
	Segment Totals (10-100)									**$204,718,345**		$232,907,286

			Alignment 8	Pacific Highway (Segments G,I)								Current Year		*Inflation Rate*
			6.1 Track Miles	Approximately $29 Million Per Track Mile								*2011.25 (YR)*		*3.50%*
SCC	**SCC Sub**	**Item #**		**Item Description**	**Unit**	**Unit Cost**	**Quantity**	**Item Cost**	**A. Cont.**	**Item Cont.**	**Subtotal**	**YoE**	**Subtotal YoE**
10				**GUIDEWAY & TRACK ELEMENTS (route miles)**				**$16,460,655**		**$4,938,197**	**$21,398,852**		**$24,345,392**
	10.04			Guideway: Aerial structure				$3,445,400		$1,033,620	$4,479,020		**$5,095,764**
		10.04.01		Alignment Over Existing Bridge	TF	$700	4922.0	$3,445,400	30%	$1,033,620	$4,479,020	2015	**$5,095,764**
		10.04.02		New Streetcar Viaduct	TF	$7,000	0.0	$0	30%	$0	$0	2015	**$0**
	10.06			Guideway: Underground cut & cover				$0		$0	$0		**$0**
		10.06.01		Cut-and-Cover Tunnel with Soldier Pile Walls	LS	$55,521,389	0.0	$0	30%	$0	$0	2015	**$0**
	10.08			Guideway: Retained cut or fill				$0		$0	$0		**$0**
		10.08.01		Retaining Wall <10ft Tall	LF	$800	0.0	$0	30%	$0	$0	2015	**$0**
		10.08.02		Retaining Wall >10ft Tall	LF	$1,600	0.0	$0	30%	$0	$0	2015	**$0**
	10.10			Track: Embedded				$12,015,255		$3,604,577	$15,619,832		**$17,770,623**
		10.10.01		Furnish Rail - Assume 112TRAM Block Rail	TF	$75	32324.6	$2,424,345	30%	$727,304	$3,151,649	2015	**$3,585,619**
		10.10.02		Embedded Track - Construct Track Slab	TF	$350	27402.6	$9,590,910	30%	$2,877,273	$12,468,183	2015	**$14,185,005**
	10.12			Track: Special (switches, turnouts)				$1,000,000		$300,000	$1,300,000		**$1,479,005**
		10.12.01		Embedded Turnout - Furnish and Install	EA	$250,000	4.0	$1,000,000	30%	$300,000	$1,300,000	2015	**$1,479,005**
		10.12.02		Embedded Crossing - Furnish and Install	EA	$150,000	0.0	$0	30%	$0	$0	2015	**$0**
20				**STATIONS, STOPS, TERMINALS, INTERMODAL (number)**				**$2,873,298**		**$861,989**	**$3,735,287**		**$4,249,622**
	20.01			At-grade station, stop, shelter, mall, terminal, platform				$2,873,298		$861,989	$3,735,287		**$4,249,622**
		20.01.01		Streetcar Stop - Basic 1 Car	EA	$80,000	35.9	$2,873,298	30%	$861,989	$3,735,287	2015	**$4,249,622**
		20.01.02		Streetcar Stop - Premium 1 Car	EA	$200,000	0.0	$0	30%	$0	$0	2015	**$0**
	20.02			Aerial station, stop, shelter, mall, terminal, platform				$0		$0	$0		**$0**
		20.02.01		Aerial Streetcar Stop	EA	$0	0.0	$0	30%	$0	$0	2015	**$0**
30				**SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS**				$4,285,458		$1,285,638	$5,571,096		**$6,338,215**
	30.02			Light Maintenance Facility				$3,061,042		$918,313	$3,979,354		**$4,527,296**
		30.02.01		Maintenance Facility Expansion: Allowance ($500k/New Vehicle)	EA	$500,000	6.1	$3,061,042	30%	$918,313	$3,979,354	2015	**$4,527,296**
	30.05			Yard and Yard Track				$1,224,417		$367,325	$1,591,742		**$1,810,918**
		30.05.01		Yard and Storage Track Expansion: Allowance ($200k/New Vehicle)	EA	$200,000	6.1	$1,224,417	30%	$367,325	$1,591,742	2015	**$1,810,918**
40				**SITEWORK & SPECIAL CONDITIONS**				**$19,740,797**		**$2,873,210**	**$22,614,008**		**$25,727,871**
	40.02			Site Utilities, Utility Relocation				$5,627,370		$1,688,211	$7,315,581		**$8,322,909**
		40.02.01		Utility Relocation - High Allowance (Dense Urban)	TF	$750	0.0	$0	30%	$0	$0	2015	**$0**
		40.02.02		Utility Relocation - Medium Allowance (Moderate Density)	TF	$350	979.0	$342,650	30%	$102,795	$445,445	2015	**$506,781**
		40.02.03		Utility Relocation - Low Allowance (Minimal Relocation Expected)	TF	$200	26423.6	$5,284,720	30%	$1,585,416	$6,870,136	2015	**$7,816,128**
	40.06			Pedestrian / bike access and accommodation, landscaping				$240,000		$72,000	$312,000		**$354,961**
		40.06.01		Pedestrian Improvement Allowance (Per Intersection)	EA	$15,000	16.0	$240,000	30%	$72,000	$312,000	2015	**$354,961**
	40.07			Automobile, bus, van accessways including roads, parking lots				$3,709,998		$1,112,999	$4,822,997		**$5,487,106**
		40.07.01		Roadway Improvement Allowance	TF	$100	27402.6	$2,740,260	30%	$822,078	$3,562,338	2015	**$4,052,858**
		40.07.02		Track Drainage Allowance	TF	$20	32324.6	$646,492	30%	$193,948	$840,440	2015	**$956,165**
		40.07.03		Street Lighting Allowance (Adjustments, Relocations, New)	TF	$10	32324.6	$323,246	30%	$96,974	$420,220	2015	**$478,082**
	40.08			Temporary Facilities and other indirect costs during construction				$10,163,429		$0	$10,163,429		**$11,562,895**
		40.08.01		Temporary Maintenance of Traffic	LS	$0	72595923.0	$3,629,796	0%	$0	$3,629,796	2015	**$4,129,605**
		40.08.02		Contractor Indirects (Staff, Office, etc.)	LS	$0	72595923.0	$5,807,674	0%	$0	$5,807,674	2015	**$6,607,369**
		40.08.03		Art in Transit (1% of Construction)	LS	$0	72595923.0	$725,959	0%	$0	$725,959	2015	**$825,921**

50		**SYSTEMS**				**$15,887,517**		**$4,766,255**	**$20,653,772**		**$23,497,718**
	50.01	Train control and signals				$300,000		$90,000	$390,000		**$443,702**
		50.01.01	TWC Control for Connection to Existing Streetcar Track	EA	$300,000	1.0	$300,000	30%	$90,000	$390,000	2015	**$443,702**
	50.02	Traffic signals and crossing protection					$1,996,492		$598,948	$2,595,440		**$2,952,822**
		50.02.01	Modify Existing Traffic Signal	EA	$75,000	8.0	$600,000	30%	$180,000	$780,000	2015	**$887,403**
		50.02.02	New Traffic Signal Allowance	EA	$250,000	3.0	$750,000	30%	$225,000	$975,000	2015	**$1,109,254**
		50.02.03	Signal Priority Allowance	TF	$20	32324.6	$646,492	30%	$193,948	$840,440	2015	**$956,165**
	50.03	Traction power supply: substations					$5,509,875		$1,652,963	$7,162,838		**$8,149,133**
		50.03.01	Traction Power Substation (Assume 1/Track Mile or 1 per 0.5 Rt. Mile)	EA	$900,000	6.1	$5,509,875	30%	$1,652,963	$7,162,838	2015	**$8,149,133**
	50.04	Traction power distribution: catenary and third rail					$8,081,150		$2,424,345	$10,505,495		**$11,952,062**
		50.04.01	Overhead Trolley Wire Allowance (Poles, wires, appurtenances)	TF	$250	32324.6	$8,081,150	30%	$2,424,345	$10,505,495	2015	**$11,952,062**
	50.05	Communications					$0		$0	$0		**$0**
		50.05.01	Communications Allowance?	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	50.06	Fare collection system and equipment					$0		$0	$0		**$0**
		50.06.01	Fare Collection (On Station or in Vehicle?)	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	Construction Subtotal (10-50)						**$59,247,725**		**$14,725,289**	**$73,973,014**		$84,158,818
60		**ROW, LAND, EXISTING IMPROVEMENTS**					**$1,177,912**		**$246,702**	**$1,424,614**		**$1,620,778**
	60.01	Purchase or lease of real estate					$1,177,912		$246,702	$1,424,614		**$1,620,778**
		60.01.01	Right of Way Acquisition	SF	$80	1390.0	$111,200	30%	$33,360	$144,560	2015	**$164,465**
		60.01.02	Right of Way Allowance	TF	$33	32324.6	$1,066,712	20%	$213,342	$1,280,054	2015	**$1,456,313**
70		**VEHICLES (number)**					$24,488,333		$1,377,469	$25,865,802		**$29,427,425**
	70.01	Light Rail					$23,876,125		$1,193,806	$25,069,931		**$28,521,966**
		70.01.01	Modern Streetcar Vehicle (Assumes wired system)	EA	$3,900,000	6.1	$23,876,125	5%	$1,193,806	$25,069,931	2015	**$28,521,966**
	70.07	Spare parts					$612,208		$183,663	$795,871		**$905,459**
		70.07.01	Spare Parts for New Vehicles (Per Vehicle)	EA	$100,000	6.1	$612,208	30%	$183,663	$795,871	2015	**$905,459**
80		**PROFESSIONAL SERVICES (applies to Cats. 10-50)**					**$25,247,645**		**$0**	**$25,247,645**		**$28,724,150**
	80.01	Preliminary Engineering					$2,524,765		$0	$2,524,765		**$2,872,415**
		80.01.01	Percentage of Direct Costs SCC (10-50)	LS	3%	84158817.9	$2,524,765	0%	$0	$2,524,765	2015	**$2,872,415**
	80.02	Final Design					$5,891,117		$0	$5,891,117		**$6,702,302**
		80.02.01	Percentage of Direct Costs SCC (10-50)	LS	7%	84158817.9	$5,891,117	0%	$0	$5,891,117	2015	**$6,702,302**
	80.03	Project Management for Design and Construction					$4,207,941		$0	$4,207,941		**$4,787,358**
		80.03.01	Percentage of Direct Costs SCC (10-50)	LS	5%	84158817.9	$4,207,941	0%	$0	$4,207,941	2015	**$4,787,358**
	80.04	Construction Administration & Management					$5,049,529		$0	$5,049,529		**$5,744,830**
		80.04.01	Percentage of Direct Costs SCC (10-50)	LS	6%	84158817.9	$5,049,529	0%	$0	$5,049,529	2015	**$5,744,830**
	80.05	Professional Liability and other Non-Construction Insurance					$2,524,765		$0	$2,524,765		**$2,872,415**
		80.05.01	Percentage of Direct Costs SCC (10-50)	LS	3%	84158817.9	$2,524,765	0%	$0	$2,524,765	2015	**$2,872,415**
	80.06	Legal; Permits; Review Fees by other agencies, cities, etc.					$1,683,176		$0	$1,683,176		**$1,914,943**
		80.06.01	Percentage of Direct Costs SCC (10-50)	LS	2%	84158817.9	$1,683,176	0%	$0	$1,683,176	2015	**$1,914,943**
	80.07	Surveys, Testing, Investigation, Inspection					$1,683,176		$0	$1,683,176		**$1,914,943**
		80.07.01	Percentage of Direct Costs SCC (10-50)	LS	2%	84158817.9	$1,683,176	0%	$0	$1,683,176	2015	**$1,914,943**
	80.08	Start up					$1,683,176		$0	$1,683,176		**$1,914,943**
		80.08.01	Percentage of Direct Costs SCC (10-50)	LS	2%	84158817.9	$1,683,176	0%	$0	$1,683,176	2015	**$1,914,943**
	Subtotal (10-80)						**$110,161,616**		**$16,349,460**	**$126,511,076**		$143,931,172
90		**UNALLOCATED CONTINGENCY**		**LS**	**25%**					**$31,627,769**		**$35,982,793**
100		**FINANCE CHARGES**								***Current Year Total***		***YoE Total***
	Segment Totals (10-100)									**$158,138,845**		$179,913,964

Appendix B – Segment Summary Cost Estimates

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Segment Summary Cost Estimates

Segment			FTA Standard Cost Category											Segment
			Guideway & Track Elements	Stations, Stops, Terminals, Intermodal	Support Facilities: Yards, Shops & Admin. Bldgs.	Sitework & Special Conditions	Systems	ROW, Land, & Existing Improvements	Vehicles	Professional Services	Unallocated Contingency	Total		
	A	YOE $	$ 24,255,665	$ 4,945,727	$ 7,376,440	$ 37,280,473	$ 26,207,496	$ 1,788,927	$ 34,247,756	$ 34,153,345	$ 42,563,957	$ 212,819,786	YOE $	A
		Current $	$ 21,319,984	$ 4,347,142	$ 6,483,664	$ 32,768,390	$ 23,035,584	$ 1,572,412	$ 30,102,725	$ 30,019,740	$ 37,412,410	$ 187,062,050	Current $	
	B	YOE $	$ 11,656,117	$ 2,117,580	$ 3,158,323	$ 14,059,840	$ 11,084,453	$ 725,678	$ 14,663,642	$ 14,361,019	$ 17,956,663	$ 89,783,315	YOE $	B
		Current $	$ 10,245,368	$ 1,861,288	$ 2,776,069	$ 12,358,167	$ 9,742,894	$ 637,849	$ 12,888,891	$ 12,622,894	$ 15,783,355	$ 78,916,775	Current $	
	C	YOE $	$ 9,506,309	$ 1,910,914	$ 2,850,085	$ 16,545,354	$ 10,504,100	$ 654,856	$ 13,232,537	$ 14,101,777	$ 17,326,482	$ 86,632,412	YOE $	C
		Current $	$ 8,355,753	$ 1,679,635	$ 2,505,137	$ 14,542,857	$ 9,232,781	$ 575,598	$ 11,630,993	$ 12,395,028	$ 15,229,445	$ 76,147,227	Current $	
	D	YOE $	$ 8,943,403	$ 1,669,448	$ 2,489,944	$ 12,535,322	$ 8,937,859	$ 594,943	$ 11,560,455	$ 11,801,087	$ 14,633,116	$ 73,165,578	YOE $	D
		Current $	$ 7,860,977	$ 1,467,394	$ 2,188,584	$ 11,018,163	$ 7,856,103	$ 522,937	$ 10,161,285	$ 10,372,793	$ 12,862,059	$ 64,310,294	Current $	
	E	YOE $	$ 7,109,522	$ 1,486,959	$ 2,217,765	$ 12,293,300	$ 8,847,055	$ 509,569	$ 10,296,768	$ 10,906,389	$ 13,416,832	$ 67,084,158	YOE $	E
		Current $	$ 6,249,051	$ 1,306,991	$ 1,949,348	$ 10,805,433	$ 7,776,289	$ 447,896	$ 9,050,542	$ 9,586,380	$ 11,792,983	$ 58,964,913	Current $	
	F	YOE $	$ 23,288,525	$ 4,241,261	$ 6,325,744	$ 29,905,044	$ 24,380,665	$ 1,583,836	$ 29,369,525	$ 30,083,386	$ 37,294,497	$ 186,472,484	YOE $	F
		Current $	$ 20,469,898	$ 3,727,938	$ 5,560,134	$ 26,285,615	$ 21,429,855	$ 1,392,144	$ 25,814,910	$ 26,442,372	$ 32,780,716	$ 163,903,582	Current $	
	G	YOE $	$ 3,786,992	$ 560,050	$ 835,302	$ 4,137,071	$ 3,958,315	$ 191,925	$ 3,878,187	$ 4,531,807	$ 5,469,912	$ 27,349,561	YOE $	G
		Current $	$ 3,328,650	$ 492,267	$ 734,205	$ 3,636,358	$ 3,479,237	$ 168,696	$ 3,408,807	$ 3,983,319	$ 4,807,885	$ 24,039,424	Current $	
	H	YOE $	$ 23,523,265	$ 4,842,565	$ 7,222,576	$ 35,416,470	$ 25,326,564	$ 1,702,578	$ 33,533,387	$ 32,878,774	$ 41,111,545	$ 205,557,725	YOE $	H
		Current $	$ 20,676,227	$ 4,256,466	$ 6,348,422	$ 31,129,989	$ 22,261,272	$ 1,496,514	$ 29,474,816	$ 28,899,432	$ 36,135,784	$ 180,678,922	Current $	
	I	YOE $	$ 20,558,400	$ 3,689,572	$ 5,502,913	$ 21,590,800	$ 19,539,403	$ 1,428,853	$ 25,549,238	$ 24,192,343	$ 30,512,881	$ 152,564,403	YOE $	I
		Current $	$ 18,070,202	$ 3,243,020	$ 4,836,891	$ 18,977,649	$ 17,174,535	$ 1,255,918	$ 22,456,995	$ 21,264,326	$ 26,819,884	$ 134,099,421	Current $	
	J	YOE $	$ 90,116,125	$ -	$ 1,272,835	$ 25,430,175	$ 5,324,665	$ 1,364,083	$ 5,909,592	$ 41,688,762	$ 42,776,559	$ 213,882,796	YOE $	J
		Current $	$ 79,209,304	$ -	$ 1,118,783	$ 22,352,343	$ 4,680,217	$ 1,198,987	$ 5,194,349	$ 36,643,140	$ 37,599,281	$ 187,996,404	Current $	

Economic Escalation Assumptions					
Current Year:	2011.25	Expense Year:	2015	Inflation Rate:	3.5%

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Appendix C - System Characteristics and Configuration Assumptions

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TECHNICAL MEMORANDUM

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Tacoma Link Extension: Streetcar and Light Rail Characteristics and Extension Configuration Assumptions

PREPARED FOR:	Val Batey, Sound Transit
PREPARED BY:	Kevin Collins & Luke Olson, HDR
COPIES:	David Knowles, CH2M HILL Kate Lyman, CH2M HILL
DATE:	April 18, 2011

1. Introduction

The purpose of this memorandum is two-fold. First it is intended to present some of the major differences in physical and operational characteristics, scale, construction and cost between typical modern streetcar systems and light rail systems. Secondly, it is intended to define the basic Tacoma Link Extension system configuration assumptions that will be used to prepare the estimates of probable cost. It is critical that Sound Transit review and agree with the following assumptions as they will serve as the basis for the engineering evaluation of the alternatives and cost estimates.

2. Background

Every streetcar system is different but most fit within a typical typology. They are primarily planned to serve a circulation transportation function, improving urban mobility by connecting neighborhoods with activity centers and other transit nodes. While part of the regional transit system, their role is to feed the transportation modes that make up the trunk of the regional system, typically light rail, commuter rail and express buses. Typically, a streetcar system is designed to minimize impacts to adjacent infrastructure, have simplified and cost effective features and blend into the existing traffic and urban landscape. Most often, they share lanes with existing bus, truck and automobile traffic which, in rail transit terms is referred to as a "shared or mixed-use guideway". Their average travel speeds are relatively low and stops are closely spaced providing easy walk access, somewhere between that of a local bus route and a light rail system.

Light rail systems by contrast typically serve as the trunk of the regional transportation function where travel time is the main goal resulting in higher operating speeds, less frequent stations and a need to reduce the number of interfaces between the light rail track and other transportation modes. This drives the physical configuration of light rail systems to "semi-exclusive guideway", where light rail trains do not share the guideway

with other transportation modes, but other transportation modes can cross the guideway at controlled at-grade crossing locations or "exclusive guideway" where there is no interface between the light rail train and other transportation modes at all.

The Central Link Light Rail guideway along Martin Luther King Way in the Rainier Valley is a semi-exclusive guideway while the portions of elevated guideway from Rainier Beach to the Airport is an exclusive guideway. The Downtown Transit Tunnel is an exclusive guideway but is unique since it is shared with buses at least for now. The Seattle Streetcar running along Westlake and Terry Avenues is a shared guideway.

This need to minimize or eliminate modal interfaces is critical as it drives the system's physical characteristics (i.e. guideway type) and therefore the size, scale and cost of the built transit system. These distinctions will be explained in more detail in the sections that follow.

3. Existing Tacoma Link Characteristics

The existing Tacoma Link is actually a combination of streetcar and light rail transit modes both in physical and operational character. Physically, the portion of Tacoma Link from its northern/eastern terminus at Freighthouse Square/Tacoma Dome Station to the Tacoma Convention Center is more light-rail like as it operates in a semi-exclusive guideway in 25th Street and Pacific Avenue. It is our understanding that the planning for Sound Move, the regional transit plan enacted by the voters in 1996, anticipated that this portion of the Tacoma Link could one day be connected to the light rail system to Seattle and points north thus the need for semi-exclusive guideway and more robust track, power and train control sub-systems. However, current thinking, including that of the Tacoma Streetcar Stakeholders Group, is that typical modern streetcar may be more congruent with the unique character and scale of Downtown Tacoma and its neighborhoods. While the Tacoma Link may remain to be a separate system physically, it is still a critical part of the regional transit system since it feeds the light rail, commuter rail and express bus systems via direct transfer at Tacoma Dome Station.

The portion of Tacoma Link from the Convention Center to its western terminus at 9th Street is more modern streetcar like as it operates in a shared use guideway where it mixes with rubber-tired vehicles, stations are smaller and more utilitarian and train control is accomplished through the existing city traffic lights.

Figure 1 Existing Tacoma Link in Semi-Exclusive Guideway in E 25th Street

The total route length of the existing Tacoma Link is 1.6 miles end to end. It is mainly single track with a short section of double track between UW Tacoma and the Convention Center. It was built for a cost of $80.4 million in 2003 which is on the higher end of the capital cost range for modern streetcar systems built around the

same time. This is largely due to the nearly one-mile segment of semi-exclusive guideway and the traction power and train control subsystems. Table 1 shows the capital cost data for some existing modern streetcar systems currently in operation.

Table 1 - Representative Capital Cost of Peer Streetcar Systems (Year of Expenditure $)

Streetcar System	System Length (Route Miles)	Total Project Cost ($ Millions)	Cost Per Route Mile ($ Millions)
Portland Streetcar (Central City, Ph I & II)	2.4	$ 56.9	$ 23.7
Portland Streetcar (Riverplace Extension)	0.6	$ 16.0	$ 26.7
Portland Streetcar (Gibbs Extension)	0.6	$ 15.8	$ 26.3
Portland Streetcar (Lowell Extension)	0.4	$ 14.5	$ 36.3
Seattle Streetcar (South Lake Union)	1.3	$ 52.1	$ 40.1
Tacoma Link	1.6	$ 80.4	$ 50.3

4. Tacoma Link Extensions - Configuration Assumptions

In order to ensure an accurate assessment and opinion of probable cost is developed, the project team proposes a set of key assumptions for the potential Tacoma Link extensions. These are based on our experience planning and designing streetcar systems in other cities of similar scale to Tacoma and to incorporate feedback from the stakeholder group on community values for the project. Therefore, for the purpose of this study and cost estimating purposes, it will be assumed that the Tacoma Link extensions will be configured and operate as typical modern streetcar, in existing traffic lanes shared with other traffic. However, there may be instances where the streetcar will operate in an exclusive lane in order to by-pass congestion, pass through low-clearance underpasses or accomplish unique traffic maneuvers such as queue jumps.

The key system configuration assumptions follow. These assumptions address the major project components that have the largest affect on the scale and cost of the streetcar project and determine the basic configuration of the project. Other design elements such as the specific track alignment will be addressed in future phases of project development.

Vehicles:

Streetcars are typically 65 long, 8 feet wide, double-articulated, steel wheel on steel rail and are operated as single cars. By contrast, light rail vehicles are usually about 90 feet long, 8.5 feet wide, double-articulated, and steel wheel on steel rail and operated in two to four car trains. The smaller size and reduced scale of streetcars fit their intended function and allow them to share the road with other travel modes; accessing places and streets such as residential neighborhoods that light rail cannot, due to its much larger scale. The larger size and scale of light rail vehicles also fits their function, as the trunk of regional transit systems typically have very high number of passengers as their ridership capture areas are large geographic areas, fed by multiple modes of transportation and traveling to and from dense urban cores.

For the purpose of this alternatives study, it is assumed that any future Tacoma Link extension will have to be designed to accommodate the existing streetcar fleet and that all future vehicles would have similar characteristics such as length, location of ADA boarding, vehicle loading (for structural deign) etc. Sound Transit should notify the project team if additional vehicles types need to be considered as part of a potential future fleet as this will affect the route alternatives that are feasible as well as the cost estimates.

Streetcar Stops:

Figure 2 Typical Modern Streetcar Station Stop. Note seamless integration with sidewalk.

Stops are an area which can significantly increase costs of a system. Many light rail systems have stations that cost in the $1 to $3 million range (or even higher for exclusive guideway systems) with large custom structural canopies, increased capacity and multiple passenger amenities. Streetcar systems such as Seattle or Portland have taken a simplified approach and have kept costs for most stations under $100k. For the Tacoma Link extensions, it is assumed that a similar approach will be taken. The proposed stops would, in general, have the following features and characteristics:

- Dimensions: Approximate length would be 45-60 feet and 8-12 feet wide depending on side or center location
- Shelter: Stop will have a basic shelter akin to a bus shelter
- Next "streetcar" display: Stop will have automated display indicating time until next streetcar
- ADA boarding: Will be accommodated using vehicle-deployed bridge plates similar to the current stops/vehicles
- Station appurtenances such as benches, trash receptacle, and railings as needed.

Traffic signals:

Streetcars typically operate in the existing traffic lanes and are controlled by the same traffic signals as automobile users whereas for light rail, the need to keep other vehicles off the guideway and increased travel speeds necessitates a dedicated train control system that is interconnected with the traffic signal system.

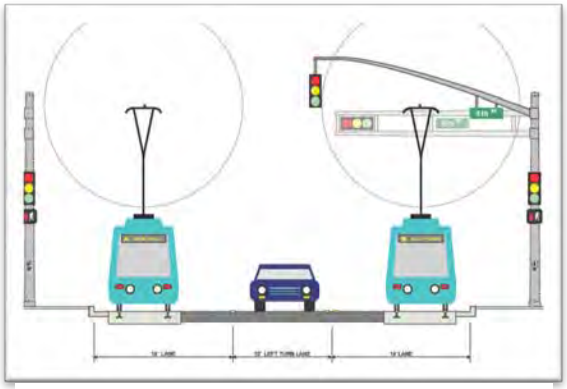

Figure 3 Typical Traffic Signal Modification

Even with streetcars, the overhead trolley wire used to power the vehicles can create a conflict between the existing

traffic signal head or mast arm. Typically a 10 foot minimum clearance around the wire is used for all elements that will require maintenance such as traffic signal heads. This is to comply with OSHA requirements. Workers can be certified and allowed to operate as close as 3 feet, 8 inches to the wire but it is more desirable to have at least 10 feet clear. In many cases, traffic signal mast arms will be shortened and/or removed in order to provide the appropriate clearance. The signal heads will be relocated to a different spot on the mast arm or pole mounted as required to obtain the desired clearances. In general, the approach to streetcar projects has been to minimize the amount of modifications to what is absolutely necessary and maximize the reuse of as much of the existing equipment as possible.

Guideway Type/Construction Limits:

Figure 4 Example of a shared use guideway on Westlake Avenue in Seattle.

In order to contain costs and minimize impacts, the design approach to a typical streetcar is to limit construction to that which is absolutely necessary. Often, the track construction can be limited to 1 foot on either side of the track with grind and overlay to make up any minor grade differences and blend the track into the existing roadway cross slope. In some cases, where the existing roadway has been overlaid several times the existing cross slope can get quite steep. In these instances, it may be necessary to reconstruct more than just the travel lane with the track. By contrast, the construction of semi-exclusive guideways are major endeavors since the guideways are essentially a separate facility from the existing road yet all existing modes must still be accommodated within the road right of way. Semi-exclusive guideway construction often extends from right of way line to right of way line and can cause major disruption during construction. Exclusive and semi-exclusive guideways typically require additional right of way in order to fit the guideway in the transportation corridor while still accommodating existing modes.

For the purposes of the Tacoma Link's project and cost estimating, HDR will assume a shared-use guideway and an average amount of roadway work based on the experience of other streetcar projects.

Street lighting:

Based on the observations, it is anticipated that some street lights may be in conflict with the overhead conductor wire which powers the streetcar. This is mostly due to maintenance access and OSHA clearances. Many lights such as cobra heads also require lift buckets to access and change the light bulbs. In final design, all lights will have to be evaluated for actual conflicts with the wire and to ensure proper access is obtainable while maintaining OSHA clearances.

For the purpose of this study and the cost estimate, an allowance will be developed to anticipate some light modifications and/or relocations.

Utilities:

Utility conflicts are one of the greatest risks and unknowns for a project in the early stages of development. In addition, there are many factors in determining conflicts and what entity bears the cost of relocation should it be necessary. In general, every city and/or project has different guidelines for determining conflicts. It can vary depending on access requirements, condition and age of the utility and franchise agreements.

Figure 5 Shared use guideways provide better access to existing utilities than semi-exclusive guideways which guides utility accommodation policies.

Generally speaking, semi-exclusive guideways require more existing utility relocations than a streetcar shared guideway. This is because of the difficulty in getting maintenance access to the utility facility in the semi-exclusive guideway if it was not relocated.

For the purpose of this study, a cursory review of the "density" and type of subsurface infrastructure will be utilized to determine the potential magnitude of impact (high, medium or low) for the potential alignments. The density of existing utilities for each alignment will be determined from the existing utility maps obtained from the City of Tacoma and Tacoma Public Utilities. The guidelines for determining conflicts and a detailed investigation should be determined in future stages of the project through review of utility franchise agreements and negotiation.

Overhead Contact System:

Figure 6 Single-wire OCS. Note span wire attachment to streetlight pole.

Unlike the current Tacoma Link system which utilizes a double wire catenary system, most modern streetcar systems use a single wire called a trolley wire to provide power to the vehicles. It's not limited to just streetcar as some light rail systems transition from a catenary two-wire system to a trolley wire in the downtown areas to lessen the visual impacts. For this study, it is assumed that a simplified single wire OCS system will be implemented for any of the possible extensions. In addition, as typical of other streetcars, it is anticipated that the trolley wire support poles will be shared with light poles and traffic signals wherever possible to minimize pole clutter and reduce costs.

Typical Characteristics of a Streetcar OCS:

- Typical Wire height: 18 – 19 feet
- Typical Pole/OCS support spacing: 80-120 feet

Traction Power Substations:

Figure 7 Typical Streetcar Traction Power Substation

The traction power system will be based on a typical streetcar operation using modern streetcar vehicles. It is assumed to have the capacity to handle single vehicles at 5-10 minute headways with no anticipation of future light rail with multi-car train sets. Based on this type of operation, typical of streetcar, the general approach has been to have smaller substations more frequently spaced and avoid costly duct banks. The smaller substations are less costly but are also more flexible in terms of where they are located. There are new, ultra compact, substations that are being introduced to the market which are capable of fitting into a single parking stall of a parking garage. Below are some common characterizes of a typical streetcar traction power system as assumed for this project:

- Power: Typical service is 480/240 vac 600amp local utility service for 500kW substations supplying 750 vdc to the vehicle traction motors
- Spacing: Spaced approximately 1 every ½ route mile or 1 per track mile.
- Approximate size: 20 x 12 feet for typical prepackaged substation; Ultra compact substation approximately 15 x 5 feet.

Maintenance and Storage Facility:

With any expansion, and increase in the number of streetcar vehicles, consideration for additional maintenance and storage is important. The existing Tacoma Link maintenance and storage facility (MSF) may have some additional capacity, however, some expansion should be expected. For this study it will be assumed that a new maintenance bay and/or facility will be needed per four additional vehicles. Additional storage track will also be required for each additional vehicle expected.

Figure 8 Existing Tacoma Link MSF

5. Conclusion

Typical modern streetcar systems serve a very specific purpose, providing increased connectivity and circulation within an urban area. The need to fit and blend into existing neighborhoods requires a transit solution that is true to the scale and character of those neighborhoods. Streetcars serve this purpose well. Their smaller scale and ***shared guideway*** operation, results in less infrastructure, smaller construction footprints and therefore lower cost than systems that operate in a ***semi-exclusive guideway*** such as the northern/eastern portion of the existing Tacoma Link.

The following assumptions will define the configuration and characteristics of the proposed extensions:

Table 2 Tacoma Link Extension System Configuration Assumptions

System Characteristic	Assumption Description
Guideway	Shared use
Vehicle	Typical modern streetcar similar to the current Tacoma Link vehicles
Stops	45 feet long, raised bump-out curb for side stops, raised median for center stops. ADA compliant, minimal furnishings
Traffic Signals and Street Lights	Most modified to raise or shorten cobra heads and mast arms or replace wire mounted traffic signals
Utilities	Relocation determined by the relative density of utilities in the corridor
Traction Power System	Trolley wire, dual-use poles, substations approx. 20′ x 12′, voltage in 240/480 vac, voltage out: 750 vdc
Maintenance and Storage Facility	1-bay expansion of the existing facility

Tacoma Link Extension: Engineering Considerations

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DATE: May 3, 2011; Revised August 5, 2011

1. Introduction

The purpose of this memorandum is to provide a high-level feasibility assessment for each of the alternatives based on engineering opportunities and constraints along each alignment.

Since each of the alternatives overlap in some areas, it is necessary to break each alternative into segments. This allows for an orderly discussion of each of the alternatives since the physical characteristics of each segment are different. It also provides the opportunity to evaluate new alternatives by combining or truncating current alternatives if one segment of a particular alternative is infeasible.

We have broken the alternatives into ten segments, A through J, and will discuss each individually. The segmentalized alternatives are described in Table 1 and graphically depicted in Figure 1.

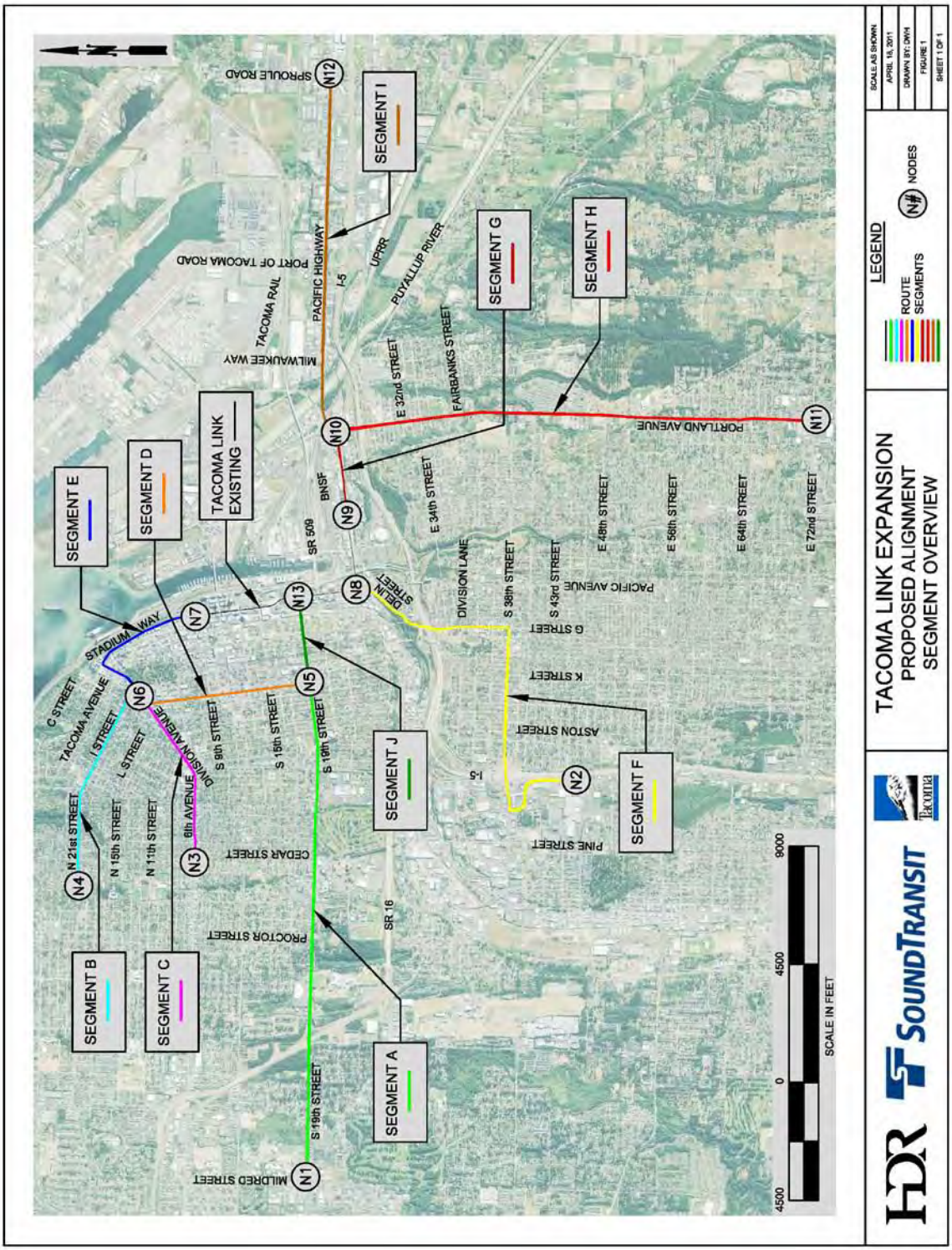
Table 1- Description of Alternative Segments

Alternative	Segment(s)	Segment Description	Segment Length (miles)	Alternative Length (miles)
Eastside *(Red)*	G	Extends east from Tacoma Dome Station on 25th St (N9) to Portland Ave (N10)	0.61	4.09
	H	Continues from 25th St/Portland Ave (N10) south along Portland Ave to 72nd St (N11)	3.48	
North Downtown Central *(Orange)*	E	Extends north from the 9th/Theater District Station (N7) via Stadium Way, continues northwest and west via N E St, N 1st St, and Division Ave to N I St (N6)	1.13	2.33
	D	Continues southwest from N I St/ Division Ave (N6) to MLK Jr. Way then south on MLK Jr. Way to S 19th Street (N5)	1.20	

North End *(Blue)*	E	Extends north from the 9th/Theater District Station (N7) via Stadium Way, continues northwest and west via N E St, N 1st St, and Division Ave to N I St (N6)	1.13	2.66
	B	Continues west from N I St/Division Ave (N6) to Alder St via I St/N 21st St (N4)	1.53	
North End Central *(Purple)*	E	Extends north from the 9th/Theater District Station (N7) via Stadium Way, continues northwest and west via N E St, N 1st St, and Division Ave to N I St (N6)	1.13	2.52
	C	Continues southwest and west via Division Ave to 6th Avenue to Alder/Cedar Streets (N3)	1.39	
Pacific Highway *(Brown)*	G	Extends east from Tacoma Dome Station on 25th St (N9) to Portland Ave (N10)	0.61	3.27
	I	Continues from 25th St/Portland Ave (N10) north on Portland Ave, east along Eells St/Pacific Highway East to Fife, at 54th Ave East (N12)	2.66	
South Downtown Central *(Green)*	J	Extends west from Union Station (N13) on S 19th St to MLK Jr. Way (N5)	0.63	4.20
	A	Continues west on S 19th St from MLK Jr. Way (N5) to Mildred St (N1)	3.57	
South Downtown to MLK *(Green/Orange)*	J	Extends west from Union Station (N13) on S 19th St to MLK Jr. Way (N5)	0.63	1.83
	D	Continues from S 19th St/MLK Jr Way (N5) north on MLK Jr. Way to Division Ave (N6)	1.20	
South End *(Yellow)*	F	Extends south on Pacific Ave from the S 25th St/Pacific Ave intersection (N8) to Delin St southwest on Delin St to S G St, south on S G St to 38th St, then west on 38th St to Tacoma Mall Blvd (N12) [1]	3.13	3.13

1: An alignment that follows Pacific Ave from S 25th Ave to S 38th Ave is fatally flawed due to the proposed 14% grade on Pacific Ave south of the new grade separation being constructed for the Sounder extension to Lakewood and existing grades on Pacific Ave in excess of 10% between S 28th Street and I-5. The alternative is described.

Figure 1 Alignment Alternative Segment Overview



2. Segment Characteristics

Each alternative was evaluated based on data gathered from field observations and inspection of existing conditions data provided by the City of Tacoma. The data sources are as follows:

- GIS files for street names/centerlines, right-of-way boundaries, sewer lines, underground power lines, signalized intersections, and topographic contours.
    - A request for underground water line data was made to Tacoma Public Utilities, but to date that information has not been received.
- Aerial imagery captured in 2009 with 12-inch resolution.
- City of Tacoma traffic count data from govME.org website.
- Google Maps Street View.
- Sound Transit Sounder Commuter Rail D-to-M Streets Track & Signal Project construction drawings.
- Skoda Tramcar 10T technical data sheet.

The streetcar vehicle technical criteria/requirements are based on information provided by the manufacturers of the existing Tacoma Link, Seattle Streetcar and Portland Streetcar vehicles. Vehicle technical data can vary slightly by manufacturer; however, to date, the Skoda/Inekon vehicle is the only modern-streetcar vehicle in operation in the United States and is therefore a suitable prototype. Skoda and Inekon are actually two separate foreign companies that manufacture nearly identical streetcar vehicles. A U.S. made version is also currently in production.

Table 2 Basic Modern Streetcar Technical Data

Track gauge		4 ft - 8½ in
Carbody width		8 ft - 1 in
Carbody height above top-of-rail		11 ft - 3½ in
Car height w/ lowered pantograph		12 ft - 8½ in
Car floor height above top of rail	Low	14 in
	High	31 in
Car length		66 ft
Minimum horizontal curve radius		60 ft
Minimum vertical curve radius		820 ft
Maximum track gradient		9%
Maximum operating speed (governed)		30 mph
Maximum operating speed (design)		42 mph
Primary voltage		750 Vdc
Control voltage		24 Vdc
New wheel diameter		24 in
Acceleration rate		3.0 mphps
Deceleration rate		3.0 mphps
Asynchronous motors		4 x 115 hp
Seated passengers		30
Standing passengers @ normal occupancy (6/m^2)		127
Weight (empty)		63,500 lb
Weight (normally loaded car with driver)		85,800 lb

Source: Skoda-Inekon, 2003

Observations were noted regarding major engineering considerations that affect the overall feasibility and ease of implementation of each alternative. These include:

- Street grades;

- Existing bridges;
- Potential for right-of-way acquisitions through off-street running, and/or corner cuts required at tight right turns;
- Significant earthwork and/or retaining wall requirements, difficult terrain;
- Potential traffic impacts during and after construction based on high-level analysis of readily available traffic count data on the street shared by the streetcar.

In addition to the specific engineering considerations, each segment is assigned an engineering feasibility rating based on the overall technical difficulty of constructing that segment. The possible ratings are L (low) which means relatively easy to construct, M (medium) indicating moderate construction difficulty, and H (high) meaning relatively difficult to construct. Table 3 includes the summary of these findings.

Table 3 Key Engineering Considerations of Each Segment

Segment	Key Engineering Considerations	Rating	Alternatives Affected
A	▪ Grades in this segment do not exceed the vehicle max of 9%, but there are stretches where the grade is between 5%-9%. While typical streetcar vehicles are able to negotiate grades in this range, it is not desirable since they result in possible limits on travel speed, more tractive effort, higher energy costs, limitations on station stop placement ▪ Segment crosses one existing bridge (SR 16 on S 19th Street), need to evaluate feasibility. ▪ Based on the street configuration and current traffic volume, streetcar operation is not likely to increase traffic congestion nor does current traffic volume appear likely to impede streetcar operation through this Segment. ▪ Due to constructability issues with Segment J, Segment A is likely feasible only if Segments D and E are constructed (see Segment J discussion).	L	South Downtown Central
B	▪ Grades in this segment do not exceed the vehicle max of 9%, but there are stretches where the grade is between 5%-9%. ▪ Segment crosses one existing bridge (gulch at N 21st & Fife Streets), need to evaluate feasibility. ▪ Based on the street configuration and current traffic volume, streetcar operation is not likely to increase traffic congestion nor does current traffic volume appear likely to impede streetcar operation through this Segment.	L	North End
C	▪ Grades in this segment do not exceed the vehicle max of 9%, but there are stretches where the grade is between 5%-9%.	M	North End Central

Segment	Key Engineering Considerations	Rating	Alternatives Affected
	▪ Based on street configuration and high traffic volume, operation of a streetcar through this segment may require traffic impact mitigation and be operationally difficult. Construction may be more difficult due to possible maintenance of traffic work restrictions. Additional study is necessary.		
D	▪ Segment passes through hospital complex; maintaining emergency vehicle access during construction would be necessary, and there may be sensitivity toward construction activities and possible electromagnetic interference with sensitive laboratory equipment. ▪ Based on the street configuration and current traffic volume, streetcar operation is not likely to increase traffic congestion nor does current traffic volume appear likely to impede streetcar operation through this Segment.	L	North Downtown Central
E	▪ Grades in this segment do not exceed the vehicle max of 9%, but there are stretches where the grade is between 5%-9%. ▪ Based on street configuration and high traffic volume, operation of a streetcar through this segment may require traffic impact mitigation and be operationally difficult. Construction may be more difficult due to possible maintenance of traffic work restrictions. Additional study is necessary. ▪ Option to proceed directly from Stadium Way to Division Avenue, instead of going by way of E and N 1st Streets, is impractical due to grade exceeding 18%.	M	North End, North End Central, & North Downtown Central
F	▪ Proposed 14% grade just to the south of the Sounder Commuter Rail Bridge over Pacific Ave (under construction) and existing grades on Pacific Ave in excess of 10% between S 28th Street and I-5 fatally flaw using Pacific Ave between the intersection of Pacific Ave & S Tacoma Way and S 38th Ave. ▪ Alternative route utilizes Delin Street from the intersection of Pacific Ave & S Tacoma Way to S 38th St. ▪ Grades in this segment (via Delin St.) do not exceed the vehicle max of 9%, but there are stretches where the grade is between 5%-9%. ▪ Significant grading and retaining wall structures would be required from Pacific	H (original) H (alternative)	South End

Segment	Key Engineering Considerations	Rating	Alternatives Affected
	Ave to Delin St due to grade differential and sloping terrain. ▪ Based on street configuration and high traffic volume, operation of a streetcar through this segment may require traffic impact mitigation and be operationally difficult. Construction may be more difficult due to possible maintenance of traffic work restrictions. Additional study is necessary. ▪ Segment crosses two existing bridges (I-5 on Delin and S 38th Streets), need to evaluate feasibility. ▪ Segment passes under one proposed bridge (Sound Transit over Pacific Avenue), overhead clearance appears to be sufficient.		
G	▪ Segment passes under one existing bridge (E L Street over E 25th Street), need to verify overhead clearance. ▪ Based on the street configuration and current traffic volume, streetcar operation is not likely to increase traffic congestion nor does current traffic volume appear likely to impede streetcar operation through this Segment.	L	Pacific Highway, Eastside
H	▪ Segment passes under two existing bridges (Tacoma Rail and I-5 over Portland Avenue), need to verify overhead clearance. ▪ Grades in this segment do not exceed the vehicle max of 9%, but there are stretches where the grade is between 5%-9%. ▪ Based on the street configuration and current traffic volume, streetcar operation is not likely to increase traffic congestion nor does current traffic volume appear likely to impede streetcar operation through this Segment. ▪ Terminal station site at Portland Avenue & E 72nd Street requires minor ROW take from an existing gas station; environmental remediation may be necessary.	L	Eastside
I	▪ Segment crosses one existing bridge (BNSF Railway, Puyallup River and Union Pacific Railroad via multi-span through truss on Eells Street/Pacific Highway/SR 99), need to evaluate feasibility. ▪ Insufficient data is available to judge feasibility of streetcar operation with respect to street configuration and traffic volume. ▪ Terminal station site at Pacific	L	Pacific Highway

Segment	Key Engineering Considerations	Rating	Alternatives Affected
	Highway/SR 99 and Sproule Road requires minor ROW take from an existing gas station; environmental remediation may be necessary. ▪ Grades in this segment do not exceed the vehicle max of 9%, but there are stretches where the grade is between 5%-9%.		
J	▪ This segment displaces a major pedestrian stairway through the UW-Tacoma campus and contains grades that range between 12% and 16%, which are far steeper than a streetcar can accommodate. ▪ Given that the vehicle max grade is 9%, an alignment with such a profile would make necessary a cut-and-cover tunnel along S 19th Street between Fawcett Avenue and MLK Jr. Way, a distance of approximately 2,040 feet, with a maximum depth of nearly 80 feet in the vicinity of I Street; an open, retained cut would be necessary for most of the remainder of this segment as the tracks transition from street level to the tunnel. ▪ Due to the 9% grade meeting the existing S 19th Street surface west of MLK Jr. Way, the junction with Segments A and/or D would have to be relocated to the intersection of S 19th Street and M Street, affecting the alignment of the south end of Segment D. ▪ There would be significant disruption to S 19th Street during construction, and a portion of the street between Tacoma and Jefferson Avenues may need to be either permanently closed or converted into a paired one-way operation with westbound-to-eastbound U-turns permitted at the Tacoma Avenue intersection. ▪ The open, retained cut would permanently interrupt through movements on numerous streets that currently cross S 19th Street, such as Fawcett and Jefferson Avenues unless the open cut is lidded to allow these streets to cross. ▪ This segment's proposed junction with the existing Tacoma Link line would likely require relocation of the existing Union Station streetcar stop eastward. ▪ It is assumed that there would be no stations in this segment due to the elevation differences. Any proposed station sites between Jefferson Avenue and L Street would be grade-separated from	H	South Downtown to MLK, South Downtown Central

Segment	Key Engineering Considerations	Rating	Alternatives Affected
	the street network, requiring elevators and stairs to connect platforms to the surface; a wider cut would also be necessary to accommodate the platform(s). ▪ With a cover over the tracks to return S 19th Street to its existing configuration, provision of emergency access/egress from the tunnel will have to be investigated. Depending on length, codes, and other considerations, the cut-and-cover segment may require a ventilation system in case of fire or other emergencies. There will also be long-term costs associated with maintaining the cover structure. ▪ There is significant risk associated with construction of this segment. Given the depth of excavation required, there are many risks that are unknown and need to be considered. Such risks may include unknown soils and the potential to encounter rock, utilities and how to handle crossings and gravity flow systems, and shoring during construction. These risks, and many others, need to be considered when evaluating this alternative.		

Given that the portion of the South Downtown Central Alternative along Segment J (Pacific Avenue to Jefferson Street through the UW-Tacoma Campus) will be difficult to construct, have a significant impact on the surrounding neighborhood during construction and has a high degree of risk, an alternative to reaching Tacoma Community College via S 19th Street is as follows:

Table 4 South Downtown Central Alternative - Modified

Alternative	Segments	Segment Description	Segment Length (miles)	Alternative Length (miles)
South Downtown Central - Modified *(Blue/Orange/Green)*	E	Extends north from the 9th/Theater District Station (N7) via Stadium Way, continues northwest and southwest via N E St, N 1st St, and Division Ave to N I St (N6)	0.63	5.40
	D	Continues from N I St/ Division Ave (N6) to MLK Jr. Way then south on MLK Jr. Way to S 19th Street (N5)	1.20	
	A	Continues west on S 19th St from MLK Jr. Way (N5) to Mildred St (N1)	3.57	

We recommend that a conceptual cost estimate be developed for the modified South Downtown Central alternative rather than excluding the entire alternative due to the impracticality of one segment.

3. Conclusions

All of the alignment alternatives appear to be feasible from an engineering perspective; however, there are clearly some segments of the alignments that are more challenging than others, including one segment which is fatally flawed mainly due to excessive grades: the portion of Segment F (South End Alternative) between S 25th Street and S 38th Street. Although Segment J has considerable construction difficulty, impact and risk, Tacoma Community College can still be served via S 19th Street (Segment A) by connecting through Segments E and D. This results in a considerably longer alignment alternative and its benefits need to be evaluated against its costs. Segment F becomes feasible with a the small modification of diverting to Delin Street from Pacific Avenue just south of the new Sounder underpass.

Future study is required to evaluate all of the potential engineering constraints for each alternative. In particular, further investigation should focus on detailed analysis of existing utilities including type, size and location, existing traffic patterns and densities, vertical clearances at underpasses and the structural suitability of the existing bridges to accommodate streetcars.

Appendix D
Tacoma Link Extension: Streetcar and Light Rail Characteristics and Extension Configuration Assumptions

TECHNICAL MEMORANDUM

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Tacoma Link Extension: Streetcar and Light Rail Characteristics and Extension Configuration Assumptions

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PREPARED BY:	Kevin Collins & Luke Olson, HDR
COPIES:	David Knowles, CH2M HILL Kate Lyman, CH2M HILL
DATE:	April 18, 2011

1. Introduction

The purpose of this memorandum is two-fold. First it is intended to present some of the major differences in physical and operational characteristics, scale, construction and cost between typical modern streetcar systems and light rail systems. Secondly, it is intended to define the basic Tacoma Link Extension system configuration assumptions that will be used to prepare the estimates of probable cost. It is critical that Sound Transit review and agree with the following assumptions as they will serve as the basis for the engineering evaluation of the alternatives and cost estimates.

2. Background

Every streetcar system is different but most fit within a typical typology. They are primarily planned to serve a circulation transportation function, improving urban mobility by connecting neighborhoods with activity centers and other transit nodes. While part of the regional transit system, their role is to feed the transportation modes that make up the trunk of the regional system, typically light rail, commuter rail and express buses. Typically, a streetcar system is designed to minimize impacts to adjacent infrastructure, have simplified and cost effective features and blend into the existing traffic and urban landscape. Most often, they share lanes with existing bus, truck and automobile traffic which, in rail transit terms is referred to as a "shared or mixed-use guideway". Their average travel speeds are relatively low and stops are closely spaced providing easy walk access, somewhere between that of a local bus route and a light rail system.

Light rail systems by contrast typically serve as the trunk of the regional transportation function where travel time is the main goal resulting in higher operating speeds, less frequent stations and a need to reduce the number of interfaces between the light rail track and other transportation modes. This drives the physical configuration of light rail systems to "semi-exclusive guideway", where light rail trains do not share the guideway

with other transportation modes, but other transportation modes can cross the guideway at controlled at-grade crossing locations or "exclusive guideway" where there is no interface between the light rail train and other transportation modes at all.

The Central Link Light Rail guideway along Martin Luther King Way in the Rainier Valley is a semi-exclusive guideway while the portions of elevated guideway from Rainier Beach to the Airport is an exclusive guideway. The Downtown Transit Tunnel is an exclusive guideway but is unique since it is shared with buses at least for now. The Seattle Streetcar running along Westlake and Terry Avenues is a shared guideway.

This need to minimize or eliminate modal interfaces is critical as it drives the system's physical characteristics (i.e. guideway type) and therefore the size, scale and cost of the built transit system. These distinctions will be explained in more detail in the sections that follow.

3. Existing Tacoma Link Characteristics

The existing Tacoma Link is actually a combination of streetcar and light rail transit modes both in physical and operational character. Physically, the portion of Tacoma Link from its northern/eastern terminus at Freighthouse Square/Tacoma Dome Station to the Tacoma Convention Center is more light-rail like as it operates in a semi-exclusive guideway in 25th Street and Pacific Avenue. It is our understanding that the planning for Sound Move, the regional transit plan enacted by the voters in 1996, anticipated that this portion of the Tacoma Link could one day be connected to the light rail system to Seattle and points north thus the need for semi-exclusive guideway and more robust track, power and train control sub-systems. However, current thinking, including that of the Tacoma Streetcar Stakeholders Group, is that typical modern streetcar may be more congruent with the unique character and scale of Downtown Tacoma and its neighborhoods. While the Tacoma Link may remain to be a separate system physically, it is still a critical part of the regional transit system since it feeds the light rail, commuter rail and express bus systems via direct transfer at Tacoma Dome Station.

The portion of Tacoma Link from the Convention Center to its western terminus at 9th Street is more modern streetcar like as it operates in a shared use guideway where it mixes with rubber-tired vehicles, stations are smaller and more utilitarian and train control is accomplished through the existing city traffic lights.

Figure 1 Existing Tacoma Link in Semi-Exclusive Guideway in E 25th Street

The total route length of the existing Tacoma Link is 1.6 miles end to end. It is mainly single track with a short section of double track between UW Tacoma and the Convention Center. It was built for a cost of $80.4 million in 2003 which is on the higher end of the capital cost range for modern streetcar systems built around the

same time. This is largely due to the nearly one-mile segment of semi-exclusive guideway and the traction power and train control subsystems. Table 1 shows the capital cost data for some existing modern streetcar systems currently in operation.

Table 1 - Representative Capital Cost of Peer Streetcar Systems (Year of Expenditure $)

Streetcar System	System Length (Route Miles)	Total Project Cost ($ Millions)	Cost Per Route Mile ($ Millions)
Portland Streetcar (Central City, Ph I & II)	2.4	$ 56.9	$ 23.7
Portland Streetcar (Riverplace Extension)	0.6	$ 16.0	$ 26.7
Portland Streetcar (Gibbs Extension)	0.6	$ 15.8	$ 26.3
Portland Streetcar (Lowell Extension)	0.4	$ 14.5	$ 36.3
Seattle Streetcar (South Lake Union)	1.3	$ 52.1	$ 40.1
Tacoma Link	1.6	$ 80.4	$ 50.3

4. Tacoma Link Extensions - Configuration Assumptions

In order to ensure an accurate assessment and opinion of probable cost is developed, the project team proposes a set of key assumptions for the potential Tacoma Link extensions. These are based on our experience planning and designing streetcar systems in other cities of similar scale to Tacoma and to incorporate feedback from the stakeholder group on community values for the project. Therefore, for the purpose of this study and cost estimating purposes, it will be assumed that the Tacoma Link extensions will be configured and operate as typical modern streetcar, in existing traffic lanes shared with other traffic. However, there may be instances where the streetcar will operate in an exclusive lane in order to by-pass congestion, pass through low-clearance underpasses or accomplish unique traffic maneuvers such as queue jumps.

The key system configuration assumptions follow. These assumptions address the major project components that have the largest affect on the scale and cost of the streetcar project and determine the basic configuration of the project. Other design elements such as the specific track alignment will be addressed in future phases of project development.

Vehicles:

Streetcars are typically 65 long, 8 feet wide, double-articulated, steel wheel on steel rail and are operated as single cars. By contrast, light rail vehicles are usually about 90 feet long, 8.5 feet wide, double-articulated, and steel wheel on steel rail and operated in two to four car trains. The smaller size and reduced scale of streetcars fit their intended function and allow them to share the road with other travel modes; accessing places and streets such as residential neighborhoods that light rail cannot, due to its much larger scale. The larger size and scale of light rail vehicles also fits their function, as the trunk of regional transit systems typically have very high number of passengers as their ridership capture areas are large geographic areas, fed by multiple modes of transportation and traveling to and from dense urban cores.

For the purpose of this alternatives study, it is assumed that any future Tacoma Link extension will have to be designed to accommodate the existing streetcar fleet and that all future vehicles would have similar characteristics such as length, location of ADA boarding, vehicle loading (for structural deign) etc. Sound Transit should notify the project team if additional vehicles types need to be considered as part of a potential future fleet as this will affect the route alternatives that are feasible as well as the cost estimates.

Streetcar Stops:

Figure 2 Typical Modern Streetcar Station Stop. Note seamless integration with sidewalk.

Stops are an area which can significantly increase costs of a system. Many light rail systems have stations that cost in the $1 to $3 million range (or even higher for exclusive guideway systems) with large custom structural canopies, increased capacity and multiple passenger amenities. Streetcar systems such as Seattle or Portland have taken a simplified approach and have kept costs for most stations under $100k. For the Tacoma Link extensions, it is assumed that a similar approach will be taken. The proposed stops would, in general, have the following features and characteristics:

- Dimensions: Approximate length would be 45-60 feet and 8-12 feet wide depending on side or center location
- Shelter: Stop will have a basic shelter akin to a bus shelter
- Next "streetcar" display: Stop will have automated display indicating time until next streetcar
- ADA boarding: Will be accommodated using vehicle-deployed bridge plates similar to the current stops/vehicles
- Station appurtenances such as benches, trash receptacle, and railings as needed.

Traffic signals:

Streetcars typically operate in the existing traffic lanes and are controlled by the same traffic signals as automobile users whereas for light rail, the need to keep other vehicles off the guideway and increased travel speeds necessitates a dedicated train control system that is interconnected with the traffic signal system.

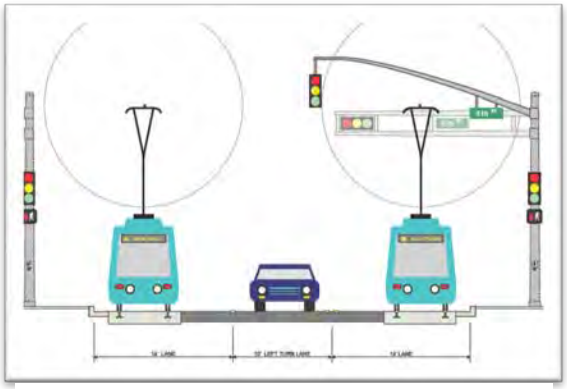

Figure 3 Typical Traffic Signal Modification

Even with streetcars, the overhead trolley wire used to power the vehicles can create a conflict between the existing

traffic signal head or mast arm. Typically a 10 foot minimum clearance around the wire is used for all elements that will require maintenance such as traffic signal heads. This is to comply with OSHA requirements. Workers can be certified and allowed to operate as close as 3 feet, 8 inches to the wire but it is more desirable to have at least 10 feet clear. In many cases, traffic signal mast arms will be shortened and/or removed in order to provide the appropriate clearance. The signal heads will be relocated to a different spot on the mast arm or pole mounted as required to obtain the desired clearances. In general, the approach to streetcar projects has been to minimize the amount of modifications to what is absolutely necessary and maximize the reuse of as much of the existing equipment as possible.

Guideway Type/Construction Limits:

Figure 4 Example of a shared use guideway on Westlake Avenue in Seattle.

In order to contain costs and minimize impacts, the design approach to a typical streetcar is to limit construction to that which is absolutely necessary. Often, the track construction can be limited to 1 foot on either side of the track with grind and overlay to make up any minor grade differences and blend the track into the existing roadway cross slope. In some cases, where the existing roadway has been overlaid several times the existing cross slope can get quite steep. In these instances, it may be necessary to reconstruct more than just the travel lane with the track. By contrast, the construction of semi-exclusive guideways are major endeavors since the guideways are essentially a separate facility from the existing road yet all existing modes must still be accommodated within the road right of way. Semi-exclusive guideway construction often extends from right of way line to right of way line and can cause major disruption during construction. Exclusive and semi-exclusive guideways typically require additional right of way in order to fit the guideway in the transportation corridor while still accommodating existing modes.

For the purposes of the Tacoma Link's project and cost estimating, HDR will assume a shared-use guideway and an average amount of roadway work based on the experience of other streetcar projects.

Street lighting:

Based on the observations, it is anticipated that some street lights may be in conflict with the overhead conductor wire which powers the streetcar. This is mostly due to maintenance access and OSHA clearances. Many lights such as cobra heads also require lift buckets to access and change the light bulbs. In final design, all lights will have to be evaluated for actual conflicts with the wire and to ensure proper access is obtainable while maintaining OSHA clearances.

For the purpose of this study and the cost estimate, an allowance will be developed to anticipate some light modifications and/or relocations.

Utilities:

Utility conflicts are one of the greatest risks and unknowns for a project in the early stages of development. In addition, there are many factors in determining conflicts and what entity bears the cost of relocation should it be necessary. In general, every city and/or project has different guidelines for determining conflicts. It can vary depending on access requirements, condition and age of the utility and franchise agreements.

Figure 5 Shared use guideways provide better access to existing utilities than semi-exclusive guideways which guides utility accommodation policies.

Generally speaking, semi-exclusive guideways require more existing utility relocations than a streetcar shared guideway. This is because of the difficulty in getting maintenance access to the utility facility in the semi-exclusive guideway if it was not relocated.

For the purpose of this study, a cursory review of the "density" and type of subsurface infrastructure will be utilized to determine the potential magnitude of impact (high, medium or low) for the potential alignments. The density of existing utilities for each alignment will be determined from the existing utility maps obtained from the City of Tacoma and Tacoma Public Utilities. The guidelines for determining conflicts and a detailed investigation should be determined in future stages of the project through review of utility franchise agreements and negotiation.

Overhead Contact System:

Figure 6 Single-wire OCS. Note span wire attachment to streetlight pole.

Unlike the current Tacoma Link system which utilizes a double wire catenary system, most modern streetcar systems use a single wire called a trolley wire to provide power to the vehicles. It's not limited to just streetcar as some light rail systems transition from a catenary two-wire system to a trolley wire in the downtown areas to lessen the visual impacts. For this study, it is assumed that a simplified single wire OCS system will be implemented for any of the possible extensions. In addition, as typical of other streetcars, it is anticipated that the trolley wire support poles will be shared with light poles and traffic signals wherever possible to minimize pole clutter and reduce costs.

Typical Characteristics of a Streetcar OCS:

- Typical Wire height: 18 – 19 feet
- Typical Pole/OCS support spacing: 80-120 feet

Traction Power Substations:

Figure 7 Typical Streetcar Traction Power Substation

The traction power system will be based on a typical streetcar operation using modern streetcar vehicles. It is assumed to have the capacity to handle single vehicles at 5-10 minute headways with no anticipation of future light rail with multi-car train sets. Based on this type of operation, typical of streetcar, the general approach has been to have smaller substations more frequently spaced and avoid costly duct banks. The smaller substations are less costly but are also more flexible in terms of where they are located. There are new, ultra compact, substations that are being introduced to the market which are capable of fitting into a single parking stall of a parking garage. Below are some common characterizes of a typical streetcar traction power system as assumed for this project:

- Power: Typical service is 480/240 vac 600amp local utility service for 500kW substations supplying 750 vdc to the vehicle traction motors
- Spacing: Spaced approximately 1 every ½ route mile or 1 per track mile.
- Approximate size: 20 x 12 feet for typical prepackaged substation; Ultra compact substation approximately 15 x 5 feet.

Maintenance and Storage Facility:

With any expansion, and increase in the number of streetcar vehicles, consideration for additional maintenance and storage is important. The existing Tacoma Link maintenance and storage facility (MSF) may have some additional capacity, however, some expansion should be expected. For this study it will be assumed that a new maintenance bay and/or facility will be needed per four additional vehicles. Additional storage track will also be required for each additional vehicle expected.

Figure 8 Existing Tacoma Link MSF

5. Conclusion

Typical modern streetcar systems serve a very specific purpose, providing increased connectivity and circulation within an urban area. The need to fit and blend into existing neighborhoods requires a transit solution that is true to the scale and character of those neighborhoods. Streetcars serve this purpose well. Their smaller scale and ***shared guideway*** operation, results in less infrastructure, smaller construction footprints and therefore lower cost than systems that operate in a ***semi-exclusive guideway*** such as the northern/eastern portion of the existing Tacoma Link.

The following assumptions will define the configuration and characteristics of the proposed extensions:

Table 2 Tacoma Link Extension System Configuration Assumptions

System Characteristic	Assumption Description
Guideway	Shared use
Vehicle	Typical modern streetcar similar to the current Tacoma Link vehicles
Stops	45 feet long, raised bump-out curb for side stops, raised median for center stops. ADA compliant, minimal furnishings
Traffic Signals and Street Lights	Most modified to raise or shorten cobra heads and mast arms or replace wire mounted traffic signals
Utilities	Relocation determined by the relative density of utilities in the corridor
Traction Power System	Trolley wire, dual-use poles, substations approx. 20′ x 12′, voltage in 240/480 vac, voltage out: 750 vdc
Maintenance and Storage Facility	1-bay expansion of the existing facility

Appendix E
Tacoma Link Extension: Opinion of Probable Capital Cost and Estimating Methodology

Tacoma Link Extension: Opinion of Probable Capital Cost and Estimating Methodology

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DATE: May 20, 2011; Revised August 5, 2011

1 Introduction

This document provides a brief summary of the opinion of probable capital costs and describes the methodology used in developing estimates for each alternative. HDR Engineering is under contract to develop these estimates for the Sound Transit Tacoma Link Pre-Alternatives Analysis Study. The estimates are complete project estimates including all major components of the project such as civil construction, utilities, structures, stations, traction power and communications systems, vehicles, fare collection equipment, right-of-way, professional services, and contingencies.

All estimates are based on the assumption that any of the Tacoma Link extension(s) being considered will be designed to "streetcar standards" as outlined in the previously submitted technical memorandum titled "*Tacoma Link Extension: System Configuration Assumptions*."

In addition, there are technical challenges and feasibility issues with some of the alignment alternatives being considered. These issues are documented in the previously submitted "*Tacoma Link Extension: Engineering Considerations*" technical memorandum which provides a high-level feasibility assessment for each of the alternatives based on engineering opportunities and constraints along each alignment.

1.1 Project Background

The total route length of the existing Tacoma Link is 1.6 miles end to end. It is mainly single track with a ¾ mile section of double track between Union Station and Theater District Station. It was built for a cost of $80.4 million in 2003 which is on the higher end of the capital cost range for modern streetcar systems built around the same time. This is largely due to the nearly one-mile segment of semi-exclusive guideway and the traction power and train control subsystems. With the proven success of the existing system, Sound Transit and the City of Tacoma are studying the possibility of extending the system. The purpose of the initial study, described as a pre-alternatives analysis, is to get a better understanding of the feasibility and cost of a broad range of alternatives, establish budgets and eliminate alternatives that are fatally flawed from further study.

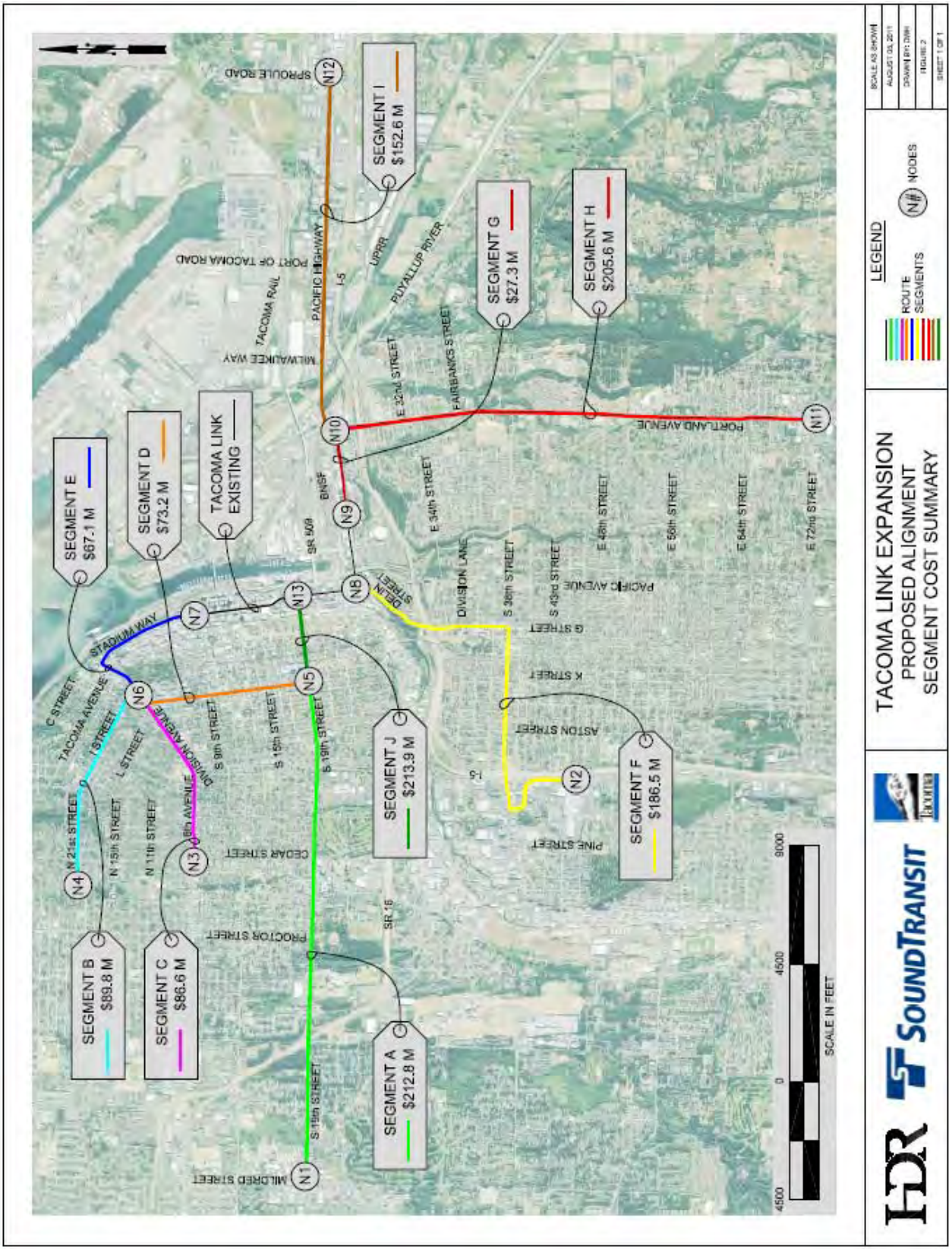
1.2 Streetcar Alignments

Several different streetcar alignments are being considered as possible extensions of the Tacoma Link including extensions to the north, east, west and south of downtown. Because many of the alignment alternatives overlapped or had common elements, they were broken into segments connected by nodes. A node occurs at each point where there is more than one alignment option. A segment is a stretch of an alignment that connects two of the nodes. This was accomplished in order to avoid redundant calculations of overlapping portions of the alignment alternatives and provide flexibility in creating additional alternatives by simply adding up the costs for each segment. Table 1 identifies each alignment for which an opinion of probable capital cost was developed, the segments of the alignment (as shown in Figure 1) and the route length of the alignment. Each alignment is predominantly double track; short stretches of single track occur at terminal stations on all alignments and near the junctions of Segments F and G with the existing Tacoma Link line.

Table 1 - Alignment Alternative Summary

Alignment	Alignment Name	Description	Sgmts	Length
Alignment 1	North End	North From Theater District to Stadium District; west to University or Puget Sound	B, E	2.66 Miles
Alignment 2	North End - Central	North from Theater District to Stadium District; west via Division/6th to Alder/Cedar St	E, C	2.52 Miles
Alignment 3	North Downtown – Central	North from Theater District to Stadium District; west to north end of MLK district and south to 19th	D, E	2.33 Miles
Alignment 4	South Downtown – To MLK	Extends from Union Station West to S 19th St, north through MLK district to Division	J, D	1.83 Miles
Alignment 5	South Downtown – Central	Extends from Union Station West to S 19th St, continues west to Tacoma Community College	J, A	4.20 Miles
Alignment 5a	South Downtown-Central (Modified)	North from Theater District to Stadium District; west to north end of MLK district and south to 19th Street; continues west to Tacoma Community College	A,D, E	5.90 Miles
Alignment 6	South End	Extends from 25th St Station south to 34th & Pacific District to S 38th St, west to Tacoma Mall	F	3.13 Miles
Alignment 7	Eastside	Extends east from Tacoma Dome south towards Salishan to 72nd Street TC	G, H	4.09 Miles
Alignment 8	Pacific Highway	Extends east from Tacoma Dome to Pacific Hwy South at Fife	G, I	3.27 Miles

Figure 1 - Alignment Alternative Segment Overview and Cost *(Costs shown are in YOE 2015)*



1.3 Summary of Costs

An opinion of probable capital cost was developed for each alignment described in section 1.2. The costs for each alignment were developed in current year dollars and then escalated to an assumed year of expenditure of 2015. Table 2 below provides a brief summary of the estimated costs for each alignment considered. A more detailed estimate of each alignment can be found in Appendix A.

Table 2 - Summary of Alignment Alternatives Capital Cost

Alignment	Alignment Description	Current Year *2011.25 (YR)*	YoE *2015.00 (YR)*
Alignment 1	North End (Segments B,E)	$137.9 M	$156.9 M
Alignment 2	North End - Central (Segments E,C)	$135.1 M	$153.7 M
Alignment 3	North Downtown Central (Segments D,E)	$123.3 M	$140.2 M
Alignment 4	South Downtown to MLK (Segments J,D)	$252.3 M	$287.0 M
Alignment 5	South Downtown Central (Segments J,A)	$375.1 M	$426.7 M
Alignment 5a[1]	South Downtown Central Modified (Segments A,D,E)	$310.3 M	$353.1 M
Alignment 6	South End (Segments F)	$163.9 M	$186.5 M
Alignment 7	East Side (Segments G,H)	$204.7 M	$232.9 M
Alignment 8	Pacific Highway (Segments G,I)	$158.1 M	$179.9 M

1) This alignment alternative was created as a feasible option for reaching Tacoma Community College in response to challenging construction conditions in Segment J of the South Downtown Central alternative. It consists of portions of the North End, North Downtown Central and South Downtown Central alignments.

2 Cost Estimate Methodology

The following section outlines the specific approach that was used to develop the opinion of probable capital cost estimates for the Tacoma Link Extension. The methodology herein describes the overall approach used to develop the estimates as well as a detailed description of the cost categories and items that were used to build the estimates.

The costs include provisions for City allowances, including administration, project management, construction management, community relations and involvement, insurance/legal, start up and testing, and training in addition to vehicles, engineering and construction costs. Because of the limited engineering and design many of the items in the cost estimates are represented as allowances. These allowances are based on HDR's experience developing and implementing streetcar projects in other cities, historical data and the engineer's professional judgment.

The estimates were developed following the Federal Transit Administration's Standard Cost Categories (SCC) in order to be easily tracked and audited, and for reporting purposes. A detailed description of the process is described in the following sections.

2.1 Estimate Development

Estimates of project capital costs were developed in four general steps under this methodology.

1. The route and other project components were broken into segments with common end points (nodes).
2. Project cost components, consistent with the level of design, were identified and quantified for each segment.
3. Unit costs were developed for each of the cost components based on HDR's past project experience and other project-specific factors. These cost components were then assembled in a spreadsheet, selective unit costs were applied, and the quantities were summed into the major cost categories.
4. Additional factors such as contingencies, engineering & administration, and year-of-expenditure escalation were applied to the summed cost subtotals to complete the cost estimates.

2.2 Format

The estimate has been prepared using Microsoft Excel spreadsheets. The spreadsheet is organized into three levels. The first level lists the main SCC items and the second level contains the SCC sub-categories. Finally, a third level expands the sub-categories into units of work to provide a level of detail more appropriate for unit pricing. As necessary, the estimate can roll these levels up into a cost summary using the SCC format for reporting purposes.

2.3 Unit Costs

Unit costs were developed from selected historical data, including final engineering estimates, completed projects, standard estimating manuals, and standard estimating practices. A mix of historical data from both local and national roadway and streetcar projects were used in developing the appropriate unit costs and allowances to be applied to the cost estimate. In many cases, due to the lack of detailed engineering, allowances had to be established based on the engineer's and firm's experience. This allowance serves as a place holder until further analysis and design can provide for more accurate and quantifiable units of work.

2.4 Escalation Factor

In order to establish accurate project budgets an escalation factor must be used. The purpose of an escalation factor is to account for anticipated inflation and increase in the cost of construction, materials and labor over time. The escalation factor is used to take the current year estimate and project it to a future base year or year of expenditure (YoE). For the purpose of this study, the YoE is the year in which the mid point of construction is anticipated. HDR Engineering has assumed 2015 as the year of expenditure for all estimates.

The factor by which the current year estimate was escalated to the YoE was assumed to be 3.5%. This value was not established using any scientific method or publications and should be reviewed by Sound Transit for concurrence. It is a reasonable estimate of the possible inflation that could be expected given the constant fluctuation in the economy and

cost of material, fuel and labor. The actual inflation or escalation realized over the next several years could be more or less than the assumed value.

2.5 Cost Categories

Cost categories consistent with the FTA Standard Cost Categories (SCC) and sub-categories were used to summarize the unit prices into a comprehensive total estimate for each segment or alternative. The major cost categories are listed and described in greater detail below:

SCC 10: Guideway and Track Elements

SCC 20: Stations, Stops, Terminals, Intermodal

SCC 30: Support Facilities: Yards, Shops, Admin Buildings

SCC 40: Sitework & Special Conditions

SCC 50: Systems

SCC 60: ROW, Land, Existing Improvements

SCC 70: Vehicles

SCC 80: Professional Services

SCC 90: Unallocated Contingency

SCC 100: Finance Charges

Capital costs for the first seven categories (SCC 10-70) were calculated by using known unit costs and measured quantities for each component. System-wide costs and allowances are calculated based on route length and not from measured quantities. A per track-foot unit cost is developed from historical data to apply to the track length. The final three categories (SCC 80-100) are calculated as a percentage of construction costs (excluding vehicle procurement).

2.5.1 Quantifiable Cost Components (SCC 10-70)

The assumptions included in each cost components quantified in SCC categories 10-70 are detailed in Table 3 below. All cost items include material, labor and delivery costs for procuring and installing the item.

Table 3 - SCC Items 10 through 70 Key Assumptions

Item #	Item Description	Unit	Item Assumptions
10.04.01	Alignment Over Existing Bridge	TF	This item is for any alignment which crosses an existing structure. It assumes the existing structure only requires minor improvements. The item assumes all costs for track, deck improvements and an overlay (~20ft width)
10.04.02	New Streetcar Viaduct	TF	This item is for any new structure that may be required for a potential alternative. It is assumed to be a transit only structure approximately 26ft wide.

Item #	Item Description	Unit	Item Assumptions
10.06.01	Cut-and-Cover Tunnel with Soldier Pile Walls	LS	This item is for the cut-and-cover tunnel required along S 19th Street as a result of existing grades in excess of the 9% maximum a streetcar can operate upon. Cost assumes an excavated trench supported by soldier pile walls, a reinforced concrete floor slab, a reinforced concrete cast-in-place box girder tunnel ceiling, and backfill to existing ground level. The possible need for emergency egress, fire safety and/or ventilation systems was not evaluated and this item does not cover such potential extra costs.
10.08.01	Retaining Wall <10ft Tall	LF	This item is for any potential areas where retaining walls may be required. Cost is assuming a MSE or cantilever wall type is used. (<10ft)
10.08.02	Retaining Wall >10ft Tall	LF	This item is for any potential areas where retaining walls may be required. Cost is assuming a MSE or cantilever wall type is used. (>10ft)
10.10.01	Furnish Rail - Assume 112TRAM Block Rail	TF	This item is for the rail procurement. It assumes 112 TRAM block rail (a domestic replacement for girder rail).
10.10.02	Embedded Track - Construct Track Slab	TF	This item is for the actual construction and installation of the embedded track. It includes excavation and base rock. All materials and labor are included except for rail counted in item 10.12.01.
10.12.01	Embedded Turnout - Furnish and Install	EA	This item is for any anticipated turnouts to connect the proposed alignments to the existing track or at terminus locations for switching track.
10.12.02	Embedded Crossing - Furnish and Install	EA	This item is for any crossings that may be required to connect the proposed and future track.
20.01.01	Streetcar Stop - Basic 1 Car	EA	This item is for a standard streetcar stop with a simple shelter and next streetcar display. It includes all excavation, construction and furnishing for the stop.
20.01.02	Streetcar Stop - Premium 1 Car	EA	This item is for a premium stop which may be required in some locations. It will not be used unless a particular stop is identified as needing a special canopy or design.
20.02.01	Aerial Streetcar Stop	EA	This item is only needed in the event that a stop will be elevated such as on a structure. It accounts for the additional premium of building on a structure and providing access through ramps and stairs.
30.02.01	Maintenance Facility Expansion: Allowance ($500k/New Vehicle)	EA	This item is an allowance which provides a dollar amount per new vehicle to fund a maintenance facility expansion and/or new facility. It is assumed that 1 stall can maintain approximately 4 vehicles and costs approximately $2 Million per stall.
30.05.01	Yard and Storage Track Expansion: Allowance ($200k/New Vehicle)	EA	This item is an allowance which provides a dollar amount per new vehicle to fund the maintenance yard storage capacity. It assumes approximately 100-200ft of track will be required per vehicle (to account for transition track, turnouts, etc.)

Item #	Item Description	Unit	Item Assumptions
40.02.01	Utility Relocation - High Allowance (Dense Urban)	TF	This item is an allowance for utility relocations that assume a significant number of utility relocations are expected due to the density of existing utilities and/or type of corridor. An average of 2 or more conflicts is expected.
40.02.02	Utility Relocation - Medium Allowance (Moderate Density)	TF	This item is an allowance for utility relocations that assume a moderate number of utility relocations. Impacts may be intermittent with an average of 1 conflict expected.
40.02.03	Utility Relocation - Low Allowance (Minimal Relocation Expected)	TF	This item is an allowance for utility relocations that assume minimal utility conflicts. It assumes that there is less than 1 conflict and it is intermittent.
40.06.01	Pedestrian Improvement Allowance (Per Intersection)	EA	This item is an allowance for upgrades to the existing sidewalk and pedestrian infrastructure. It includes items such as upgrading ADA ramps to be compliant with current regulations. This allowance is based off assuming 3/4 of all existing ramps at an intersection are non-compliant and need to be reconstructed.
40.07.01	Roadway Improvement Allowance	TF	This allowance is intended to cover any additional pavement reconstruction and/or overlay that may be required outside of the track slab. It will be based off experiences and averages from other streetcar projects.
40.07.02	Track Drainage Allowance	TF	This is an allowance for installing track drainage and minor adjustments in the existing storm water system.
40.07.03	Street Lighting Allowance (Adjustments, Relocations, New)	TF	This is an allowance to account for minor conflicts with the existing street lights. Conflicts include direct conflicts or as a result of eliminating access.
40.08.01	Temporary Maintenance of Traffic	LS	This item is to account for the traffic control required during construction. It is taken as a percentage of the direct construction costs
40.08.02	Contractor Indirect (Staff, Office, etc.)	LS	This item is to account for the contractor indirects during construction including staff, field offices, vehicles, etc.
40.08.03	Art in Transit (1% of Construction)	LS	This item is common to all projects with federal funding.
50.01.01	TWC Control for Connection to Existing Streetcar Track	EA	This item is an allowance to account for special wayside controls and controller equipment that will be required for a connection to the existing track including twc loops, train signals, powered switch controls, etc.
50.02.01	Modify Existing Traffic Signal	EA	This is an allowance for modifying any existing signals along the alignment. Because of the OCS wire, modifications such as shortening the mast arm are common for streetcar projects.
50.02.02	New Traffic Signal Allowance	EA	This is an allowance for a new signal. Detailed analysis is not part of the scope of this study, however, for locations where it is clear a new signal will be required, this item will be used.

Item #	Item Description	Unit	Item Assumptions
50.02.03	Signal Priority Allowance	TF	This is an allowance to upgrade any of the existing signal equipment along the alignment to allow for signal priority. It is assumed that much of the equipment is in place today and only minor upgrades will be required.
50.03.01	Traction Power Substation (Assume 1/Track Mile or 1 per 0.5 Rt. Mile)	EA	This item is to account for the cost to procure and install a traction power substation including any feeder lines to connect between the substation and alignment.
50.04.01	Overhead Trolley Wire Allowance (Poles, wires, appurtenances)	TF	This item is an allowance for the procurement and installation of an OCS system assuming a trolley wire. It includes all costs such as poles, wires, supports, etc.
50.05.01	Communications Allowance	LS	It is assumed that no communications system will be installed
50.06.01	Fare Collection	LS	It is assumed that fare collection will occur on the vehicle, not the station.
60.01.01	Right of Way Acquisition	SF	This item accounts for specific ROW acquisition that was identified during quantity takeoff.
60.01.02	Right of Way Allowance	TF	This item is to account for any potential ROW acquisition, easement, lease or license agreement costs that are unknown at this time but may be required as project development advances.
70.01.01	Modern Streetcar Vehicle (Assumes wired system)	EA	This item is for one additional vehicle. It is assumed that approximately 1 new vehicle will be required per track mile for approximately 10-minute headway operation; this value accounts for acquisition of spare vehicles. In order to distribute the cost of the vehicles equally among the alignment alternatives, vehicles will be prorated at a rate of 1vh/mile of total track length.
70.07.01	Spare Parts for New Vehicles (Per Vehicle)	EA	This is an allowance for spare parts for each new vehicle.

2.5.2 Allocated Contingencies (SCC 10-70)

Contingency is typically included in an estimate to address uncertainties based on the current level of engineering design. The contingency allowance addresses the potential for quantity fluctuations and cost variability when items of work are not readily apparent or unknown at the current level of design. Contingency is assigned in two major categories, allocated and unallocated. Unallocated contingencies are covered by SCC 90. Allocated contingencies are line item contingencies applied to each item in SCC 10 through SCC 70.

Based on the extremely limited level of design development of the pre-alternatives analysis, an allocated contingency of 30 percent was selected and applied to the items in cost categories 10-70. The percentage selected is based on professional experience and judgment related to the potential variability of costs within each of these cost categories. The table below lists the percentages that will normally be used for allocated contingencies during early conceptual design.

2.5.3 Professional Services (SCC 80)

This category includes the costs for engineering, administration and construction management services. Costs for these services will be based on a percentage of the total cost of all direct capital cost categories except vehicles and right-of-way. The percentages are

applied individually and not cumulatively. The following percentages were used for this estimate:

Table 4 - Professional Services Cost as a Percentage of Construction Cost

Professional Services Percentages For Estimates	
Description	**Percentage**
80.01 - Preliminary Engineering	3
80.02 - Final Design	7
80.03 - Project Management for Design and Construction	5
80.04 - Construction Administration and Management	6
80.05 - Insurance	3
80.06 - Legal; Permits; Review Fees	2
80.07 - Survey, Testing, Investigation, Inspection	2
80.08 - Start-up Costs	2
Total	30%

2.5.4 Unallocated Contingency (SCC 90)

Both allocated and unallocated contingency are typically used to estimate early level opinion of probable capital costs. Unallocated contingencies are intended to cover the unknowns not yet identified, quantifiable or known at a given stage of project development. Typically the unallocated contingency at the early pre-conceptual engineering stage would be 25% of project costs.

2.5.5 Finance Charges (SCC 100)

This category includes finance charges expected to be incurred to complete the project. Costs are typically derived from the project financial plan which will be developed in future phases of project development. At this stage, Finance Charges are not assumed or included in the estimate.

3 Conclusion and Limitations

The opinion of probable capital costs developed as part of the Pre-Alternatives Analysis are conceptual in nature and based on limited engineering data. HDR accomplished a high level engineering screening (May 3, Engineering Considerations memo), documented system assumptions (April 18, Configuration Assumptions memo) and this cost methodology to support the estimates that were produced. It is important that Sound Transit reviews and understands all three documents as they serve as the basis of the estimate. For convenience, copies of the previous two memoranda mentioned are included in Appendix B.

The primary objective of these estimates is for comparative purposes and to establish an order of magnitude budget as the project moves forward into a more detailed alternatives analysis process. As more detailed design and analysis occur during the alternatives analysis and preliminary engineering, the estimates produced should be reviewed and refined. The project costs estimated as part of the pre-alternatives analysis with limited

engineering and investigation may be higher or lower than actual costs and are intended to only serve for establishing an order of magnitude budget and to compare alternatives.

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Appendix A – Detailed Cost Estimates

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			Alignment 1	North End (Segments B,E)								Current Year		*Inflation Rate*
			5.2 Track Miles	Approximately $30 Million Per Track Mile								*2011.25 (YR)*		*3.50%*
SCC	**SCC Sub**	**Item #**		**Item Description**	**Unit**	**Unit Cost**	**Quantity**	**Item Cost**	**A. Cont.**	**Item Cont.**	**Subtotal**	**YoE**	**Subtotal YoE**
10				**GUIDEWAY & TRACK ELEMENTS (route miles)**				**$12,688,015**		**$3,806,405**	**$16,494,420**		**$18,765,639**
	10.04			Guideway: Aerial structure				$270,900		$81,270	$352,170		**$400,662**
		10.04.01		Alignment Over Existing Bridge	TF	$700	387.0	$270,900	30%	$81,270	$352,170	2015	**$400,662**
		10.04.02		New Streetcar Viaduct	TF	$7,000	0.0	$0	30%	$0	$0	2015	**$0**
	10.06			Guideway: Underground cut & cover				$0		$0	$0		**$0**
		10.06.01		Cut-and-Cover Tunnel with Soldier Pile Walls	LS	$55,521,389	0.0	$0	30%	$0	$0	2015	**$0**
	10.08			Guideway: Retained cut or fill				$0		$0	$0		**$0**
		10.08.01		Retaining Wall <10ft Tall	LF	$800	0.0	$0	30%	$0	$0	2015	**$0**
		10.08.02		Retaining Wall >10ft Tall	LF	$1,600	0.0	$0	30%	$0	$0	2015	**$0**
	10.10			Track: Embedded				$11,517,115		$3,455,135	$14,972,250		**$17,033,872**
		10.10.01		Furnish Rail - Assume 112TRAM Block Rail	TF	$75	27417.8	$2,056,335	30%	$616,901	$2,673,236	2015	**$3,041,330**
		10.10.02		Embedded Track - Construct Track Slab	TF	$350	27030.8	$9,460,780	30%	$2,838,234	$12,299,014	2015	**$13,992,542**
	10.12			Track: Special (switches, turnouts)				$900,000		$270,000	$1,170,000		**$1,331,105**
		10.12.01		Embedded Turnout - Furnish and Install	EA	$250,000	3.0	$750,000	30%	$225,000	$975,000	2015	**$1,109,254**
		10.12.02		Embedded Crossing - Furnish and Install	EA	$150,000	1.0	$150,000	30%	$45,000	$195,000	2015	**$221,851**
20				**STATIONS, STOPS, TERMINALS, INTERMODAL (number)**				**$2,437,138**		**$731,141**	**$3,168,279**		**$3,604,539**
	20.01			At-grade station, stop, shelter, mall, terminal, platform				$2,437,138		$731,141	$3,168,279		**$3,604,539**
		20.01.01		Streetcar Stop - Basic 1 Car	EA	$80,000	30.5	$2,437,138	30%	$731,141	$3,168,279	2015	**$3,604,539**
		20.01.02		Streetcar Stop - Premium 1 Car	EA	$200,000	0.0	$0	30%	$0	$0	2015	**$0**
	20.02			Aerial station, stop, shelter, mall, terminal, platform				$0		$0	$0		**$0**
		20.02.01		Aerial Streetcar Stop	EA	$0	0.0	$0	30%	$0	$0	2015	**$0**
30				**SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS**				$3,634,936		$1,090,481	$4,725,416		**$5,376,088**
	30.02			Light Maintenance Facility				$2,596,383		$778,915	$3,375,297		**$3,840,063**
		30.02.01		Maintenance Facility Expansion: Allowance ($500k/New Vehicle)	EA	$500,000	5.2	$2,596,383	30%	$778,915	$3,375,297	2015	**$3,840,063**
	30.05			Yard and Yard Track				$1,038,553		$311,566	$1,350,119		**$1,536,025**
		30.05.01		Yard and Storage Track Expansion: Allowance ($200k/New Vehicle)	EA	$200,000	5.2	$1,038,553	30%	$311,566	$1,350,119	2015	**$1,536,025**
40				**SITEWORK & SPECIAL CONDITIONS**				**$19,881,308**		**$3,282,292**	**$23,163,600**		**$26,353,140**
	40.02			Site Utilities, Utility Relocation				$7,040,360		$2,112,108	$9,152,468		**$10,412,728**
		40.02.01		Utility Relocation - High Allowance (Dense Urban)	TF	$750	1672.0	$1,254,000	30%	$376,200	$1,630,200	2015	**$1,854,672**
		40.02.02		Utility Relocation - Medium Allowance (Moderate Density)	TF	$350	4764.0	$1,667,400	30%	$500,220	$2,167,620	2015	**$2,466,093**
		40.02.03		Utility Relocation - Low Allowance (Minimal Relocation Expected)	TF	$200	20594.8	$4,118,960	30%	$1,235,688	$5,354,648	2015	**$6,091,963**
	40.06			Pedestrian / bike access and accommodation, landscaping				$375,000		$112,500	$487,500		**$554,627**
		40.06.01		Pedestrian Improvement Allowance (Per Intersection)	EA	$15,000	25.0	$375,000	30%	$112,500	$487,500	2015	**$554,627**
	40.07			Automobile, bus, van accessways including roads, parking lots				$3,525,614		$1,057,684	$4,583,298		**$5,214,401**
		40.07.01		Roadway Improvement Allowance	TF	$100	27030.8	$2,703,080	30%	$810,924	$3,514,004	2015	**$3,997,869**
		40.07.02		Track Drainage Allowance	TF	$20	27417.8	$548,356	30%	$164,507	$712,863	2015	**$811,021**
		40.07.03		Street Lighting Allowance (Adjustments, Relocations, New)	TF	$10	27417.8	$274,178	30%	$82,253	$356,431	2015	**$405,511**
	40.08			Temporary Facilities and other indirect costs during construction				$8,940,334		$0	$8,940,334		**$10,171,384**
		40.08.01		Temporary Maintenance of Traffic	LS	$0	63859530.1	$3,192,977	0%	$0	$3,192,977	2015	**$3,632,637**
		40.08.02		Contractor Indirects (Staff, Office, etc.)	LS	$0	63859530.1	$5,108,762	0%	$0	$5,108,762	2015	**$5,812,220**
		40.08.03		Art in Transit (1% of Construction)	LS	$0	63859530.1	$638,595	0%	$0	$638,595	2015	**$726,527**

50		**SYSTEMS**				**$13,476,295**		**$4,042,888**	**$17,519,183**		**$19,931,508**
	50.01	Train control and signals				$300,000		$90,000	$390,000		**$443,702**
		50.01.01	TWC Control for Connection to Existing Streetcar Track	EA	$300,000	1.0	$300,000	30%	$90,000	$390,000	2015	**$443,702**
	50.02	Traffic signals and crossing protection					$1,648,356		$494,507	$2,142,863		**$2,437,927**
		50.02.01	Modify Existing Traffic Signal	EA	$75,000	8.0	$600,000	30%	$180,000	$780,000	2015	**$887,403**
		50.02.02	New Traffic Signal Allowance	EA	$250,000	2.0	$500,000	30%	$150,000	$650,000	2015	**$739,503**
		50.02.03	Signal Priority Allowance	TF	$20	27417.8	$548,356	30%	$164,507	$712,863	2015	**$811,021**
	50.03	Traction power supply: substations					$4,673,489		$1,402,047	$6,075,535		**$6,912,113**
		50.03.01	Traction Power Substation (Assume 1/Track Mile or 1 per 0.5 Rt. Mile)	EA	$900,000	5.2	$4,673,489	30%	$1,402,047	$6,075,535	2015	**$6,912,113**
	50.04	Traction power distribution: catenary and third rail					$6,854,450		$2,056,335	$8,910,785		**$10,137,766**
		50.04.01	Overhead Trolley Wire Allowance (Poles, wires, appurtenances)	TF	$250	27417.8	$6,854,450	30%	$2,056,335	$8,910,785	2015	**$10,137,766**
	50.05	Communications					$0		$0	$0		**$0**
		50.05.01	Communications Allowance?	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	50.06	Fare collection system and equipment					$0		$0	$0		**$0**
		50.06.01	Fare Collection (On Station or in Vehicle?)	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	Construction Subtotal (10-50)						**$52,117,691**		**$12,953,207**	**$65,070,898**		$74,030,914
60		**ROW, LAND, EXISTING IMPROVEMENTS**					**$904,787**		**$180,957**	**$1,085,745**		**$1,235,248**
	60.01	Purchase or lease of real estate					$904,787		$180,957	$1,085,745		**$1,235,248**
		60.01.01	Right of Way Acquisition	SF	$80	0.0	$0	30%	$0	$0	2015	**$0**
		60.01.02	Right of Way Allowance	TF	$33	27417.8	$904,787	20%	$180,957	$1,085,745	2015	**$1,235,248**
70		**VEHICLES (number)**					$20,771,061		$1,168,372	$21,939,433		**$24,960,410**
	70.01	Light Rail					$20,251,784		$1,012,589	$21,264,373		**$24,192,397**
		70.01.01	Modern Streetcar Vehicle (Assumes wired system)	EA	$3,900,000	5.2	$20,251,784	5%	$1,012,589	$21,264,373	2015	**$24,192,397**
	70.07	Spare parts					$519,277		$155,783	$675,059		**$768,013**
		70.07.01	Spare Parts for New Vehicles (Per Vehicle)	EA	$100,000	5.2	$519,277	30%	$155,783	$675,059	2015	**$768,013**
80		**PROFESSIONAL SERVICES (applies to Cats. 10-50)**					**$22,209,274**		**$0**	**$22,209,274**		**$25,267,407**
	80.01	Preliminary Engineering					$2,220,927		$0	$2,220,927		**$2,526,741**
		80.01.01	Percentage of Direct Costs SCC (10-50)	LS	3%	74030914.5	$2,220,927	0%	$0	$2,220,927	2015	**$2,526,741**
	80.02	Final Design					$5,182,164		$0	$5,182,164		**$5,895,728**
		80.02.01	Percentage of Direct Costs SCC (10-50)	LS	7%	74030914.5	$5,182,164	0%	$0	$5,182,164	2015	**$5,895,728**
	80.03	Project Management for Design and Construction					$3,701,546		$0	$3,701,546		**$4,211,235**
		80.03.01	Percentage of Direct Costs SCC (10-50)	LS	5%	74030914.5	$3,701,546	0%	$0	$3,701,546	2015	**$4,211,235**
	80.04	Construction Administration & Management					$4,441,855		$0	$4,441,855		**$5,053,481**
		80.04.01	Percentage of Direct Costs SCC (10-50)	LS	6%	74030914.5	$4,441,855	0%	$0	$4,441,855	2015	**$5,053,481**
	80.05	Professional Liability and other Non-Construction Insurance					$2,220,927		$0	$2,220,927		**$2,526,741**
		80.05.01	Percentage of Direct Costs SCC (10-50)	LS	3%	74030914.5	$2,220,927	0%	$0	$2,220,927	2015	**$2,526,741**
	80.06	Legal; Permits; Review Fees by other agencies, cities, etc.					$1,480,618		$0	$1,480,618		**$1,684,494**
		80.06.01	Percentage of Direct Costs SCC (10-50)	LS	2%	74030914.5	$1,480,618	0%	$0	$1,480,618	2015	**$1,684,494**
	80.07	Surveys, Testing, Investigation, Inspection					$1,480,618		$0	$1,480,618		**$1,684,494**
		80.07.01	Percentage of Direct Costs SCC (10-50)	LS	2%	74030914.5	$1,480,618	0%	$0	$1,480,618	2015	**$1,684,494**
	80.08	Start up					$1,480,618		$0	$1,480,618		**$1,684,494**
		80.08.01	Percentage of Direct Costs SCC (10-50)	LS	2%	74030914.5	$1,480,618	0%	$0	$1,480,618	2015	**$1,684,494**
	Subtotal (10-80)						**$96,002,814**		**$14,302,537**	**$110,305,350**		$125,493,979
90		**UNALLOCATED CONTINGENCY**		**LS**	**25%**					**$27,576,338**		**$31,373,495**
100		**FINANCE CHARGES**								***Current Year Total***		***YoE Total***
	Segment Totals (10-100)									**$137,881,688**		$156,867,474

		Alignment 2	North End - Central (Segments E,C)							Current Year		*Inflation Rate*
		4.9 Track Miles	Approximately $31 Million Per Track Mile							*2011.25 (YR)*		*3.50%*
SCC	**SCC Sub**	**Item #**	**Item Description**	**Unit**	**Unit Cost**	**Quantity**	**Item Cost**	**A. Cont.**	**Item Cont.**	**Subtotal**	**YoE**	**Subtotal YoE**
10			**GUIDEWAY & TRACK ELEMENTS (route miles)**				**$11,234,465**		**$3,370,340**	**$14,604,805**		**$16,615,831**
	10.04		Guideway: Aerial structure				$0		$0	$0		**$0**
		10.04.01	Alignment Over Existing Bridge	TF	$700	0.0	$0	30%	$0	$0	2015	**$0**
		10.04.02	New Streetcar Viaduct	TF	$7,000	0.0	$0	30%	$0	$0	2015	**$0**
	10.06		Guideway: Underground cut & cover				$0		$0	$0		**$0**
		10.06.01	Cut-and-Cover Tunnel with Soldier Pile Walls	LS	$55,521,389	0.0	$0	30%	$0	$0	2015	**$0**
	10.08		Guideway: Retained cut or fill				$0		$0	$0		**$0**
		10.08.01	Retaining Wall <10ft Tall	LF	$800	0.0	$0	30%	$0	$0	2015	**$0**
		10.08.02	Retaining Wall >10ft Tall	LF	$1,600	0.0	$0	30%	$0	$0	2015	**$0**
	10.10		Track: Embedded				$10,984,465		$3,295,340	$14,279,805		**$16,246,079**
		10.10.01	Furnish Rail - Assume 112TRAM Block Rail	TF	$75	25845.8	$1,938,435	30%	$581,531	$2,519,966	2015	**$2,866,955**
		10.10.02	Embedded Track - Construct Track Slab	TF	$350	25845.8	$9,046,030	30%	$2,713,809	$11,759,839	2015	**$13,379,124**
	10.12		Track: Special (switches, turnouts)				$250,000		$75,000	$325,000		**$369,751**
		10.12.01	Embedded Turnout - Furnish and Install	EA	$250,000	1.0	$250,000	30%	$75,000	$325,000	2015	**$369,751**
		10.12.02	Embedded Crossing - Furnish and Install	EA	$150,000	0.0	$0	30%	$0	$0	2015	**$0**
20			**STATIONS, STOPS, TERMINALS, INTERMODAL (number)**				**$2,297,404**		**$689,221**	**$2,986,626**		**$3,397,873**
	20.01		At-grade station, stop, shelter, mall, terminal, platform				$2,297,404		$689,221	$2,986,626		**$3,397,873**
		20.01.01	Streetcar Stop - Basic 1 Car	EA	$80,000	28.7	$2,297,404	30%	$689,221	$2,986,626	2015	**$3,397,873**
		20.01.02	Streetcar Stop - Premium 1 Car	EA	$200,000	0.0	$0	30%	$0	$0	2015	**$0**
	20.02		Aerial station, stop, shelter, mall, terminal, platform				$0		$0	$0		**$0**
		20.02.01	Aerial Streetcar Stop	EA	$0	0.0	$0	30%	$0	$0	2015	**$0**
30			**SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS**				$3,426,527		$1,027,958	$4,454,484		**$5,067,850**
	30.02		Light Maintenance Facility				$2,447,519		$734,256	$3,181,775		**$3,619,893**
		30.02.01	Maintenance Facility Expansion: Allowance ($500k/New Vehicle)	EA	$500,000	4.9	$2,447,519	30%	$734,256	$3,181,775	2015	**$3,619,893**
	30.05		Yard and Yard Track				$979,008		$293,702	$1,272,710		**$1,447,957**
		30.05.01	Yard and Storage Track Expansion: Allowance ($200k/New Vehicle)	EA	$200,000	4.9	$979,008	30%	$293,702	$1,272,710	2015	**$1,447,957**
40			**SITEWORK & SPECIAL CONDITIONS**				**$21,540,671**		**$3,807,619**	**$25,348,290**		**$28,838,654**
	40.02		Site Utilities, Utility Relocation				$9,002,110		$2,700,633	$11,702,743		**$13,314,166**
		40.02.01	Utility Relocation - High Allowance (Dense Urban)	TF	$750	5295.0	$3,971,250	30%	$1,191,375	$5,162,625	2015	**$5,873,499**
		40.02.02	Utility Relocation - Medium Allowance (Moderate Density)	TF	$350	6138.0	$2,148,300	30%	$644,490	$2,792,790	2015	**$3,177,347**
		40.02.03	Utility Relocation - Low Allowance (Minimal Relocation Expected)	TF	$200	14412.8	$2,882,560	30%	$864,768	$3,747,328	2015	**$4,263,321**
	40.06		Pedestrian / bike access and accommodation, landscaping				$330,000		$99,000	$429,000		**$488,072**
		40.06.01	Pedestrian Improvement Allowance (Per Intersection)	EA	$15,000	22.0	$330,000	30%	$99,000	$429,000	2015	**$488,072**
	40.07		Automobile, bus, van accessways including roads, parking lots				$3,359,954		$1,007,986	$4,367,940		**$4,969,389**
		40.07.01	Roadway Improvement Allowance	TF	$100	25845.8	$2,584,580	30%	$775,374	$3,359,954	2015	**$3,822,607**
		40.07.02	Track Drainage Allowance	TF	$20	25845.8	$516,916	30%	$155,075	$671,991	2015	**$764,521**
		40.07.03	Street Lighting Allowance (Adjustments, Relocations, New)	TF	$10	25845.8	$258,458	30%	$77,537	$335,995	2015	**$382,261**
	40.08		Temporary Facilities and other indirect costs during construction				$8,848,607		$0	$8,848,607		**$10,067,027**
		40.08.01	Temporary Maintenance of Traffic	LS	$0	63204335.4	$3,160,217	0%	$0	$3,160,217	2015	**$3,595,367**
		40.08.02	Contractor Indirects (Staff, Office, etc.)	LS	$0	63204335.4	$5,056,347	0%	$0	$5,056,347	2015	**$5,752,587**
		40.08.03	Art in Transit (1% of Construction)	LS	$0	63204335.4	$632,043	0%	$0	$632,043	2015	**$719,073**

50		**SYSTEMS**				**$13,083,900**		**$3,925,170**	**$17,009,070**		**$19,351,155**
	50.01	Train control and signals				$300,000		$90,000	$390,000		**$443,702**
		50.01.01	TWC Control for Connection to Existing Streetcar Track	EA	$300,000	1.0	$300,000	30%	$90,000	$390,000	2015	**$443,702**
	50.02	Traffic signals and crossing protection					$1,916,916		$575,075	$2,491,991		**$2,835,128**
		50.02.01	Modify Existing Traffic Signal	EA	$75,000	12.0	$900,000	30%	$270,000	$1,170,000	2015	**$1,331,105**
		50.02.02	New Traffic Signal Allowance	EA	$250,000	2.0	$500,000	30%	$150,000	$650,000	2015	**$739,503**
		50.02.03	Signal Priority Allowance	TF	$20	25845.8	$516,916	30%	$155,075	$671,991	2015	**$764,521**
	50.03	Traction power supply: substations					$4,405,534		$1,321,660	$5,727,194		**$6,515,807**
		50.03.01	Traction Power Substation (Assume 1/Track Mile or 1 per 0.5 Rt. Mile)	EA	$900,000	4.9	$4,405,534	30%	$1,321,660	$5,727,194	2015	**$6,515,807**
	50.04	Traction power distribution: catenary and third rail					$6,461,450		$1,938,435	$8,399,885		**$9,556,517**
		50.04.01	Overhead Trolley Wire Allowance (Poles, wires, appurtenances)	TF	$250	25845.8	$6,461,450	30%	$1,938,435	$8,399,885	2015	**$9,556,517**
	50.05	Communications					$0		$0	$0		**$0**
		50.05.01	Communications Allowance?	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	50.06	Fare collection system and equipment					$0		$0	$0		**$0**
		50.06.01	Fare Collection (On Station or in Vehicle?)	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	Construction Subtotal (10-50)						**$51,582,967**		**$12,820,308**	**$64,403,275**		**$73,271,362**
60		**ROW, LAND, EXISTING IMPROVEMENTS**					**$852,911**		**$170,582**	**$1,023,494**		**$1,164,425**
	60.01	Purchase or lease of real estate					$852,911		$170,582	$1,023,494		**$1,164,425**
		60.01.01	Right of Way Acquisition	SF	$80	0.0	$0	30%	$0	$0	2015	**$0**
		60.01.02	Right of Way Allowance	TF	$33	25845.8	$852,911	20%	$170,582	$1,023,494	2015	**$1,164,425**
70		**VEHICLES (number)**					$19,580,152		$1,101,384	$20,681,535		**$23,529,304**
	70.01	Light Rail					$19,090,648		$954,532	$20,045,180		**$22,805,325**
		70.01.01	Modern Streetcar Vehicle (Assumes wired system)	EA	$3,900,000	4.9	$19,090,648	5%	$954,532	$20,045,180	2015	**$22,805,325**
	70.07	Spare parts					$489,504		$146,851	$636,355		**$723,979**
		70.07.01	Spare Parts for New Vehicles (Per Vehicle)	EA	$100,000	4.9	$489,504	30%	$146,851	$636,355	2015	**$723,979**
80		**PROFESSIONAL SERVICES (applies to Cats. 10-50)**					**$21,981,409**		**$0**	**$21,981,409**		**$25,008,165**
	80.01	Preliminary Engineering					$2,198,141		$0	$2,198,141		**$2,500,817**
		80.01.01	Percentage of Direct Costs SCC (10-50)	LS	3%	73271362.0	$2,198,141	0%	$0	$2,198,141	2015	**$2,500,817**
	80.02	Final Design					$5,128,995		$0	$5,128,995		**$5,835,239**
		80.02.01	Percentage of Direct Costs SCC (10-50)	LS	7%	73271362.0	$5,128,995	0%	$0	$5,128,995	2015	**$5,835,239**
	80.03	Project Management for Design and Construction					$3,663,568		$0	$3,663,568		**$4,168,028**
		80.03.01	Percentage of Direct Costs SCC (10-50)	LS	5%	73271362.0	$3,663,568	0%	$0	$3,663,568	2015	**$4,168,028**
	80.04	Construction Administration & Management					$4,396,282		$0	$4,396,282		**$5,001,633**
		80.04.01	Percentage of Direct Costs SCC (10-50)	LS	6%	73271362.0	$4,396,282	0%	$0	$4,396,282	2015	**$5,001,633**
	80.05	Professional Liability and other Non-Construction Insurance					$2,198,141		$0	$2,198,141		**$2,500,817**
		80.05.01	Percentage of Direct Costs SCC (10-50)	LS	3%	73271362.0	$2,198,141	0%	$0	$2,198,141	2015	**$2,500,817**
	80.06	Legal; Permits; Review Fees by other agencies, cities, etc.					$1,465,427		$0	$1,465,427		**$1,667,211**
		80.06.01	Percentage of Direct Costs SCC (10-50)	LS	2%	73271362.0	$1,465,427	0%	$0	$1,465,427	2015	**$1,667,211**
	80.07	Surveys, Testing, Investigation, Inspection					$1,465,427		$0	$1,465,427		**$1,667,211**
		80.07.01	Percentage of Direct Costs SCC (10-50)	LS	2%	73271362.0	$1,465,427	0%	$0	$1,465,427	2015	**$1,667,211**
	80.08	Start up					$1,465,427		$0	$1,465,427		**$1,667,211**
		80.08.01	Percentage of Direct Costs SCC (10-50)	LS	2%	73271362.0	$1,465,427	0%	$0	$1,465,427	2015	**$1,667,211**
	Subtotal (10-80)						**$93,997,439**		**$14,092,274**	**$108,089,712**		**$122,973,256**
90		**UNALLOCATED CONTINGENCY**		**LS**	**25%**					**$27,022,428**		**$30,743,314**
100		**FINANCE CHARGES**								***Current Year Total***		***YoE Total***
	Segment Totals (10-100)									**$135,112,140**		**$153,716,570**

			Alignment 3	North Downton Central (Segments D,E)								Current Year		*Inflation Rate*
			4.5 Track Miles	Approximately $31 Million Per Track Mile								*2011.25 (YR)*		*3.50%*
SCC	**SCC Sub**	**Item #**		**Item Description**	**Unit**	**Unit Cost**	**Quantity**	**Item Cost**	**A. Cont.**	**Item Cont.**	**Subtotal**	**YoE**	**Subtotal YoE**
10				**GUIDEWAY & TRACK ELEMENTS (route miles)**				**$10,853,868**		**$3,256,160**	**$14,110,028**		**$16,052,925**
	10.04			Guideway: Aerial structure				$0		$0	$0		**$0**
		10.04.01		Alignment Over Existing Bridge	TF	$700	0.0	$0	30%	$0	$0	2015	**$0**
		10.04.02		New Streetcar Viaduct	TF	$7,000	0.0	$0	30%	$0	$0	2015	**$0**
	10.06			Guideway: Underground cut & cover				$0		$0	$0		**$0**
		10.06.01		Cut-and-Cover Tunnel with Soldier Pile Walls	LS	$55,521,389	0.0	$0	30%	$0	$0	2015	**$0**
	10.08			Guideway: Retained cut or fill				$0		$0	$0		**$0**
		10.08.01		Retaining Wall <10ft Tall	LF	$800	0.0	$0	30%	$0	$0	2015	**$0**
		10.08.02		Retaining Wall >10ft Tall	LF	$1,600	0.0	$0	30%	$0	$0	2015	**$0**
	10.10			Track: Embedded				$10,203,868		$3,061,160	$13,265,028		**$15,091,572**
		10.10.01		Furnish Rail - Assume 112TRAM Block Rail	TF	$75	24009.1	$1,800,683	30%	$540,205	$2,340,887	2015	**$2,663,219**
		10.10.02		Embedded Track - Construct Track Slab	TF	$350	24009.1	$8,403,185	30%	$2,520,956	$10,924,141	2015	**$12,428,353**
	10.12			Track: Special (switches, turnouts)				$650,000		$195,000	$845,000		**$961,353**
		10.12.01		Embedded Turnout - Furnish and Install	EA	$250,000	2.0	$500,000	30%	$150,000	$650,000	2015	**$739,503**
		10.12.02		Embedded Crossing - Furnish and Install	EA	$150,000	1.0	$150,000	30%	$45,000	$195,000	2015	**$221,851**
20				**STATIONS, STOPS, TERMINALS, INTERMODAL (number)**				**$2,134,142**		**$640,243**	**$2,774,385**		**$3,156,407**
	20.01			At-grade station, stop, shelter, mall, terminal, platform				$2,134,142		$640,243	$2,774,385		**$3,156,407**
		20.01.01		Streetcar Stop - Basic 1 Car	EA	$80,000	26.7	$2,134,142	30%	$640,243	$2,774,385	2015	**$3,156,407**
		20.01.02		Streetcar Stop - Premium 1 Car	EA	$200,000	0.0	$0	30%	$0	$0	2015	**$0**
	20.02			Aerial station, stop, shelter, mall, terminal, platform				$0		$0	$0		**$0**
		20.02.01		Aerial Streetcar Stop	EA	$0	0.0	$0	30%	$0	$0	2015	**$0**
30				**SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS**				$3,183,025		$954,907	$4,137,932		**$4,707,710**
	30.02			Light Maintenance Facility				$2,273,589		$682,077	$2,955,666		**$3,362,650**
		30.02.01		Maintenance Facility Expansion: Allowance ($500k/New Vehicle)	EA	$500,000	4.5	$2,273,589	30%	$682,077	$2,955,666	2015	**$3,362,650**
	30.05			Yard and Yard Track				$909,436		$272,831	$1,182,266		**$1,345,060**
		30.05.01		Yard and Storage Track Expansion: Allowance ($200k/New Vehicle)	EA	$200,000	4.5	$909,436	30%	$272,831	$1,182,266	2015	**$1,345,060**
40				**SITEWORK & SPECIAL CONDITIONS**				**$18,641,510**		**$3,182,086**	**$21,823,596**		**$24,828,622**
	40.02			Site Utilities, Utility Relocation				$7,185,770		$2,155,731	$9,341,501		**$10,627,790**
		40.02.01		Utility Relocation - High Allowance (Dense Urban)	TF	$750	2943.0	$2,207,250	30%	$662,175	$2,869,425	2015	**$3,264,534**
		40.02.02		Utility Relocation - Medium Allowance (Moderate Density)	TF	$350	5102.0	$1,785,700	30%	$535,710	$2,321,410	2015	**$2,641,059**
		40.02.03		Utility Relocation - Low Allowance (Minimal Relocation Expected)	TF	$200	15964.1	$3,192,820	30%	$957,846	$4,150,666	2015	**$4,722,197**
	40.06			Pedestrian / bike access and accommodation, landscaping				$300,000		$90,000	$390,000		**$443,702**
		40.06.01		Pedestrian Improvement Allowance (Per Intersection)	EA	$15,000	20.0	$300,000	30%	$90,000	$390,000	2015	**$443,702**
	40.07			Automobile, bus, van accessways including roads, parking lots				$3,121,183		$936,355	$4,057,538		**$4,616,245**
		40.07.01		Roadway Improvement Allowance	TF	$100	24009.1	$2,400,910	30%	$720,273	$3,121,183	2015	**$3,550,958**
		40.07.02		Track Drainage Allowance	TF	$20	24009.1	$480,182	30%	$144,055	$624,237	2015	**$710,192**
		40.07.03		Street Lighting Allowance (Adjustments, Relocations, New)	TF	$10	24009.1	$240,091	30%	$72,027	$312,118	2015	**$355,096**
	40.08			Temporary Facilities and other indirect costs during construction				$8,034,557		$0	$8,034,557		**$9,140,885**
		40.08.01		Temporary Maintenance of Traffic	LS	$0	57389692.8	$2,869,485	0%	$0	$2,869,485	2015	**$3,264,602**
		40.08.02		Contractor Indirects (Staff, Office, etc.)	LS	$0	57389692.8	$4,591,175	0%	$0	$4,591,175	2015	**$5,223,363**
		40.08.03		Art in Transit (1% of Construction)	LS	$0	57389692.8	$573,897	0%	$0	$573,897	2015	**$652,920**

50		**SYSTEMS**				**$12,024,917**		**$3,607,475**	**$15,632,392**		**$17,784,914**
	50.01	Train control and signals				$300,000		$90,000	$390,000		**$443,702**
		50.01.01	TWC Control for Connection to Existing Streetcar Track	EA	$300,000	1.0	$300,000	30%	$90,000	$390,000	2015	**$443,702**
	50.02	Traffic signals and crossing protection					$1,630,182		$489,055	$2,119,237		**$2,411,047**
		50.02.01	Modify Existing Traffic Signal	EA	$75,000	12.0	$900,000	30%	$270,000	$1,170,000	2015	**$1,331,105**
		50.02.02	New Traffic Signal Allowance	EA	$250,000	1.0	$250,000	30%	$75,000	$325,000	2015	**$369,751**
		50.02.03	Signal Priority Allowance	TF	$20	24009.1	$480,182	30%	$144,055	$624,237	2015	**$710,192**
	50.03	Traction power supply: substations					$4,092,460		$1,227,738	$5,320,198		**$6,052,769**
		50.03.01	Traction Power Substation (Assume 1/Track Mile or 1 per 0.5 Rt. Mile)	EA	$900,000	4.5	$4,092,460	30%	$1,227,738	$5,320,198	2015	**$6,052,769**
	50.04	Traction power distribution: catenary and third rail					$6,002,275		$1,800,683	$7,802,958		**$8,877,395**
		50.04.01	Overhead Trolley Wire Allowance (Poles, wires, appurtenances)	TF	$250	24009.1	$6,002,275	30%	$1,800,683	$7,802,958	2015	**$8,877,395**
	50.05	Communications					$0		$0	$0		**$0**
		50.05.01	Communications Allowance?	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	50.06	Fare collection system and equipment					$0		$0	$0		**$0**
		50.06.01	Fare Collection (On Station or in Vehicle?)	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	Construction Subtotal (10-50)						**$46,837,462**		**$11,640,871**	**$58,478,333**		$66,530,578
60		**ROW, LAND, EXISTING IMPROVEMENTS**					**$807,740**		**$163,092**	**$970,832**		**$1,104,512**
	60.01	Purchase or lease of real estate					$807,740		$163,092	$970,832		**$1,104,512**
		60.01.01	Right of Way Acquisition	SF	$80	193.0	$15,440	30%	$4,632	$20,072	2015	**$22,836**
		60.01.02	Right of Way Allowance	TF	$33	24009.1	$792,300	20%	$158,460	$950,760	2015	**$1,081,676**
70		**VEHICLES (number)**					$18,188,712		$1,023,115	$19,211,827		**$21,857,223**
	70.01	Light Rail					$17,733,994		$886,700	$18,620,694		**$21,184,693**
		70.01.01	Modern Streetcar Vehicle (Assumes wired system)	EA	$3,900,000	4.5	$17,733,994	5%	$886,700	$18,620,694	2015	**$21,184,693**
	70.07	Spare parts					$454,718		$136,415	$591,133		**$672,530**
		70.07.01	Spare Parts for New Vehicles (Per Vehicle)	EA	$100,000	4.5	$454,718	30%	$136,415	$591,133	2015	**$672,530**
80		**PROFESSIONAL SERVICES (applies to Cats. 10-50)**					**$19,959,173**		**$0**	**$19,959,173**		**$22,707,476**
	80.01	Preliminary Engineering					$1,995,917		$0	$1,995,917		**$2,270,748**
		80.01.01	Percentage of Direct Costs SCC (10-50)	LS	3%	66530577.8	$1,995,917	0%	$0	$1,995,917	2015	**$2,270,748**
	80.02	Final Design					$4,657,140		$0	$4,657,140		**$5,298,411**
		80.02.01	Percentage of Direct Costs SCC (10-50)	LS	7%	66530577.8	$4,657,140	0%	$0	$4,657,140	2015	**$5,298,411**
	80.03	Project Management for Design and Construction					$3,326,529		$0	$3,326,529		**$3,784,579**
		80.03.01	Percentage of Direct Costs SCC (10-50)	LS	5%	66530577.8	$3,326,529	0%	$0	$3,326,529	2015	**$3,784,579**
	80.04	Construction Administration & Management					$3,991,835		$0	$3,991,835		**$4,541,495**
		80.04.01	Percentage of Direct Costs SCC (10-50)	LS	6%	66530577.8	$3,991,835	0%	$0	$3,991,835	2015	**$4,541,495**
	80.05	Professional Liability and other Non-Construction Insurance					$1,995,917		$0	$1,995,917		**$2,270,748**
		80.05.01	Percentage of Direct Costs SCC (10-50)	LS	3%	66530577.8	$1,995,917	0%	$0	$1,995,917	2015	**$2,270,748**
	80.06	Legal; Permits; Review Fees by other agencies, cities, etc.					$1,330,612		$0	$1,330,612		**$1,513,832**
		80.06.01	Percentage of Direct Costs SCC (10-50)	LS	2%	66530577.8	$1,330,612	0%	$0	$1,330,612	2015	**$1,513,832**
	80.07	Surveys, Testing, Investigation, Inspection					$1,330,612		$0	$1,330,612		**$1,513,832**
		80.07.01	Percentage of Direct Costs SCC (10-50)	LS	2%	66530577.8	$1,330,612	0%	$0	$1,330,612	2015	**$1,513,832**
	80.08	Start up					$1,330,612		$0	$1,330,612		**$1,513,832**
		80.08.01	Percentage of Direct Costs SCC (10-50)	LS	2%	66530577.8	$1,330,612	0%	$0	$1,330,612	2015	**$1,513,832**
	Subtotal (10-80)						**$85,793,087**		**$12,827,078**	**$98,620,166**		$112,199,789
90		**UNALLOCATED CONTINGENCY**		**LS**	**25%**					**$24,655,041**		**$28,049,947**
100		**FINANCE CHARGES**								***Current Year Total***		***YoE Total***
	Segment Totals (10-100)									**$123,275,207**		$140,249,736

			Alignment 4	South Downtown to MLK (Segments J,D)								Current Year		*Inflation Rate*
			3.6 Track Miles	Approximately $79 Million Per Track Mile								*2011.25 (YR)*		*3.50%*
SCC	**SCC Sub**	**Item #**		**Item Description**	**Unit**	**Unit Cost**	**Quantity**	**Item Cost**	**A. Cont.**	**Item Cont.**	**Subtotal**	**YoE**	**Subtotal YoE**
10				**GUIDEWAY & TRACK ELEMENTS (route miles)**				**$66,977,139**		**$20,093,142**	**$87,070,281**		**$99,059,528**
	10.04			Guideway: Aerial structure				$0		$0	$0		**$0**
		10.04.01		Alignment Over Existing Bridge	TF	$700	0.0	$0	30%	$0	$0	2015	**$0**
		10.04.02		New Streetcar Viaduct	TF	$7,000	0.0	$0	30%	$0	$0	2015	**$0**
	10.06			Guideway: Underground cut & cover				$55,521,389		$16,656,417	$72,177,806		**$82,116,416**
		10.06.01		Cut-and-Cover Tunnel with Soldier Pile Walls	LS	$55,521,389	1.0	$55,521,389	30%	$16,656,417	$72,177,806	2015	**$82,116,416**
	10.08			Guideway: Retained cut or fill				$0		$0	$0		**$0**
		10.08.01		Retaining Wall <10ft Tall	LF	$800	0.0	$0	30%	$0	$0	2015	**$0**
		10.08.02		Retaining Wall >10ft Tall	LF	$1,600	0.0	$0	30%	$0	$0	2015	**$0**
	10.10			Track: Embedded				$8,155,750		$2,446,725	$10,602,475		**$12,062,396**
		10.10.01		Furnish Rail - Assume 112TRAM Block Rail	TF	$75	19190.0	$1,439,250	30%	$431,775	$1,871,025	2015	**$2,128,658**
		10.10.02		Embedded Track - Construct Track Slab	TF	$350	19190.0	$6,716,500	30%	$2,014,950	$8,731,450	2015	**$9,933,738**
	10.12			Track: Special (switches, turnouts)				$3,300,000		$990,000	$4,290,000		**$4,880,717**
		10.12.01		Embedded Turnout - Furnish and Install	EA	$250,000	12.0	$3,000,000	30%	$900,000	$3,900,000	2015	**$4,437,015**
		10.12.02		Embedded Crossing - Furnish and Install	EA	$150,000	2.0	$300,000	30%	$90,000	$390,000	2015	**$443,702**
20				**STATIONS, STOPS, TERMINALS, INTERMODAL (number)**				**$1,128,764**		**$338,629**	**$1,467,394**		**$1,669,448**
	20.01			At-grade station, stop, shelter, mall, terminal, platform				$1,128,764		$338,629	$1,467,394		**$1,669,448**
		20.01.01		Streetcar Stop - Basic 1 Car	EA	$80,000	14.1	$1,128,764	30%	$338,629	$1,467,394	2015	**$1,669,448**
		20.01.02		Streetcar Stop - Premium 1 Car	EA	$200,000	0.0	$0	30%	$0	$0	2015	**$0**
	20.02			Aerial station, stop, shelter, mall, terminal, platform				$0		$0	$0		**$0**
		20.02.01		Aerial Streetcar Stop	EA	$0	0.0	$0	30%	$0	$0	2015	**$0**
30				**SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS**				$2,544,129		$763,239	$3,307,367		**$3,762,779**
	30.02			Light Maintenance Facility				$1,817,235		$545,170	$2,362,405		**$2,687,700**
		30.02.01		Maintenance Facility Expansion: Allowance ($500k/New Vehicle)	EA	$500,000	3.6	$1,817,235	30%	$545,170	$2,362,405	2015	**$2,687,700**
	30.05			Yard and Yard Track				$726,894		$218,068	$944,962		**$1,075,080**
		30.05.01		Yard and Storage Track Expansion: Allowance ($200k/New Vehicle)	EA	$200,000	3.6	$726,894	30%	$218,068	$944,962	2015	**$1,075,080**
40				**SITEWORK & SPECIAL CONDITIONS**				**$30,037,214**		**$3,333,291**	**$33,370,505**		**$37,965,498**
	40.02			Site Utilities, Utility Relocation				$8,301,270		$2,490,381	$10,791,651		**$12,277,620**
		40.02.01		Utility Relocation - High Allowance (Dense Urban)	TF	$750	7762.4	$5,821,800	30%	$1,746,540	$7,568,340	2015	**$8,610,472**
		40.02.02		Utility Relocation - Medium Allowance (Moderate Density)	TF	$350	1293.0	$452,550	30%	$135,765	$588,315	2015	**$669,324**
		40.02.03		Utility Relocation - Low Allowance (Minimal Relocation Expected)	TF	$200	10134.6	$2,026,920	30%	$608,076	$2,634,996	2015	**$2,997,825**
	40.06			Pedestrian / bike access and accommodation, landscaping				$315,000		$94,500	$409,500		**$465,887**
		40.06.01		Pedestrian Improvement Allowance (Per Intersection)	EA	$15,000	21.0	$315,000	30%	$94,500	$409,500	2015	**$465,887**
	40.07			Automobile, bus, van accessways including roads, parking lots				$2,494,700		$748,410	$3,243,110		**$3,689,674**
		40.07.01		Roadway Improvement Allowance	TF	$100	19190.0	$1,919,000	30%	$575,700	$2,494,700	2015	**$2,838,211**
		40.07.02		Track Drainage Allowance	TF	$20	19190.0	$383,800	30%	$115,140	$498,940	2015	**$567,642**
		40.07.03		Street Lighting Allowance (Adjustments, Relocations, New)	TF	$10	19190.0	$191,900	30%	$57,570	$249,470	2015	**$283,821**
	40.08			Temporary Facilities and other indirect costs during construction				$18,926,244		$0	$18,926,244		**$21,532,317**
		40.08.01		Temporary Maintenance of Traffic	LS	$0	135187460.3	$6,759,373	0%	$0	$6,759,373	2015	**$7,690,113**
		40.08.02		Contractor Indirects (Staff, Office, etc.)	LS	$0	135187460.3	$10,814,997	0%	$0	$10,814,997	2015	**$12,304,181**
		40.08.03		Art in Transit (1% of Construction)	LS	$0	135187460.3	$1,351,875	0%	$0	$1,351,875	2015	**$1,538,023**

50		**SYSTEMS**				**$9,643,323**		**$2,892,997**	**$12,536,320**		**$14,262,523**
	50.01	Train control and signals				$300,000		$90,000	$390,000		**$443,702**
		50.01.01	TWC Control for Connection to Existing Streetcar Track	EA	$300,000	1.0	$300,000	30%	$90,000	$390,000	2015	**$443,702**
	50.02	Traffic signals and crossing protection					$1,274,800		$382,440	$1,657,240		**$1,885,436**
		50.02.01	Modify Existing Traffic Signal	EA	$75,000	12.0	$900,000	30%	$270,000	$1,170,000	2015	**$1,331,105**
		50.02.02	New Traffic Signal Allowance	EA	$250,000	0.0	$0	30%	$0	$0	2015	**$0**
		50.02.03	Signal Priority Allowance	TF	$20	18740.0	$374,800	30%	$112,440	$487,240	2015	**$554,331**
	50.03	Traction power supply: substations					$3,271,023		$981,307	$4,252,330		**$4,837,859**
		50.03.01	Traction Power Substation (Assume 1/Track Mile or 1 per 0.5 Rt. Mile)	EA	$900,000	3.6	$3,271,023	30%	$981,307	$4,252,330	2015	**$4,837,859**
	50.04	Traction power distribution: catenary and third rail					$4,797,500		$1,439,250	$6,236,750		**$7,095,527**
		50.04.01	Overhead Trolley Wire Allowance (Poles, wires, appurtenances)	TF	$250	19190.0	$4,797,500	30%	$1,439,250	$6,236,750	2015	**$7,095,527**
	50.05	Communications					$0		$0	$0		**$0**
		50.05.01	Communications Allowance?	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	50.06	Fare collection system and equipment					$0		$0	$0		**$0**
		50.06.01	Fare Collection (On Station or in Vehicle?)	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	Construction Subtotal (10-50)						**$110,330,569**		**$27,421,297**	**$137,751,867**		$156,719,777
60		**ROW, LAND, EXISTING IMPROVEMENTS**					**$1,373,270**		**$348,654**	**$1,721,924**		**$1,959,026**
	60.01	Purchase or lease of real estate					$1,373,270		$348,654	$1,721,924		**$1,959,026**
		60.01.01	Right of Way Acquisition	SF	$80	9250.0	$740,000	30%	$222,000	$962,000	2015	**$1,094,464**
		60.01.02	Right of Way Allowance	TF	$33	19190.0	$633,270	20%	$126,654	$759,924	2015	**$864,563**
70		**VEHICLES (number)**					$14,537,879		$817,756	$15,355,634		**$17,470,047**
	70.01	Light Rail					$14,174,432		$708,722	$14,883,153		**$16,932,507**
		70.01.01	Modern Streetcar Vehicle (Assumes wired system)	EA	$3,900,000	3.6	$14,174,432	5%	$708,722	$14,883,153	2015	**$16,932,507**
	70.07	Spare parts					$363,447		$109,034	$472,481		**$537,540**
		70.07.01	Spare Parts for New Vehicles (Per Vehicle)	EA	$100,000	3.6	$363,447	30%	$109,034	$472,481	2015	**$537,540**
80		**PROFESSIONAL SERVICES (applies to Cats. 10-50)**					**$47,015,933**		**$0**	**$47,015,933**		**$53,489,849**
	80.01	Preliminary Engineering					$4,701,593		$0	$4,701,593		**$5,348,985**
		80.01.01	Percentage of Direct Costs SCC (10-50)	LS	3%	156719776.9	$4,701,593	0%	$0	$4,701,593	2015	**$5,348,985**
	80.02	Final Design					$10,970,384		$0	$10,970,384		**$12,480,965**
		80.02.01	Percentage of Direct Costs SCC (10-50)	LS	7%	156719776.9	$10,970,384	0%	$0	$10,970,384	2015	**$12,480,965**
	80.03	Project Management for Design and Construction					$7,835,989		$0	$7,835,989		**$8,914,975**
		80.03.01	Percentage of Direct Costs SCC (10-50)	LS	5%	156719776.9	$7,835,989	0%	$0	$7,835,989	2015	**$8,914,975**
	80.04	Construction Administration & Management					$9,403,187		$0	$9,403,187		**$10,697,970**
		80.04.01	Percentage of Direct Costs SCC (10-50)	LS	6%	156719776.9	$9,403,187	0%	$0	$9,403,187	2015	**$10,697,970**
	80.05	Professional Liability and other Non-Construction Insurance					$4,701,593		$0	$4,701,593		**$5,348,985**
		80.05.01	Percentage of Direct Costs SCC (10-50)	LS	3%	156719776.9	$4,701,593	0%	$0	$4,701,593	2015	**$5,348,985**
	80.06	Legal; Permits; Review Fees by other agencies, cities, etc.					$3,134,396		$0	$3,134,396		**$3,565,990**
		80.06.01	Percentage of Direct Costs SCC (10-50)	LS	2%	156719776.9	$3,134,396	0%	$0	$3,134,396	2015	**$3,565,990**
	80.07	Surveys, Testing, Investigation, Inspection					$3,134,396		$0	$3,134,396		**$3,565,990**
		80.07.01	Percentage of Direct Costs SCC (10-50)	LS	2%	156719776.9	$3,134,396	0%	$0	$3,134,396	2015	**$3,565,990**
	80.08	Start up					$3,134,396		$0	$3,134,396		**$3,565,990**
		80.08.01	Percentage of Direct Costs SCC (10-50)	LS	2%	156719776.9	$3,134,396	0%	$0	$3,134,396	2015	**$3,565,990**
	Subtotal (10-80)						**$173,257,651**		**$28,587,707**	**$201,845,358**		$229,638,699
90		**UNALLOCATED CONTINGENCY**		**LS**	**25%**					**$50,461,340**		**$57,409,675**
100		**FINANCE CHARGES**								***Current Year Total***		***YoE Total***
	Segment Totals (10-100)									**$252,306,698**		$287,048,374

			Alignment 5 South Downtown Central (Segments J,A)									Current Year		*Inflation Rate*
			8.4 Track Miles Approximately $51 Million Per Track Mile									*2011.25 (YR)*		*3.50%*
SCC	**SCC Sub**	**Item #**	**Item Description**	**Unit**	**Unit Cost**	**Quantity**	**Item Cost**	**A. Cont.**	**Item Cont.**	**Subtotal**	**YoE**	**Subtotal YoE**
10			**GUIDEWAY & TRACK ELEMENTS (route miles)**				**$77,330,221**		**$23,199,066**	**$100,529,288**		**$114,371,790**
	10.04		Guideway: Aerial structure				$323,400		$97,020	$420,420		**$478,310**
		10.04.01	Alignment Over Existing Bridge	TF	$700	462.0	$323,400	30%	$97,020	$420,420	2015	**$478,310**
		10.04.02	New Streetcar Viaduct	TF	$7,000	0.0	$0	30%	$0	$0	2015	**$0**
	10.06		Guideway: Underground cut & cover				$55,521,389		$16,656,417	$72,177,806		**$82,116,416**
		10.06.01	Cut-and-Cover Tunnel with Soldier Pile Walls	LS	$55,521,389	1.0	$55,521,389	30%	$16,656,417	$72,177,806	2015	**$82,116,416**
	10.08		Guideway: Retained cut or fill				$0		$0	$0		**$0**
		10.08.01	Retaining Wall <10ft Tall	LF	$800	0.0	$0	30%	$0	$0	2015	**$0**
		10.08.02	Retaining Wall >10ft Tall	LF	$1,600	0.0	$0	30%	$0	$0	2015	**$0**
	10.10		Track: Embedded				$18,585,433		$5,575,630	$24,161,062		**$27,487,949**
		10.10.01	Furnish Rail - Assume 112TRAM Block Rail	TF	$75	44110.9	$3,308,318	30%	$992,495	$4,300,813	2015	**$4,893,018**
		10.10.02	Embedded Track - Construct Track Slab	TF	$350	43648.9	$15,277,115	30%	$4,583,135	$19,860,250	2015	**$22,594,931**
	10.12		Track: Special (switches, turnouts)				$2,900,000		$870,000	$3,770,000		**$4,289,115**
		10.12.01	Embedded Turnout - Furnish and Install	EA	$250,000	11.0	$2,750,000	30%	$825,000	$3,575,000	2015	**$4,067,264**
		10.12.02	Embedded Crossing - Furnish and Install	EA	$150,000	1.0	$150,000	30%	$45,000	$195,000	2015	**$221,851**
20			**STATIONS, STOPS, TERMINALS, INTERMODAL (number)**				**$3,343,956**		**$1,003,187**	**$4,347,142**		**$4,945,727**
	20.01		At-grade station, stop, shelter, mall, terminal, platform				$3,343,956		$1,003,187	$4,347,142		**$4,945,727**
		20.01.01	Streetcar Stop - Basic 1 Car	EA	$80,000	41.8	$3,343,956	30%	$1,003,187	$4,347,142	2015	**$4,945,727**
		20.01.02	Streetcar Stop - Premium 1 Car	EA	$200,000	0.0	$0	30%	$0	$0	2015	**$0**
	20.02		Aerial station, stop, shelter, mall, terminal, platform				$0		$0	$0		**$0**
		20.02.01	Aerial Streetcar Stop	EA	$0	0.0	$0	30%	$0	$0	2015	**$0**
30			**SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS**				$5,848,036		$1,754,411	$7,602,447		**$8,649,275**
	30.02		Light Maintenance Facility				$4,177,169		$1,253,151	$5,430,319		**$6,178,053**
		30.02.01	Maintenance Facility Expansion: Allowance ($500k/New Vehicle)	EA	$500,000	8.4	$4,177,169	30%	$1,253,151	$5,430,319	2015	**$6,178,053**
	30.05		Yard and Yard Track				$1,670,867		$501,260	$2,172,128		**$2,471,221**
		30.05.01	Yard and Storage Track Expansion: Allowance ($200k/New Vehicle)	EA	$200,000	8.4	$1,670,867	30%	$501,260	$2,172,128	2015	**$2,471,221**
40			**SITEWORK & SPECIAL CONDITIONS**				**$48,593,282**		**$6,527,450**	**$55,120,732**		**$62,710,648**
	40.02		Site Utilities, Utility Relocation				$15,424,950		$4,627,485	$20,052,435		**$22,813,579**
		40.02.01	Utility Relocation - High Allowance (Dense Urban)	TF	$750	8709.4	$6,532,050	30%	$1,959,615	$8,491,665	2015	**$9,660,935**
		40.02.02	Utility Relocation - Medium Allowance (Moderate Density)	TF	$350	12700.0	$4,445,000	30%	$1,333,500	$5,778,500	2015	**$6,574,178**
		40.02.03	Utility Relocation - Low Allowance (Minimal Relocation Expected)	TF	$200	22239.5	$4,447,900	30%	$1,334,370	$5,782,270	2015	**$6,578,467**
	40.06		Pedestrian / bike access and accommodation, landscaping				$645,000		$193,500	$838,500		**$953,958**
		40.06.01	Pedestrian Improvement Allowance (Per Intersection)	EA	$15,000	43.0	$645,000	30%	$193,500	$838,500	2015	**$953,958**
	40.07		Automobile, bus, van accessways including roads, parking lots				$5,688,217		$1,706,465	$7,394,682		**$8,412,902**
		40.07.01	Roadway Improvement Allowance	TF	$100	43648.9	$4,364,890	30%	$1,309,467	$5,674,357	2015	**$6,455,694**
		40.07.02	Track Drainage Allowance	TF	$20	44110.9	$882,218	30%	$264,665	$1,146,883	2015	**$1,304,805**
		40.07.03	Street Lighting Allowance (Adjustments, Relocations, New)	TF	$10	44110.9	$441,109	30%	$132,333	$573,442	2015	**$652,402**
	40.08		Temporary Facilities and other indirect costs during construction				$26,835,115		$0	$26,835,115		**$30,530,209**
		40.08.01	Temporary Maintenance of Traffic	LS	$0	191679392.4	$9,583,970	0%	$0	$9,583,970	2015	**$10,903,646**
		40.08.02	Contractor Indirects (Staff, Office, etc.)	LS	$0	191679392.4	$15,334,351	0%	$0	$15,334,351	2015	**$17,445,833**
		40.08.03	Art in Transit (1% of Construction)	LS	$0	191679392.4	$1,916,794	0%	$0	$1,916,794	2015	**$2,180,729**

50		**SYSTEMS**				**$21,319,846**		**$6,395,954**	**$27,715,800**		**$31,532,161**
	50.01	Train control and signals				$300,000		$90,000	$390,000		**$443,702**
	50.01.01	TWC Control for Connection to Existing Streetcar Track	EA	$300,000	1.0	$300,000	30%	$90,000	$390,000	2015	**$443,702**
	50.02	Traffic signals and crossing protection				$2,473,218		$741,965	$3,215,183		**$3,657,902**
	50.02.01	Modify Existing Traffic Signal	EA	$75,000	18.0	$1,350,000	30%	$405,000	$1,755,000	2015	**$1,996,657**
	50.02.02	New Traffic Signal Allowance	EA	$250,000	1.0	$250,000	30%	$75,000	$325,000	2015	**$369,751**
	50.02.03	Signal Priority Allowance	TF	$20	43660.9	$873,218	30%	$261,965	$1,135,183	2015	**$1,291,494**
	50.03	Traction power supply: substations				$7,518,903		$2,255,671	$9,774,574		**$11,120,496**
	50.03.01	Traction Power Substation (Assume 1/Track Mile or 1 per 0.5 Rt. Mile)	EA	$900,000	8.4	$7,518,903	30%	$2,255,671	$9,774,574	2015	**$11,120,496**
	50.04	Traction power distribution: catenary and third rail				$11,027,725		$3,308,318	$14,336,043		**$16,310,061**
	50.04.01	Overhead Trolley Wire Allowance (Poles, wires, appurtenances)	TF	$250	44110.9	$11,027,725	30%	$3,308,318	$14,336,043	2015	**$16,310,061**
	50.05	Communications				$0		$0	$0		**$0**
	50.05.01	Communications Allowance?	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	50.06	Fare collection system and equipment				$0		$0	$0		**$0**
	50.06.01	Fare Collection (On Station or in Vehicle?)	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	Construction Subtotal (10-50)					**$156,435,341**		**$38,880,068**	**$195,315,409**		$222,209,601
60		**ROW, LAND, EXISTING IMPROVEMENTS**				**$2,243,820**		**$527,580**	**$2,771,400**		**$3,153,011**
	60.01	Purchase or lease of real estate				$2,243,820		$527,580	$2,771,400		**$3,153,011**
	60.01.01	Right of Way Acquisition	SF	$80	9852.0	$788,160	30%	$236,448	$1,024,608	2015	**$1,165,693**
	60.01.02	Right of Way Allowance	TF	$33	44110.9	$1,455,660	20%	$291,132	$1,746,792	2015	**$1,987,318**
70		**VEHICLES (number)**				$33,417,348		$1,879,726	$35,297,074		**$40,157,348**
	70.01	Light Rail				$32,581,915		$1,629,096	$34,211,011		**$38,921,737**
	70.01.01	Modern Streetcar Vehicle (Assumes wired system)	EA	$3,900,000	8.4	$32,581,915	5%	$1,629,096	$34,211,011	2015	**$38,921,737**
	70.07	Spare parts				$835,434		$250,630	$1,086,064		**$1,235,611**
	70.07.01	Spare Parts for New Vehicles (Per Vehicle)	EA	$100,000	8.4	$835,434	30%	$250,630	$1,086,064	2015	**$1,235,611**
80		**PROFESSIONAL SERVICES (applies to Cats. 10-50)**				**$66,662,880**		**$0**	**$66,662,880**		**$75,842,106**
	80.01	Preliminary Engineering				$6,666,288		$0	$6,666,288		**$7,584,211**
	80.01.01	Percentage of Direct Costs SCC (10-50)	LS	3%	222209601.0	$6,666,288	0%	$0	$6,666,288	2015	**$7,584,211**
	80.02	Final Design				$15,554,672		$0	$15,554,672		**$17,696,491**
	80.02.01	Percentage of Direct Costs SCC (10-50)	LS	7%	222209601.0	$15,554,672	0%	$0	$15,554,672	2015	**$17,696,491**
	80.03	Project Management for Design and Construction				$11,110,480		$0	$11,110,480		**$12,640,351**
	80.03.01	Percentage of Direct Costs SCC (10-50)	LS	5%	222209601.0	$11,110,480	0%	$0	$11,110,480	2015	**$12,640,351**
	80.04	Construction Administration & Management				$13,332,576		$0	$13,332,576		**$15,168,421**
	80.04.01	Percentage of Direct Costs SCC (10-50)	LS	6%	222209601.0	$13,332,576	0%	$0	$13,332,576	2015	**$15,168,421**
	80.05	Professional Liability and other Non-Construction Insurance				$6,666,288		$0	$6,666,288		**$7,584,211**
	80.05.01	Percentage of Direct Costs SCC (10-50)	LS	3%	222209601.0	$6,666,288	0%	$0	$6,666,288	2015	**$7,584,211**
	80.06	Legal; Permits; Review Fees by other agencies, cities, etc.				$4,444,192		$0	$4,444,192		**$5,056,140**
	80.06.01	Percentage of Direct Costs SCC (10-50)	LS	2%	222209601.0	$4,444,192	0%	$0	$4,444,192	2015	**$5,056,140**
	80.07	Surveys, Testing, Investigation, Inspection				$4,444,192		$0	$4,444,192		**$5,056,140**
	80.07.01	Percentage of Direct Costs SCC (10-50)	LS	2%	222209601.0	$4,444,192	0%	$0	$4,444,192	2015	**$5,056,140**
	80.08	Start up				$4,444,192		$0	$4,444,192		**$5,056,140**
	80.08.01	Percentage of Direct Costs SCC (10-50)	LS	2%	222209601.0	$4,444,192	0%	$0	$4,444,192	2015	**$5,056,140**
	Subtotal (10-80)					**$258,759,390**		**$41,287,374**	**$300,046,763**		$341,362,066
90		**UNALLOCATED CONTINGENCY**	**LS**	**25%**					**$75,011,691**		**$85,340,516**
100		**FINANCE CHARGES**							***Current Year Total***		***YoE Total***
	Segment Totals (10-100)								**$375,058,454**		$426,702,582

			Alignment 5a South Downtown Central Modified (Segments A,D,E)							Current Year		*Inflation Rate*
			11.7 Track Miles Approximately $30 Million Per Track Mile							*2011.25 (YR)*		*3.50%*
SCC	**SCC Sub**	**Item #**	**Item Description**	**Unit**	**Unit Cost**	**Quantity**	**Item Cost**	**A. Cont.**	**Item Cont.**	**Subtotal**	**YoE**	**Subtotal YoE**
10			**GUIDEWAY & TRACK ELEMENTS (route miles)**				**$27,253,855**		**$8,176,157**	**$35,430,012**		**$40,308,590**
	10.04		Guideway: Aerial structure				$323,400		$97,020	$420,420		**$478,310**
		10.04.01	Alignment Over Existing Bridge	TF	$700	462.0	$323,400	30%	$97,020	$420,420	2015	**$478,310**
		10.04.02	New Streetcar Viaduct	TF	$7,000	0.0	$0	30%	$0	$0	2015	**$0**
	10.06		Guideway: Underground cut & cover				$0		$0	$0		**$0**
		10.06.01	Cut-and-Cover Tunnel with Soldier Pile Walls	LS	$55,521,389	0.0	$0	30%	$0	$0	2015	**$0**
	10.08		Guideway: Retained cut or fill				$0		$0	$0		**$0**
		10.08.01	Retaining Wall <10ft Tall	LF	$800	0.0	$0	30%	$0	$0	2015	**$0**
		10.08.02	Retaining Wall >10ft Tall	LF	$1,600	0.0	$0	30%	$0	$0	2015	**$0**
	10.10		Track: Embedded				$26,030,455		$7,809,137	$33,839,592		**$38,499,175**
		10.10.01	Furnish Rail - Assume 112TRAM Block Rail	TF	$75	61628.6	$4,622,145	30%	$1,386,644	$6,008,789	2015	**$6,836,176**
		10.10.02	Embedded Track - Construct Track Slab	TF	$350	61166.6	$21,408,310	30%	$6,422,493	$27,830,803	2015	**$31,662,999**
	10.12		Track: Special (switches, turnouts)				$900,000		$270,000	$1,170,000		**$1,331,105**
		10.12.01	Embedded Turnout - Furnish and Install	EA	$250,000	3.0	$750,000	30%	$225,000	$975,000	2015	**$1,109,254**
		10.12.02	Embedded Crossing - Furnish and Install	EA	$150,000	1.0	$150,000	30%	$45,000	$195,000	2015	**$221,851**
20			**STATIONS, STOPS, TERMINALS, INTERMODAL (number)**				**$5,478,098**		**$1,643,429**	**$7,121,527**		**$8,102,134**
	20.01		At-grade station, stop, shelter, mall, terminal, platform				$5,478,098		$1,643,429	$7,121,527		**$8,102,134**
		20.01.01	Streetcar Stop - Basic 1 Car	EA	$80,000	68.5	$5,478,098	30%	$1,643,429	$7,121,527	2015	**$8,102,134**
		20.01.02	Streetcar Stop - Premium 1 Car	EA	$200,000	0.0	$0	30%	$0	$0	2015	**$0**
	20.02		Aerial station, stop, shelter, mall, terminal, platform				$0		$0	$0		**$0**
		20.02.01	Aerial Streetcar Stop	EA	$0	0.0	$0	30%	$0	$0	2015	**$0**
30			**SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS**				$8,170,458		$2,451,138	$10,621,596		**$12,084,149**
	30.02		Light Maintenance Facility				$5,836,042		$1,750,813	$7,586,854		**$8,631,535**
		30.02.01	Maintenance Facility Expansion: Allowance ($500k/New Vehicle)	EA	$500,000	11.7	$5,836,042	30%	$1,750,813	$7,586,854	2015	**$8,631,535**
	30.05		Yard and Yard Track				$2,334,417		$700,325	$3,034,742		**$3,452,614**
		30.05.01	Yard and Storage Track Expansion: Allowance ($200k/New Vehicle)	EA	$200,000	11.7	$2,334,417	30%	$700,325	$3,034,742	2015	**$3,452,614**
40			**SITEWORK & SPECIAL CONDITIONS**				**$46,636,679**		**$7,955,306**	**$54,591,985**		**$62,109,095**
	40.02		Site Utilities, Utility Relocation				$17,742,170		$5,322,651	$23,064,821		**$26,240,759**
		40.02.01	Utility Relocation - High Allowance (Dense Urban)	TF	$750	5161.0	$3,870,750	30%	$1,161,225	$5,031,975	2015	**$5,724,859**
		40.02.02	Utility Relocation - Medium Allowance (Moderate Density)	TF	$350	17802.0	$6,230,700	30%	$1,869,210	$8,099,910	2015	**$9,215,237**
		40.02.03	Utility Relocation - Low Allowance (Minimal Relocation Expected)	TF	$200	38203.6	$7,640,720	30%	$2,292,216	$9,932,936	2015	**$11,300,664**
	40.06		Pedestrian / bike access and accommodation, landscaping				$810,000		$243,000	$1,053,000		**$1,197,994**
		40.06.01	Pedestrian Improvement Allowance (Per Intersection)	EA	$15,000	54.0	$810,000	30%	$243,000	$1,053,000	2015	**$1,197,994**
	40.07		Automobile, bus, van accessways including roads, parking lots				$7,965,518		$2,389,655	$10,355,173		**$11,781,042**
		40.07.01	Roadway Improvement Allowance	TF	$100	61166.6	$6,116,660	30%	$1,834,998	$7,951,658	2015	**$9,046,571**
		40.07.02	Track Drainage Allowance	TF	$20	61628.6	$1,232,572	30%	$369,772	$1,602,344	2015	**$1,822,980**
		40.07.03	Street Lighting Allowance (Adjustments, Relocations, New)	TF	$10	61628.6	$616,286	30%	$184,886	$801,172	2015	**$911,490**
	40.08		Temporary Facilities and other indirect costs during construction				$20,118,991		$0	$20,118,991		**$22,889,300**
		40.08.01	Temporary Maintenance of Traffic	LS	$0	143707078.6	$7,185,354	0%	$0	$7,185,354	2015	**$8,174,750**
		40.08.02	Contractor Indirects (Staff, Office, etc.)	LS	$0	143707078.6	$11,496,566	0%	$0	$11,496,566	2015	**$13,079,600**
		40.08.03	Art in Transit (1% of Construction)	LS	$0	143707078.6	$1,437,071	0%	$0	$1,437,071	2015	**$1,634,950**

50		**SYSTEMS**				**$29,744,597**		**$8,923,379**	**$38,667,976**		**$43,992,410**
	50.01	Train control and signals				$300,000		$90,000	$390,000		**$443,702**
	50.01.01	TWC Control for Connection to Existing Streetcar Track	EA	$300,000	1.0	$300,000	30%	$90,000	$390,000	2015	**$443,702**
	50.02	Traffic signals and crossing protection				$3,532,572		$1,059,772	$4,592,344		**$5,224,692**
	50.02.01	Modify Existing Traffic Signal	EA	$75,000	24.0	$1,800,000	30%	$540,000	$2,340,000	2015	**$2,662,209**
	50.02.02	New Traffic Signal Allowance	EA	$250,000	2.0	$500,000	30%	$150,000	$650,000	2015	**$739,503**
	50.02.03	Signal Priority Allowance	TF	$20	61628.6	$1,232,572	30%	$369,772	$1,602,344	2015	**$1,822,980**
	50.03	Traction power supply: substations				$10,504,875		$3,151,463	$13,656,338		**$15,536,763**
	50.03.01	Traction Power Substation (Assume 1/Track Mile or 1 per 0.5 Rt. Mile)	EA	$900,000	11.7	$10,504,875	30%	$3,151,463	$13,656,338	2015	**$15,536,763**
	50.04	Traction power distribution: catenary and third rail				$15,407,150		$4,622,145	$20,029,295		**$22,787,253**
	50.04.01	Overhead Trolley Wire Allowance (Poles, wires, appurtenances)	TF	$250	61628.6	$15,407,150	30%	$4,622,145	$20,029,295	2015	**$22,787,253**
	50.05	Communications				$0		$0	$0		**$0**
	50.05.01	Communications Allowance?	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	50.06	Fare collection system and equipment				$0		$0	$0		**$0**
	50.06.01	Fare Collection (On Station or in Vehicle?)	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	Construction Subtotal (10-50)				**0.0**	**$117,283,687**		**$29,149,409**	**$146,433,096**		$166,596,378
60		**ROW, LAND, EXISTING IMPROVEMENTS**				**$2,112,784**		**$430,461**	**$2,543,245**		**$2,893,440**
	60.01	Purchase or lease of real estate				$2,112,784		$430,461	$2,543,245		**$2,893,440**
	60.01.01	Right of Way Acquisition	SF	$80	988.0	$79,040	30%	$23,712	$102,752	2015	**$116,901**
	60.01.02	Right of Way Allowance	TF	$33	61628.6	$2,033,744	20%	$406,749	$2,440,493	2015	**$2,776,539**
70		**VEHICLES (number)**				$46,688,333		$2,626,219	$49,314,552		**$56,104,979**
	70.01	Light Rail				$45,521,125		$2,276,056	$47,797,181		**$54,378,672**
	70.01.01	Modern Streetcar Vehicle (Assumes wired system)	EA	$3,900,000	11.7	$45,521,125	5%	$2,276,056	$47,797,181	2015	**$54,378,672**
	70.07	Spare parts				$1,167,208		$350,163	$1,517,371		**$1,726,307**
	70.07.01	Spare Parts for New Vehicles (Per Vehicle)	EA	$100,000	11.7	$1,167,208	30%	$350,163	$1,517,371	2015	**$1,726,307**
80		**PROFESSIONAL SERVICES (applies to Cats. 10-50)**				**$49,978,914**		**$0**	**$49,978,914**		**$56,860,821**
	80.01	Preliminary Engineering				$4,997,891		$0	$4,997,891		**$5,686,082**
	80.01.01	Percentage of Direct Costs SCC (10-50)	LS	3%	166596378.4	$4,997,891	0%	$0	$4,997,891	2015	**$5,686,082**
	80.02	Final Design				$11,661,746		$0	$11,661,746		**$13,267,525**
	80.02.01	Percentage of Direct Costs SCC (10-50)	LS	7%	166596378.4	$11,661,746	0%	$0	$11,661,746	2015	**$13,267,525**
	80.03	Project Management for Design and Construction				$8,329,819		$0	$8,329,819		**$9,476,803**
	80.03.01	Percentage of Direct Costs SCC (10-50)	LS	5%	166596378.4	$8,329,819	0%	$0	$8,329,819	2015	**$9,476,803**
	80.04	Construction Administration & Management				$9,995,783		$0	$9,995,783		**$11,372,164**
	80.04.01	Percentage of Direct Costs SCC (10-50)	LS	6%	166596378.4	$9,995,783	0%	$0	$9,995,783	2015	**$11,372,164**
	80.05	Professional Liability and other Non-Construction Insurance				$4,997,891		$0	$4,997,891		**$5,686,082**
	80.05.01	Percentage of Direct Costs SCC (10-50)	LS	3%	166596378.4	$4,997,891	0%	$0	$4,997,891	2015	**$5,686,082**
	80.06	Legal; Permits; Review Fees by other agencies, cities, etc.				$3,331,928		$0	$3,331,928		**$3,790,721**
	80.06.01	Percentage of Direct Costs SCC (10-50)	LS	2%	166596378.4	$3,331,928	0%	$0	$3,331,928	2015	**$3,790,721**
	80.07	Surveys, Testing, Investigation, Inspection				$3,331,928		$0	$3,331,928		**$3,790,721**
	80.07.01	Percentage of Direct Costs SCC (10-50)	LS	2%	166596378.4	$3,331,928	0%	$0	$3,331,928	2015	**$3,790,721**
	80.08	Start up				$3,331,928		$0	$3,331,928		**$3,790,721**
	80.08.01	Percentage of Direct Costs SCC (10-50)	LS	2%	166596378.4	$3,331,928	0%	$0	$3,331,928	2015	**$3,790,721**
	Subtotal (10-80)					**$216,063,718**		**$32,206,088**	**$248,269,806**		$282,455,618
90		**UNALLOCATED CONTINGENCY**	**LS**	**25%**					**$62,067,452**		**$70,613,904**
100		**FINANCE CHARGES**							***Current Year Total***		***YoE Total***
	Segment Totals (10-100)								**$310,337,258**		$353,069,522

			Alignment 6 South End (Segments F)								Current Year		*Inflation Rate*
			6.1 Track Miles Approximately $31 Million Per Track Mile								*2011.25 (YR)*		*3.50%*
SCC	**SCC Sub**	**Item #**	**Item Description**	**Unit**	**Unit Cost**	**Quantity**	**Item Cost**	**A. Cont.**	**Item Cont.**	**Subtotal**	**YoE**	**Subtotal YoE**
10			**GUIDEWAY & TRACK ELEMENTS (route miles)**				**$15,746,075**		**$4,723,823**	**$20,469,898**		**$23,288,525**
	10.04		Guideway: Aerial structure				$1,266,300		$379,890	$1,646,190		**$1,872,864**
		10.04.01	Alignment Over Existing Bridge	TF	$700	1809.0	$1,266,300	30%	$379,890	$1,646,190	2015	**$1,872,864**
		10.04.02	New Streetcar Viaduct	TF	$7,000	0.0	$0	30%	$0	$0	2015	**$0**
	10.06		Guideway: Underground cut & cover				$0		$0	$0		**$0**
		10.06.01	Cut-and-Cover Tunnel with Soldier Pile Walls	LS	$55,521,389	0.0	$0	30%	$0	$0	2015	**$0**
	10.08		Guideway: Retained cut or fill				$152,000		$45,600	$197,600		**$224,809**
		10.08.01	Retaining Wall <10ft Tall	LF	$800	190.0	$152,000	30%	$45,600	$197,600	2015	**$224,809**
		10.08.02	Retaining Wall >10ft Tall	LF	$1,600	0.0	$0	30%	$0	$0	2015	**$0**
	10.10		Track: Embedded				$13,077,775		$3,923,333	$17,001,108		**$19,342,096**
		10.10.01	Furnish Rail - Assume 112TRAM Block Rail	TF	$75	32261.0	$2,419,575	30%	$725,873	$3,145,448	2015	**$3,578,564**
		10.10.02	Embedded Track - Construct Track Slab	TF	$350	30452.0	$10,658,200	30%	$3,197,460	$13,855,660	2015	**$15,763,532**
	10.12		Track: Special (switches, turnouts)				$1,250,000		$375,000	$1,625,000		**$1,848,756**
		10.12.01	Embedded Turnout - Furnish and Install	EA	$250,000	5.0	$1,250,000	30%	$375,000	$1,625,000	2015	**$1,848,756**
		10.12.02	Embedded Crossing - Furnish and Install	EA	$150,000	0.0	$0	30%	$0	$0	2015	**$0**
20			**STATIONS, STOPS, TERMINALS, INTERMODAL (number)**				**$2,867,644**		**$860,293**	**$3,727,938**		**$4,241,261**
	20.01		At-grade station, stop, shelter, mall, terminal, platform				$2,867,644		$860,293	$3,727,938		**$4,241,261**
		20.01.01	Streetcar Stop - Basic 1 Car	EA	$80,000	35.8	$2,867,644	30%	$860,293	$3,727,938	2015	**$4,241,261**
		20.01.02	Streetcar Stop - Premium 1 Car	EA	$200,000	0.0	$0	30%	$0	$0	2015	**$0**
	20.02		Aerial station, stop, shelter, mall, terminal, platform				$0		$0	$0		**$0**
		20.02.01	Aerial Streetcar Stop	EA	$0	0.0	$0	30%	$0	$0	2015	**$0**
30			**SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS**				$4,277,027		$1,283,108	$5,560,134		**$6,325,744**
	30.02		Light Maintenance Facility				$3,055,019		$916,506	$3,971,525		**$4,518,389**
		30.02.01	Maintenance Facility Expansion: Allowance ($500k/New Vehicle)	EA	$500,000	6.1	$3,055,019	30%	$916,506	$3,971,525	2015	**$4,518,389**
	30.05		Yard and Yard Track				$1,222,008		$366,602	$1,588,610		**$1,807,355**
		30.05.01	Yard and Storage Track Expansion: Allowance ($200k/New Vehicle)	EA	$200,000	6.1	$1,222,008	30%	$366,602	$1,588,610	2015	**$1,807,355**
40			**SITEWORK & SPECIAL CONDITIONS**				**$22,676,096**		**$3,609,519**	**$26,285,615**		**$29,905,044**
	40.02		Site Utilities, Utility Relocation				$7,673,700		$2,302,110	$9,975,810		**$11,349,441**
		40.02.01	Utility Relocation - High Allowance (Dense Urban)	TF	$750	527.0	$395,250	30%	$118,575	$513,825	2015	**$584,577**
		40.02.02	Utility Relocation - Medium Allowance (Moderate Density)	TF	$350	8623.0	$3,018,050	30%	$905,415	$3,923,465	2015	**$4,463,711**
		40.02.03	Utility Relocation - Low Allowance (Minimal Relocation Expected)	TF	$200	21302.0	$4,260,400	30%	$1,278,120	$5,538,520	2015	**$6,301,153**
	40.06		Pedestrian / bike access and accommodation, landscaping				$345,000		$103,500	$448,500		**$510,257**
		40.06.01	Pedestrian Improvement Allowance (Per Intersection)	EA	$15,000	23.0	$345,000	30%	$103,500	$448,500	2015	**$510,257**
	40.07		Automobile, bus, van accessways including roads, parking lots				$4,013,030		$1,203,909	$5,216,939		**$5,935,292**
		40.07.01	Roadway Improvement Allowance	TF	$100	30452.0	$3,045,200	30%	$913,560	$3,958,760	2015	**$4,503,866**
		40.07.02	Track Drainage Allowance	TF	$20	32261.0	$645,220	30%	$193,566	$838,786	2015	**$954,284**
		40.07.03	Street Lighting Allowance (Adjustments, Relocations, New)	TF	$10	32261.0	$322,610	30%	$96,783	$419,393	2015	**$477,142**
	40.08		Temporary Facilities and other indirect costs during construction				$10,644,366		$0	$10,644,366		**$12,110,055**
		40.08.01	Temporary Maintenance of Traffic	LS	$0	76031184.4	$3,801,559	0%	$0	$3,801,559	2015	**$4,325,020**
		40.08.02	Contractor Indirects (Staff, Office, etc.)	LS	$0	76031184.4	$6,082,495	0%	$0	$6,082,495	2015	**$6,920,031**
		40.08.03	Art in Transit (1% of Construction)	LS	$0	76031184.4	$760,312	0%	$0	$760,312	2015	**$865,004**

50		**SYSTEMS**				**$16,484,504**		**$4,945,351**	**$21,429,855**		**$24,380,665**
	50.01	Train control and signals				$300,000		$90,000	$390,000		**$443,702**
		50.01.01	TWC Control for Connection to Existing Streetcar Track	EA	$300,000	1.0	$300,000	30%	$90,000	$390,000	2015	**$443,702**
	50.02	Traffic signals and crossing protection					$2,620,220		$786,066	$3,406,286		**$3,875,319**
		50.02.01	Modify Existing Traffic Signal	EA	$75,000	13.0	$975,000	30%	$292,500	$1,267,500	2015	**$1,442,030**
		50.02.02	New Traffic Signal Allowance	EA	$250,000	4.0	$1,000,000	30%	$300,000	$1,300,000	2015	**$1,479,005**
		50.02.03	Signal Priority Allowance	TF	$20	32261.0	$645,220	30%	$193,566	$838,786	2015	**$954,284**
	50.03	Traction power supply: substations					$5,499,034		$1,649,710	$7,148,744		**$8,133,099**
		50.03.01	Traction Power Substation (Assume 1/Track Mile or 1 per 0.5 Rt. Mile)	EA	$900,000	6.1	$5,499,034	30%	$1,649,710	$7,148,744	2015	**$8,133,099**
	50.04	Traction power distribution: catenary and third rail					$8,065,250		$2,419,575	$10,484,825		**$11,928,546**
		50.04.01	Overhead Trolley Wire Allowance (Poles, wires, appurtenances)	TF	$250	32261.0	$8,065,250	30%	$2,419,575	$10,484,825	2015	**$11,928,546**
	50.05	Communications					$0		$0	$0		**$0**
		50.05.01	Communications Allowance?	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	50.06	Fare collection system and equipment					$0		$0	$0		**$0**
		50.06.01	Fare Collection (On Station or in Vehicle?)	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	Construction Subtotal (10-50)						**$62,051,346**		**$15,422,094**	**$77,473,440**		$88,141,239
60		**ROW, LAND, EXISTING IMPROVEMENTS**					**$1,152,773**		**$239,371**	**$1,392,144**		**$1,583,836**
	60.01	Purchase or lease of real estate					$1,152,773		$239,371	$1,392,144		**$1,583,836**
		60.01.01	Right of Way Acquisition	SF	$80	1102.0	$88,160	30%	$26,448	$114,608	2015	**$130,389**
		60.01.02	Right of Way Allowance	TF	$33	32261.0	$1,064,613	20%	$212,923	$1,277,536	2015	**$1,453,447**
70		**VEHICLES (number)**					$24,440,152		$1,374,759	$25,814,910		**$29,369,525**
	70.01	Light Rail					$23,829,148		$1,191,457	$25,020,605		**$28,465,848**
		70.01.01	Modern Streetcar Vehicle (Assumes wired system)	EA	$3,900,000	6.1	$23,829,148	5%	$1,191,457	$25,020,605	2015	**$28,465,848**
	70.07	Spare parts					$611,004		$183,301	$794,305		**$903,678**
		70.07.01	Spare Parts for New Vehicles (Per Vehicle)	EA	$100,000	6.1	$611,004	30%	$183,301	$794,305	2015	**$903,678**
80		**PROFESSIONAL SERVICES (applies to Cats. 10-50)**					**$26,442,372**		**$0**	**$26,442,372**		**$30,083,386**
	80.01	Preliminary Engineering					$2,644,237		$0	$2,644,237		**$3,008,339**
		80.01.01	Percentage of Direct Costs SCC (10-50)	LS	3%	88141239.0	$2,644,237	0%	$0	$2,644,237	2015	**$3,008,339**
	80.02	Final Design					$6,169,887		$0	$6,169,887		**$7,019,457**
		80.02.01	Percentage of Direct Costs SCC (10-50)	LS	7%	88141239.0	$6,169,887	0%	$0	$6,169,887	2015	**$7,019,457**
	80.03	Project Management for Design and Construction					$4,407,062		$0	$4,407,062		**$5,013,898**
		80.03.01	Percentage of Direct Costs SCC (10-50)	LS	5%	88141239.0	$4,407,062	0%	$0	$4,407,062	2015	**$5,013,898**
	80.04	Construction Administration & Management					$5,288,474		$0	$5,288,474		**$6,016,677**
		80.04.01	Percentage of Direct Costs SCC (10-50)	LS	6%	88141239.0	$5,288,474	0%	$0	$5,288,474	2015	**$6,016,677**
	80.05	Professional Liability and other Non-Construction Insurance					$2,644,237		$0	$2,644,237		**$3,008,339**
		80.05.01	Percentage of Direct Costs SCC (10-50)	LS	3%	88141239.0	$2,644,237	0%	$0	$2,644,237	2015	**$3,008,339**
	80.06	Legal; Permits; Review Fees by other agencies, cities, etc.					$1,762,825		$0	$1,762,825		**$2,005,559**
		80.06.01	Percentage of Direct Costs SCC (10-50)	LS	2%	88141239.0	$1,762,825	0%	$0	$1,762,825	2015	**$2,005,559**
	80.07	Surveys, Testing, Investigation, Inspection					$1,762,825		$0	$1,762,825		**$2,005,559**
		80.07.01	Percentage of Direct Costs SCC (10-50)	LS	2%	88141239.0	$1,762,825	0%	$0	$1,762,825	2015	**$2,005,559**
	80.08	Start up					$1,762,825		$0	$1,762,825		**$2,005,559**
		80.08.01	Percentage of Direct Costs SCC (10-50)	LS	2%	88141239.0	$1,762,825	0%	$0	$1,762,825	2015	**$2,005,559**
	Subtotal (10-80)						**$114,086,642**		**$17,036,223**	**$131,122,865**		$149,177,987
90		**UNALLOCATED CONTINGENCY**		**LS**	**25%**					**$32,780,716**		**$37,294,497**
100		**FINANCE CHARGES**								***Current Year Total***		***YoE Total***
	Segment Totals (10-100)									**$163,903,582**		$186,472,484

			Alignment 7	East Side (Segments G,H)								Current Year		*Inflation Rate*
			7.8 Track Miles	Approximately $30 Million Per Track Mile								*2011.25 (YR)*		*3.50%*
SCC	**SCC Sub**	**Item #**		**Item Description**	**Unit**	**Unit Cost**	**Quantity**	**Item Cost**	**A. Cont.**	**Item Cont.**	**Subtotal**	**YoE**	**Subtotal YoE**
10				**GUIDEWAY & TRACK ELEMENTS (route miles)**				**$18,465,290**		**$5,539,587**	**$24,004,877**		**$27,310,258**
	10.04			Guideway: Aerial structure				$0		$0	$0		**$0**
		10.04.01		Alignment Over Existing Bridge	TF	$700	0.0	$0	30%	$0	$0	2015	**$0**
		10.04.02		New Streetcar Viaduct	TF	$7,000	0.0	$0	30%	$0	$0	2015	**$0**
	10.06			Guideway: Underground cut & cover				$0		$0	$0		**$0**
		10.06.01		Cut-and-Cover Tunnel with Soldier Pile Walls	LS	$55,521,389	0.0	$0	30%	$0	$0	2015	**$0**
	10.08			Guideway: Retained cut or fill				$0		$0	$0		**$0**
		10.08.01		Retaining Wall <10ft Tall	LF	$800	0.0	$0	30%	$0	$0	2015	**$0**
		10.08.02		Retaining Wall >10ft Tall	LF	$1,600	0.0	$0	30%	$0	$0	2015	**$0**
	10.10			Track: Embedded				$17,465,290		$5,239,587	$22,704,877		**$25,831,253**
		10.10.01		Furnish Rail - Assume 112TRAM Block Rail	TF	$75	41094.8	$3,082,110	30%	$924,633	$4,006,743	2015	**$4,558,456**
		10.10.02		Embedded Track - Construct Track Slab	TF	$350	41094.8	$14,383,180	30%	$4,314,954	$18,698,134	2015	**$21,272,796**
	10.12			Track: Special (switches, turnouts)				$1,000,000		$300,000	$1,300,000		**$1,479,005**
		10.12.01		Embedded Turnout - Furnish and Install	EA	$250,000	4.0	$1,000,000	30%	$300,000	$1,300,000	2015	**$1,479,005**
		10.12.02		Embedded Crossing - Furnish and Install	EA	$150,000	0.0	$0	30%	$0	$0	2015	**$0**
20				**STATIONS, STOPS, TERMINALS, INTERMODAL (number)**				**$3,652,871**		**$1,095,861**	**$4,748,732**		**$5,402,615**
	20.01			At-grade station, stop, shelter, mall, terminal, platform				$3,652,871		$1,095,861	$4,748,732		**$5,402,615**
		20.01.01		Streetcar Stop - Basic 1 Car	EA	$80,000	45.7	$3,652,871	30%	$1,095,861	$4,748,732	2015	**$5,402,615**
		20.01.02		Streetcar Stop - Premium 1 Car	EA	$200,000	0.0	$0	30%	$0	$0	2015	**$0**
	20.02			Aerial station, stop, shelter, mall, terminal, platform				$0		$0	$0		**$0**
		20.02.01		Aerial Streetcar Stop	EA	$0	0.0	$0	30%	$0	$0	2015	**$0**
30				**SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS**				$5,448,174		$1,634,452	$7,082,627		**$8,057,877**
	30.02			Light Maintenance Facility				$3,891,553		$1,167,466	$5,059,019		**$5,755,627**
		30.02.01		Maintenance Facility Expansion: Allowance ($500k/New Vehicle)	EA	$500,000	7.8	$3,891,553	30%	$1,167,466	$5,059,019	2015	**$5,755,627**
	30.05			Yard and Yard Track				$1,556,621		$466,986	$2,023,608		**$2,302,251**
		30.05.01		Yard and Storage Track Expansion: Allowance ($200k/New Vehicle)	EA	$200,000	7.8	$1,556,621	30%	$466,986	$2,023,608	2015	**$2,302,251**
40				**SITEWORK & SPECIAL CONDITIONS**				**$29,798,022**		**$4,968,325**	**$34,766,347**		**$39,553,541**
	40.02			Site Utilities, Utility Relocation				$10,738,760		$3,221,628	$13,960,388		**$15,882,681**
		40.02.01		Utility Relocation - High Allowance (Dense Urban)	TF	$750	1045.0	$783,750	30%	$235,125	$1,018,875	2015	**$1,159,170**
		40.02.02		Utility Relocation - Medium Allowance (Moderate Density)	TF	$350	12967.0	$4,538,450	30%	$1,361,535	$5,899,985	2015	**$6,712,391**
		40.02.03		Utility Relocation - Low Allowance (Minimal Relocation Expected)	TF	$200	27082.8	$5,416,560	30%	$1,624,968	$7,041,528	2015	**$8,011,120**
	40.06			Pedestrian / bike access and accommodation, landscaping				$480,000		$144,000	$624,000		**$709,922**
		40.06.01		Pedestrian Improvement Allowance (Per Intersection)	EA	$15,000	32.0	$480,000	30%	$144,000	$624,000	2015	**$709,922**
	40.07			Automobile, bus, van accessways including roads, parking lots				$5,342,324		$1,602,697	$6,945,021		**$7,901,324**
		40.07.01		Roadway Improvement Allowance	TF	$100	41094.8	$4,109,480	30%	$1,232,844	$5,342,324	2015	**$6,077,942**
		40.07.02		Track Drainage Allowance	TF	$20	41094.8	$821,896	30%	$246,569	$1,068,465	2015	**$1,215,588**
		40.07.03		Street Lighting Allowance (Adjustments, Relocations, New)	TF	$10	41094.8	$410,948	30%	$123,284	$534,232	2015	**$607,794**
	40.08			Temporary Facilities and other indirect costs during construction				$13,236,938		$0	$13,236,938		**$15,059,614**
		40.08.01		Temporary Maintenance of Traffic	LS	$0	94549556.6	$4,727,478	0%	$0	$4,727,478	2015	**$5,378,434**
		40.08.02		Contractor Indirects (Staff, Office, etc.)	LS	$0	94549556.6	$7,563,965	0%	$0	$7,563,965	2015	**$8,605,494**
		40.08.03		Art in Transit (1% of Construction)	LS	$0	94549556.6	$945,496	0%	$0	$945,496	2015	**$1,075,687**

50		**SYSTEMS**				**$19,800,391**		**$5,940,117**	**$25,740,509**		**$29,284,879**
	50.01	Train control and signals				$300,000		$90,000	$390,000		**$443,702**
		50.01.01	TWC Control for Connection to Existing Streetcar Track	EA	$300,000	1.0	$300,000	30%	$90,000	$390,000	2015	**$443,702**
	50.02	Traffic signals and crossing protection					$2,221,896		$666,569	$2,888,465		**$3,286,195**
		50.02.01	Modify Existing Traffic Signal	EA	$75,000	12.0	$900,000	30%	$270,000	$1,170,000	2015	**$1,331,105**
		50.02.02	New Traffic Signal Allowance	EA	$250,000	2.0	$500,000	30%	$150,000	$650,000	2015	**$739,503**
		50.02.03	Signal Priority Allowance	TF	$20	41094.8	$821,896	30%	$246,569	$1,068,465	2015	**$1,215,588**
	50.03	Traction power supply: substations					$7,004,795		$2,101,439	$9,106,234		**$10,360,128**
		50.03.01	Traction Power Substation (Assume 1/Track Mile or 1 per 0.5 Rt. Mile)	EA	$900,000	7.8	$7,004,795	30%	$2,101,439	$9,106,234	2015	**$10,360,128**
	50.04	Traction power distribution: catenary and third rail					$10,273,700		$3,082,110	$13,355,810		**$15,194,854**
		50.04.01	Overhead Trolley Wire Allowance (Poles, wires, appurtenances)	TF	$250	41094.8	$10,273,700	30%	$3,082,110	$13,355,810	2015	**$15,194,854**
	50.05	Communications					$0		$0	$0		**$0**
		50.05.01	Communications Allowance?	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	50.06	Fare collection system and equipment					$0		$0	$0		**$0**
		50.06.01	Fare Collection (On Station or in Vehicle?)	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	Construction Subtotal (10-50)						**$77,164,749**		**$19,178,343**	**$96,343,092**		$109,609,171
60		**ROW, LAND, EXISTING IMPROVEMENTS**					**$1,385,248**		**$279,962**	**$1,665,210**		**$1,894,503**
	60.01	Purchase or lease of real estate					$1,385,248		$279,962	$1,665,210		**$1,894,503**
		60.01.01	Right of Way Acquisition	SF	$80	364.0	$29,120	30%	$8,736	$37,856	2015	**$43,069**
		60.01.02	Right of Way Allowance	TF	$33	41094.8	$1,356,128	20%	$271,226	$1,627,354	2015	**$1,851,435**
70		**VEHICLES (number)**					$31,132,424		$1,751,199	$32,883,623		**$37,411,573**
	70.01	Light Rail					$30,354,114		$1,517,706	$31,871,819		**$36,260,448**
		70.01.01	Modern Streetcar Vehicle (Assumes wired system)	EA	$3,900,000	7.8	$30,354,114	5%	$1,517,706	$31,871,819	2015	**$36,260,448**
	70.07	Spare parts					$778,311		$233,493	$1,011,804		**$1,151,125**
		70.07.01	Spare Parts for New Vehicles (Per Vehicle)	EA	$100,000	7.8	$778,311	30%	$233,493	$1,011,804	2015	**$1,151,125**
80		**PROFESSIONAL SERVICES (applies to Cats. 10-50)**					**$32,882,751**		**$0**	**$32,882,751**		**$37,410,581**
	80.01	Preliminary Engineering					$3,288,275		$0	$3,288,275		**$3,741,058**
		80.01.01	Percentage of Direct Costs SCC (10-50)	LS	3%	109609170.7	$3,288,275	0%	$0	$3,288,275	2015	**$3,741,058**
	80.02	Final Design					$7,672,642		$0	$7,672,642		**$8,729,136**
		80.02.01	Percentage of Direct Costs SCC (10-50)	LS	7%	109609170.7	$7,672,642	0%	$0	$7,672,642	2015	**$8,729,136**
	80.03	Project Management for Design and Construction					$5,480,459		$0	$5,480,459		**$6,235,097**
		80.03.01	Percentage of Direct Costs SCC (10-50)	LS	5%	109609170.7	$5,480,459	0%	$0	$5,480,459	2015	**$6,235,097**
	80.04	Construction Administration & Management					$6,576,550		$0	$6,576,550		**$7,482,116**
		80.04.01	Percentage of Direct Costs SCC (10-50)	LS	6%	109609170.7	$6,576,550	0%	$0	$6,576,550	2015	**$7,482,116**
	80.05	Professional Liability and other Non-Construction Insurance					$3,288,275		$0	$3,288,275		**$3,741,058**
		80.05.01	Percentage of Direct Costs SCC (10-50)	LS	3%	109609170.7	$3,288,275	0%	$0	$3,288,275	2015	**$3,741,058**
	80.06	Legal; Permits; Review Fees by other agencies, cities, etc.					$2,192,183		$0	$2,192,183		**$2,494,039**
		80.06.01	Percentage of Direct Costs SCC (10-50)	LS	2%	109609170.7	$2,192,183	0%	$0	$2,192,183	2015	**$2,494,039**
	80.07	Surveys, Testing, Investigation, Inspection					$2,192,183		$0	$2,192,183		**$2,494,039**
		80.07.01	Percentage of Direct Costs SCC (10-50)	LS	2%	109609170.7	$2,192,183	0%	$0	$2,192,183	2015	**$2,494,039**
	80.08	Start up					$2,192,183		$0	$2,192,183		**$2,494,039**
		80.08.01	Percentage of Direct Costs SCC (10-50)	LS	2%	109609170.7	$2,192,183	0%	$0	$2,192,183	2015	**$2,494,039**
	Subtotal (10-80)						**$142,565,173**		**$21,209,504**	**$163,774,676**		$186,325,829
90		**UNALLOCATED CONTINGENCY**		**LS**	**25%**					**$40,943,669**		**$46,581,457**
100		**FINANCE CHARGES**								***Current Year Total***		***YoE Total***
	Segment Totals (10-100)									**$204,718,345**		$232,907,286

			Alignment 8	Pacific Highway (Segments G,I)								Current Year		*Inflation Rate*
			6.1 Track Miles	Approximately $29 Million Per Track Mile								*2011.25 (YR)*		*3.50%*
SCC	**SCC Sub**	**Item #**		**Item Description**	**Unit**	**Unit Cost**	**Quantity**	**Item Cost**	**A. Cont.**	**Item Cont.**	**Subtotal**	**YoE**	**Subtotal YoE**
10				**GUIDEWAY & TRACK ELEMENTS (route miles)**				**$16,460,655**		**$4,938,197**	**$21,398,852**		**$24,345,392**
	10.04			Guideway: Aerial structure				$3,445,400		$1,033,620	$4,479,020		**$5,095,764**
		10.04.01		Alignment Over Existing Bridge	TF	$700	4922.0	$3,445,400	30%	$1,033,620	$4,479,020	2015	**$5,095,764**
		10.04.02		New Streetcar Viaduct	TF	$7,000	0.0	$0	30%	$0	$0	2015	**$0**
	10.06			Guideway: Underground cut & cover				$0		$0	$0		**$0**
		10.06.01		Cut-and-Cover Tunnel with Soldier Pile Walls	LS	$55,521,389	0.0	$0	30%	$0	$0	2015	**$0**
	10.08			Guideway: Retained cut or fill				$0		$0	$0		**$0**
		10.08.01		Retaining Wall <10ft Tall	LF	$800	0.0	$0	30%	$0	$0	2015	**$0**
		10.08.02		Retaining Wall >10ft Tall	LF	$1,600	0.0	$0	30%	$0	$0	2015	**$0**
	10.10			Track: Embedded				$12,015,255		$3,604,577	$15,619,832		**$17,770,623**
		10.10.01		Furnish Rail - Assume 112TRAM Block Rail	TF	$75	32324.6	$2,424,345	30%	$727,304	$3,151,649	2015	**$3,585,619**
		10.10.02		Embedded Track - Construct Track Slab	TF	$350	27402.6	$9,590,910	30%	$2,877,273	$12,468,183	2015	**$14,185,005**
	10.12			Track: Special (switches, turnouts)				$1,000,000		$300,000	$1,300,000		**$1,479,005**
		10.12.01		Embedded Turnout - Furnish and Install	EA	$250,000	4.0	$1,000,000	30%	$300,000	$1,300,000	2015	**$1,479,005**
		10.12.02		Embedded Crossing - Furnish and Install	EA	$150,000	0.0	$0	30%	$0	$0	2015	**$0**
20				**STATIONS, STOPS, TERMINALS, INTERMODAL (number)**				**$2,873,298**		**$861,989**	**$3,735,287**		**$4,249,622**
	20.01			At-grade station, stop, shelter, mall, terminal, platform				$2,873,298		$861,989	$3,735,287		**$4,249,622**
		20.01.01		Streetcar Stop - Basic 1 Car	EA	$80,000	35.9	$2,873,298	30%	$861,989	$3,735,287	2015	**$4,249,622**
		20.01.02		Streetcar Stop - Premium 1 Car	EA	$200,000	0.0	$0	30%	$0	$0	2015	**$0**
	20.02			Aerial station, stop, shelter, mall, terminal, platform				$0		$0	$0		**$0**
		20.02.01		Aerial Streetcar Stop	EA	$0	0.0	$0	30%	$0	$0	2015	**$0**
30				**SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS**				$4,285,458		$1,285,638	$5,571,096		**$6,338,215**
	30.02			Light Maintenance Facility				$3,061,042		$918,313	$3,979,354		**$4,527,296**
		30.02.01		Maintenance Facility Expansion: Allowance ($500k/New Vehicle)	EA	$500,000	6.1	$3,061,042	30%	$918,313	$3,979,354	2015	**$4,527,296**
	30.05			Yard and Yard Track				$1,224,417		$367,325	$1,591,742		**$1,810,918**
		30.05.01		Yard and Storage Track Expansion: Allowance ($200k/New Vehicle)	EA	$200,000	6.1	$1,224,417	30%	$367,325	$1,591,742	2015	**$1,810,918**
40				**SITEWORK & SPECIAL CONDITIONS**				**$19,740,797**		**$2,873,210**	**$22,614,008**		**$25,727,871**
	40.02			Site Utilities, Utility Relocation				$5,627,370		$1,688,211	$7,315,581		**$8,322,909**
		40.02.01		Utility Relocation - High Allowance (Dense Urban)	TF	$750	0.0	$0	30%	$0	$0	2015	**$0**
		40.02.02		Utility Relocation - Medium Allowance (Moderate Density)	TF	$350	979.0	$342,650	30%	$102,795	$445,445	2015	**$506,781**
		40.02.03		Utility Relocation - Low Allowance (Minimal Relocation Expected)	TF	$200	26423.6	$5,284,720	30%	$1,585,416	$6,870,136	2015	**$7,816,128**
	40.06			Pedestrian / bike access and accommodation, landscaping				$240,000		$72,000	$312,000		**$354,961**
		40.06.01		Pedestrian Improvement Allowance (Per Intersection)	EA	$15,000	16.0	$240,000	30%	$72,000	$312,000	2015	**$354,961**
	40.07			Automobile, bus, van accessways including roads, parking lots				$3,709,998		$1,112,999	$4,822,997		**$5,487,106**
		40.07.01		Roadway Improvement Allowance	TF	$100	27402.6	$2,740,260	30%	$822,078	$3,562,338	2015	**$4,052,858**
		40.07.02		Track Drainage Allowance	TF	$20	32324.6	$646,492	30%	$193,948	$840,440	2015	**$956,165**
		40.07.03		Street Lighting Allowance (Adjustments, Relocations, New)	TF	$10	32324.6	$323,246	30%	$96,974	$420,220	2015	**$478,082**
	40.08			Temporary Facilities and other indirect costs during construction				$10,163,429		$0	$10,163,429		**$11,562,895**
		40.08.01		Temporary Maintenance of Traffic	LS	$0	72595923.0	$3,629,796	0%	$0	$3,629,796	2015	**$4,129,605**
		40.08.02		Contractor Indirects (Staff, Office, etc.)	LS	$0	72595923.0	$5,807,674	0%	$0	$5,807,674	2015	**$6,607,369**
		40.08.03		Art in Transit (1% of Construction)	LS	$0	72595923.0	$725,959	0%	$0	$725,959	2015	**$825,921**

50		**SYSTEMS**				**$15,887,517**		**$4,766,255**	**$20,653,772**		**$23,497,718**
	50.01	Train control and signals				$300,000		$90,000	$390,000		**$443,702**
		50.01.01	TWC Control for Connection to Existing Streetcar Track	EA	$300,000	1.0	$300,000	30%	$90,000	$390,000	2015	**$443,702**
	50.02	Traffic signals and crossing protection					$1,996,492		$598,948	$2,595,440		**$2,952,822**
		50.02.01	Modify Existing Traffic Signal	EA	$75,000	8.0	$600,000	30%	$180,000	$780,000	2015	**$887,403**
		50.02.02	New Traffic Signal Allowance	EA	$250,000	3.0	$750,000	30%	$225,000	$975,000	2015	**$1,109,254**
		50.02.03	Signal Priority Allowance	TF	$20	32324.6	$646,492	30%	$193,948	$840,440	2015	**$956,165**
	50.03	Traction power supply: substations					$5,509,875		$1,652,963	$7,162,838		**$8,149,133**
		50.03.01	Traction Power Substation (Assume 1/Track Mile or 1 per 0.5 Rt. Mile)	EA	$900,000	6.1	$5,509,875	30%	$1,652,963	$7,162,838	2015	**$8,149,133**
	50.04	Traction power distribution: catenary and third rail					$8,081,150		$2,424,345	$10,505,495		**$11,952,062**
		50.04.01	Overhead Trolley Wire Allowance (Poles, wires, appurtenances)	TF	$250	32324.6	$8,081,150	30%	$2,424,345	$10,505,495	2015	**$11,952,062**
	50.05	Communications					$0		$0	$0		**$0**
		50.05.01	Communications Allowance?	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	50.06	Fare collection system and equipment					$0		$0	$0		**$0**
		50.06.01	Fare Collection (On Station or in Vehicle?)	XX	$0	0.0	$0	30%	$0	$0	2015	**$0**
	Construction Subtotal (10-50)						**$59,247,725**		**$14,725,289**	**$73,973,014**		$84,158,818
60		**ROW, LAND, EXISTING IMPROVEMENTS**					**$1,177,912**		**$246,702**	**$1,424,614**		**$1,620,778**
	60.01	Purchase or lease of real estate					$1,177,912		$246,702	$1,424,614		**$1,620,778**
		60.01.01	Right of Way Acquisition	SF	$80	1390.0	$111,200	30%	$33,360	$144,560	2015	**$164,465**
		60.01.02	Right of Way Allowance	TF	$33	32324.6	$1,066,712	20%	$213,342	$1,280,054	2015	**$1,456,313**
70		**VEHICLES (number)**					$24,488,333		$1,377,469	$25,865,802		**$29,427,425**
	70.01	Light Rail					$23,876,125		$1,193,806	$25,069,931		**$28,521,966**
		70.01.01	Modern Streetcar Vehicle (Assumes wired system)	EA	$3,900,000	6.1	$23,876,125	5%	$1,193,806	$25,069,931	2015	**$28,521,966**
	70.07	Spare parts					$612,208		$183,663	$795,871		**$905,459**
		70.07.01	Spare Parts for New Vehicles (Per Vehicle)	EA	$100,000	6.1	$612,208	30%	$183,663	$795,871	2015	**$905,459**
80		**PROFESSIONAL SERVICES (applies to Cats. 10-50)**					**$25,247,645**		**$0**	**$25,247,645**		**$28,724,150**
	80.01	Preliminary Engineering					$2,524,765		$0	$2,524,765		**$2,872,415**
		80.01.01	Percentage of Direct Costs SCC (10-50)	LS	3%	84158817.9	$2,524,765	0%	$0	$2,524,765	2015	**$2,872,415**
	80.02	Final Design					$5,891,117		$0	$5,891,117		**$6,702,302**
		80.02.01	Percentage of Direct Costs SCC (10-50)	LS	7%	84158817.9	$5,891,117	0%	$0	$5,891,117	2015	**$6,702,302**
	80.03	Project Management for Design and Construction					$4,207,941		$0	$4,207,941		**$4,787,358**
		80.03.01	Percentage of Direct Costs SCC (10-50)	LS	5%	84158817.9	$4,207,941	0%	$0	$4,207,941	2015	**$4,787,358**
	80.04	Construction Administration & Management					$5,049,529		$0	$5,049,529		**$5,744,830**
		80.04.01	Percentage of Direct Costs SCC (10-50)	LS	6%	84158817.9	$5,049,529	0%	$0	$5,049,529	2015	**$5,744,830**
	80.05	Professional Liability and other Non-Construction Insurance					$2,524,765		$0	$2,524,765		**$2,872,415**
		80.05.01	Percentage of Direct Costs SCC (10-50)	LS	3%	84158817.9	$2,524,765	0%	$0	$2,524,765	2015	**$2,872,415**
	80.06	Legal; Permits; Review Fees by other agencies, cities, etc.					$1,683,176		$0	$1,683,176		**$1,914,943**
		80.06.01	Percentage of Direct Costs SCC (10-50)	LS	2%	84158817.9	$1,683,176	0%	$0	$1,683,176	2015	**$1,914,943**
	80.07	Surveys, Testing, Investigation, Inspection					$1,683,176		$0	$1,683,176		**$1,914,943**
		80.07.01	Percentage of Direct Costs SCC (10-50)	LS	2%	84158817.9	$1,683,176	0%	$0	$1,683,176	2015	**$1,914,943**
	80.08	Start up					$1,683,176		$0	$1,683,176		**$1,914,943**
		80.08.01	Percentage of Direct Costs SCC (10-50)	LS	2%	84158817.9	$1,683,176	0%	$0	$1,683,176	2015	**$1,914,943**
	Subtotal (10-80)						**$110,161,616**		**$16,349,460**	**$126,511,076**		$143,931,172
90		**UNALLOCATED CONTINGENCY**		**LS**	**25%**					**$31,627,769**		**$35,982,793**
100		**FINANCE CHARGES**								***Current Year Total***		***YoE Total***
	Segment Totals (10-100)									**$158,138,845**		$179,913,964

Appendix B – Segment Summary Cost Estimates

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Segment Summary Cost Estimates

Segment			FTA Standard Cost Category											Segment
			Guideway & Track Elements	Stations, Stops, Terminals, Intermodal	Support Facilities: Yards, Shops & Admin. Bldgs.	Sitework & Special Conditions	Systems	ROW, Land, & Existing Improvements	Vehicles	Professional Services	Unallocated Contingency	Total		
	A	YOE $	$ 24,255,665	$ 4,945,727	$ 7,376,440	$ 37,280,473	$ 26,207,496	$ 1,788,927	$ 34,247,756	$ 34,153,345	$ 42,563,957	$ 212,819,786	YOE $	A
		Current $	$ 21,319,984	$ 4,347,142	$ 6,483,664	$ 32,768,390	$ 23,035,584	$ 1,572,412	$ 30,102,725	$ 30,019,740	$ 37,412,410	$ 187,062,050	Current $	
	B	YOE $	$ 11,656,117	$ 2,117,580	$ 3,158,323	$ 14,059,840	$ 11,084,453	$ 725,678	$ 14,663,642	$ 14,361,019	$ 17,956,663	$ 89,783,315	YOE $	B
		Current $	$ 10,245,368	$ 1,861,288	$ 2,776,069	$ 12,358,167	$ 9,742,894	$ 637,849	$ 12,888,891	$ 12,622,894	$ 15,783,355	$ 78,916,775	Current $	
	C	YOE $	$ 9,506,309	$ 1,910,914	$ 2,850,085	$ 16,545,354	$ 10,504,100	$ 654,856	$ 13,232,537	$ 14,101,777	$ 17,326,482	$ 86,632,412	YOE $	C
		Current $	$ 8,355,753	$ 1,679,635	$ 2,505,137	$ 14,542,857	$ 9,232,781	$ 575,598	$ 11,630,993	$ 12,395,028	$ 15,229,445	$ 76,147,227	Current $	
	D	YOE $	$ 8,943,403	$ 1,669,448	$ 2,489,944	$ 12,535,322	$ 8,937,859	$ 594,943	$ 11,560,455	$ 11,801,087	$ 14,633,116	$ 73,165,578	YOE $	D
		Current $	$ 7,860,977	$ 1,467,394	$ 2,188,584	$ 11,018,163	$ 7,856,103	$ 522,937	$ 10,161,285	$ 10,372,793	$ 12,862,059	$ 64,310,294	Current $	
	E	YOE $	$ 7,109,522	$ 1,486,959	$ 2,217,765	$ 12,293,300	$ 8,847,055	$ 509,569	$ 10,296,768	$ 10,906,389	$ 13,416,832	$ 67,084,158	YOE $	E
		Current $	$ 6,249,051	$ 1,306,991	$ 1,949,348	$ 10,805,433	$ 7,776,289	$ 447,896	$ 9,050,542	$ 9,586,380	$ 11,792,983	$ 58,964,913	Current $	
	F	YOE $	$ 23,288,525	$ 4,241,261	$ 6,325,744	$ 29,905,044	$ 24,380,665	$ 1,583,836	$ 29,369,525	$ 30,083,386	$ 37,294,497	$ 186,472,484	YOE $	F
		Current $	$ 20,469,898	$ 3,727,938	$ 5,560,134	$ 26,285,615	$ 21,429,855	$ 1,392,144	$ 25,814,910	$ 26,442,372	$ 32,780,716	$ 163,903,582	Current $	
	G	YOE $	$ 3,786,992	$ 560,050	$ 835,302	$ 4,137,071	$ 3,958,315	$ 191,925	$ 3,878,187	$ 4,531,807	$ 5,469,912	$ 27,349,561	YOE $	G
		Current $	$ 3,328,650	$ 492,267	$ 734,205	$ 3,636,358	$ 3,479,237	$ 168,696	$ 3,408,807	$ 3,983,319	$ 4,807,885	$ 24,039,424	Current $	
	H	YOE $	$ 23,523,265	$ 4,842,565	$ 7,222,576	$ 35,416,470	$ 25,326,564	$ 1,702,578	$ 33,533,387	$ 32,878,774	$ 41,111,545	$ 205,557,725	YOE $	H
		Current $	$ 20,676,227	$ 4,256,466	$ 6,348,422	$ 31,129,989	$ 22,261,272	$ 1,496,514	$ 29,474,816	$ 28,899,432	$ 36,135,784	$ 180,678,922	Current $	
	I	YOE $	$ 20,558,400	$ 3,689,572	$ 5,502,913	$ 21,590,800	$ 19,539,403	$ 1,428,853	$ 25,549,238	$ 24,192,343	$ 30,512,881	$ 152,564,403	YOE $	I
		Current $	$ 18,070,202	$ 3,243,020	$ 4,836,891	$ 18,977,649	$ 17,174,535	$ 1,255,918	$ 22,456,995	$ 21,264,326	$ 26,819,884	$ 134,099,421	Current $	
	J	YOE $	$ 90,116,125	$ -	$ 1,272,835	$ 25,430,175	$ 5,324,665	$ 1,364,083	$ 5,909,592	$ 41,688,762	$ 42,776,559	$ 213,882,796	YOE $	J
		Current $	$ 79,209,304	$ -	$ 1,118,783	$ 22,352,343	$ 4,680,217	$ 1,198,987	$ 5,194,349	$ 36,643,140	$ 37,599,281	$ 187,996,404	Current $	

Economic Escalation Assumptions					
Current Year:	2011.25	Expense Year:	2015	Inflation Rate:	3.5%

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Appendix F
FTA's Small Starts and Other Funding Mechanisms for Streetcar Projects

HDR | ONE COMPANY *Many Solutions*℠

Memo

To: David Knowles	
From: Marc Soronson/Stephanie Shipp	Project: Tacoma Streetcar
CC: Kevin Collins	
Date: March 22, 2011	

RE: FTA's Small Starts and Other Funding Mechanisms for Streetcar Projects

The following memo describes funding opportunities to supplement the local funding available for the Tacoma Streetcar project. ST2, the regional transportation plan, set aside $85 million in sales tax revenues that may be applied to the expansion of the Tacoma Link Streetcar. To supplement these funds, the following will describe potential sources of capital funding that exist or are likely to exist in the future.

BACKGROUND

The Federal Transit Administration (FTA) has three programs under SAFETEA-LU to finance major capital transit investments: New Starts, Small Starts, and Very Small Starts. Each program generally focuses on a different size, function, and complexity of transit capital projects. While these programs have helped to fund and implement a wide range of transit projects nationwide, the evaluation and funding of streetcar projects does not readily fit into the FTA's evaluation criteria for New, Small, or Very Small Starts projects given the emphasis on travel time savings and user benefits as compared to the required Baseline Alternative. As of the FY12 Annual Report on Funding Recommendations, only one streetcar project (Portland) has been recommended for funding through FTA's major capital programs.

In 2009, additional funding for transit projects became available as a result of the American Recovery and Reinvestment Act. The federal government released nearly $2.5 billion of discretionary dollars through competitive programs that include urban and sustainable criteria well suited to streetcar projects. The following is a list of those funding opportunities:

- TIGER – $1.5 billion available, awarded Feb, 2010
- TIGER 2 - $600 million available, awarded Oct, 2010
- Urban Circulator - $105 million available, awarded March, 2010

Combined, 12 streetcar projects received an award for funding through these programs for a total of $358 million. These programs emphasized characteristics common to streetcar projects. Livability, walkability, economic development, and connectivity to attractions and other transit modes were all evaluation criteria. While only temporary, these funding programs have provided a number of benefits to those cities planning streetcar projects. A multi-agency partnership was formed between the US Department of Transportation (USDOT), Department of Housing and Urban Development, and the Environmental Protection Agency (EPA). This partnership has already influenced transportation policy within each agency and will likely have a significant impact on the upcoming reauthorization of the surface transportation funding legislation. For example, the FTA has stated that transit projects utilizing funding from other federal agencies, and in particular HUD and EPA funds, may receive additional credit during the New and Small Starts evaluation process as an "other factor." For streetcar projects in particular, the FTA recognizes the need for a separate set of evaluation criteria, and has even suggested these projects should have a separate funding program because of their unique nature.

It is widely recognized that streetcar projects can provide a valuable and unique resource for cities. Often used as a means to circulate within an urban environment or connect major attractions, it is a travel mode that gives users a rail alternative to longer walk trips and, in some cases, a more direct connection than existing bus service could provide. For these reasons and the unique travel markets a streetcar project attracts, the FTA has struggled to fit these projects into its existing evaluation criteria. However, given the growing national interest and high number of streetcar project applications received for stimulus funds, the FTA is beginning to rethink how streetcar projects are

evaluated and receive funding. The following will describe the current funding opportunities within the FTA as well as other funding initiatives that may help to construct and implement a streetcar project.

FTA FUNDING OPPORTUNITIES FOR STREETCAR PROJECTS

As noted above, the FTA has three programs of funding. Only the Small Starts program, however, generally fits the cost and attributes of streetcar projects. The following will provide a brief overview of the Small Starts program including the annual program budget, the eligibility criteria, and the evaluation and rating process.

Small Starts Program Overview

The Small Starts program was first authorized under SAFETEA-LU and began evaluating projects in the fall of 2006. For each of the six year authorization period, the annual Small Starts budget was $200 million. Since the expiration of SAFETEA-LU, the program has continued to offer the same level of annual funding. The intent of the Small Starts program is to provide a relatively quick evaluation and funding process for smaller projects and those projects in cities with existing transit service and implementation experience. Over the years, the majority of funded projects have been bus rapid transit (BRT) projects. Table 1 below shows the amount of funding provided by transit mode for each year since 2006.

TABLE 1 – Small Starts Funding Recommendations by Mode, FY07 – FY12 ($Millions)

	FY08	FY09*	FY10	FY11	FY12	TOTAL
Bus Rapid Transit	$84.9	$401.0	$136.8	$176.1	$143.2	$942.0
Commuter Rail		$150.0	$37.4	$23.5		$210.9
Light Rail					$37.5	$37.5
Streetcar		$75.0				$75.0
TOTAL	$84.9	$626.0	$174.2	$199.6	$180.7	$1,265.4

* Funding recommendations in this year exceeded the annual $200 million budget due to additional funds available from previous years. No projects were evaluated or recommended for funding prior to FY08.

Small Starts Eligibility Criteria

While the Small Starts eligibility criteria have been refined in recent years based on experience, the basic structure of the program has remained the same. Since inception, the program sought to streamline the evaluation and rating process over what project sponsors of New Starts projects have experienced. The New Starts program has an average timeline of 6-12 years for one project to proceed through the evaluation and funding pipeline. Small Starts projects, on the other hand, have averaged 3-4 years to proceed through the pipeline. The following summarizes the current eligibility criteria for Small Starts projects:

- Total cost of $250 million or less and a request of no greater than $75 million in Small Starts funding
- Projects must be in a fixed guideway for 50% of its length –OR– be a corridor based bus project with 10 minute peak and 15 minute off peak frequencies and at least three of the following capital components included in the project:
    - Substantial transit stations
    - Traffic signal priority / preemption
    - Low floor vehicles or level boarding
    - "Branding" of the proposed service

Small Starts Evaluation Process

Small Starts projects include fewer overall evaluation criteria than New Starts projects. Additionally, it is thought that these generally smaller projects will have a greater immediate impact on criteria such as land use and economic development, than a New Starts project. For this reason, FTA evaluates Small Starts projects based on opening day metrics, rather than a 20-30 year forecast horizon, as is the case with New Starts projects. Thus, the idea that Small Starts projects may not only be evaluated on a shorter timeframe, but will also have a more rapid impact in the surrounding community helps to guide the development of evaluation criteria.

The overall project rating for Small Starts projects is comprised of two categories of criteria: project justification and local financial commitment. Each of these composes 50% of the overall project rating. Figure 1 below shows individual evaluation criteria within these categories. In addition to those criteria listed below, there are several programmatic items that, as part of other federal requirements and good planning practice, are also required to accompany an application to enter Project Development. These items include:

- Compliance with Metropolitan Planning and Programming requirements
- Demonstrating Project Management Technical Capacity
- Adhering to requirements of the National Environmental Protection Act (NEPA)
- Completion of an alternatives analysis study

Pros and Cons of Advancing a Streetcar Project through Small Starts

As noted above, to date only one streetcar project, the Portland Streetcar Loop, has been approved for Small Starts funding. There are a few reasons that streetcar projects do not fare well in the Small Starts evaluation process.

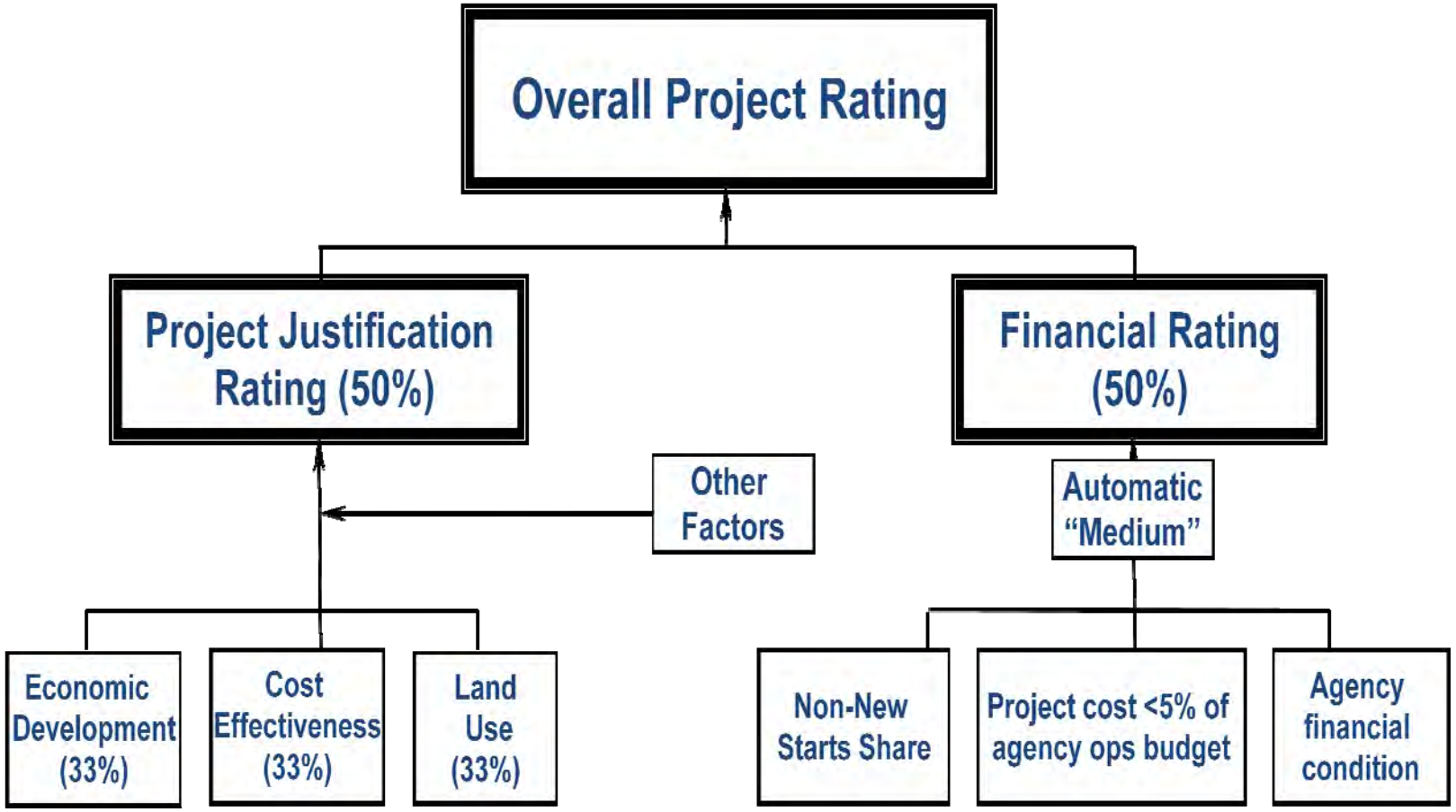
- Timeframe of evaluation – the evaluation of Small Starts criteria is based on a project's opening year.
    - One important goal of a streetcar project is to promote economic development. However, because often the opening year of a project is not in line with the development forecast surrounding a project; it is difficult to prove the project's economic development merits within a Small Starts evaluation framework.
    - While this timeframe is beneficial to those projects where service exists and data on travel markets is readily available, if streetcar is a new mode to the region or corridor, the development of opening year forecasts could be a lengthy and costly pursuit.
- Calculation of cost effectiveness – the cost effectiveness measure is one used to understand the travel time savings a project provides over either existing service or some fictional alternative that is the best that may be done without the construction of a fixed guideway.
    - While the FTA no longer requires a specific value for cost effectiveness in order to advance a project for funding recommendation, FTA has recently indicated that project's cost effectiveness value may not exceed three digits. FTA has not stated exactly where the cut off should be, however has used a project that exceeded a $400 CEI as an example that is unacceptable.
    - Streetcar projects are generally implemented with the goal of enhancing land use and increasing economic development within a corridor. Travel time savings is not a primary goal. Additionally, existing bus service in a corridor is considered competitive to a streetcar project when calculating cost effectiveness.
    - While FTA often prefers to use existing service and boarding count data in lieu of travel forecasts for smaller projects, very few cities have existing streetcar operation and boarding data. Thus, justifying boarding figures for streetcar projects may be accompanied by scrutiny from FTA travel forecasting staff.
- Technical capacity of project sponsor – one benefit of the Small Starts program is that project sponsors who do not have not significant experience implementing transit projects may still pursue funding and receive guidance on project implementation. A similar project pursuing New Starts funds would likely not receive the same consideration.
    - A number of streetcar projects currently in planning are not being planned through a transit agency or agency with prior experience planning transit projects.

How Reauthorization of SAFETEA-LU May Affect Small Starts

Current legislation governing funding levels and evaluation criteria of the Small Starts program expired September 30, 2009. From discussions with FTA, the reauthorization of this legislation is likely to affect how and by what agency streetcar projects are evaluated and funded. Current thinking from FTA staff has indicated one of a few directions is likely for these projects. They are as follows:

- Capital funding for streetcar projects could move to HUD – Historically, FTA has provided capital funding for transit projects that improve transportation over longer distances and for projects that mostly serve commuter markets. Thus, it is difficult to create and maintain a consistent set of national evaluation criteria for both streetcar projects and longer haul modes such as light rail and commuter rail.
- Create new FTA funding program that focuses on streetcar projects – similar to Small Starts, the next reauthorization may create a separate capital funding program that is tailored to the needs of streetcar projects.

FIGURE 1 – Small Starts Evaluation and Rating Criteria



ADDITIONAL FUNDING OPPORTUNITIES FOR STREETCAR PROJECTS

ARRA Stimulus Funds

In 2009, the federal government released a number of sizable financial stimulus programs under the American Recovery and Reinvestment Act (ARRA) of 2009. Streetcar projects were eligible to apply for funding in three programs within these national funding packages: 1) TIGER 2) Urban Circulator and 3) TIGER 2. Each of these programs was unique not only in the amount of funding available, but also for the evaluation criteria and the agencies evaluating potential projects. These programs each emphasized the ability of a proposed project to connect attractions, enhance or create service in a corridor, and those that generally have a significant impact on the surrounding community, region, or even nation as a whole. Additionally, because of the scope of the evaluation criteria, a mix of federal agencies oversaw the evaluation of these projects. With the exception of the Urban Circulator funds (solely evaluated by FTA), applications for these funds were evaluated by the USDOT, EPA, AND HUD. Also during this time of evaluation, these three agencies formed the Partnership for Sustainable Communities. This partnership "will coordinate federal housing, transportation, and other infrastructure investments to protect the environment, promote equitable development, and help to address the challenges of climate change (http://www.epa.gov/smartgrowth/partnership/#background)." In many cities, a streetcar project fits these criteria exceptionally well. Thus, it is with little surprise that 12 streetcar projects received funding under these stimulus programs. Table 2 summarizes these projects.

TABLE 2 – ARRA Awards for all Streetcar Projects

	Type of Streetcar	Award Amount
Feb 2010 – Recovery Act TIGER I		
Tucson Modern Streetcar	Modern	$63,000,000
New Orleans Union Passenger Terminal/Loyal Loop	Heritage	$45,000,000
Detroit M1 Woodward Ave	Heritage	$25,000,000
Dallas Downtown Streetcar	Heritage	$23,000,000
Portland OR SW Moody Street and Streetcar alignment reconstruction	Modern	$23,000,000
March 2010 Urban Circulator Grants (capped at $25M)		
Charlotte Center City Streetcar	Modern	$25,000,000
Cincinnati Modern Streetcar	Modern	$25,000,000
Fort Worth Streetcar Loop	Modern	$25,000,000
St Louis Loop Trolley	Heritage	$25,000,000
Dallas McKinney Ave Trolley Extension	Heritage	$5,000,000
Oct 2010 – Recovery Act TIGER II		
Atlanta Streetcar GA	Modern	$47,667,777
Sugar House Streetcar (South Salt Lake City) UT	Modern	$26,000,000

While the stimulus funds were distributed within a relatively short time period, the effects of these funding programs have endured. FTA and the USDOT have now publicly recognized the importance of funding transportation projects that meet community goals outside of traditional travel time savings measures. Additionally, FTA has recognized that streetcar projects are meritorious and do not fit well into the current Small Starts evaluation framework. A final benefit of these programs is that, with each successive round of funding, the evaluation criteria have been held constant. Thus, project sponsors may be able to prepare in

advance, a case for their project in the event additional funds become available or evaluation criteria of existing programs adapt to those of the TIGER and TIGER 2 programs.

Potential Local Funding Opportunities

Methods to finance a project's construction or operations locally are as varied as projects themselves. Table 3 lists a few methods by which a project may receive financing.

TABLE 3 – Local Funding Options for Streetcar Projects

Category	Funding Source	
General Taxes	Sales Tax	Income Tax
	Property Tax	Payroll/Head Tax
Special Taxes	Fuel Tax	Parking Tax
	Auto Registration Fee (Flat Rate)	Rental Car Tax
	Auto License Tax (Value Based)	Hotel Room Occupancy Tax
	Driver's License Tax or Fee	Excise Taxes
	Utility Excise Tax	Business License/Fee
Growth Related Mechanisms	Impact Fees	Tax Increment Financing
	In-Kind Contributions	
Public-Private Partnerships	Turnkey/Full Service Delivery	Vendor Financing
	Joint Development	
Other Mechanisms	Special Financing Districts	Advertising
	Tax-Exempt Financing	Congestion Pricing

Many of the mechanisms for local funding are self-explanatory. Descriptions of some of the less-common approaches are summarized below.

- Payroll/Head Tax - A flat rate assessment per employee within a jurisdiction.
- Parking Tax - Assessment per parking space levied on commercial property owners to discourage free parking and single-occupant behavior.
- Impact Fees - : Assessments on new development intended to offset the cost of new infrastructure. They are often calculated as a fixed amount per residential unit or square foot of commercial/industrial space.
- In-Kind Contributions - Alternatives to the impact fee, but typically assessed (negotiated) for the same basic purpose, to fund new infrastructure.
- Turnkey/Full Service Delivery - Involves full delegation of project development responsibilities to a single design/build or design/build/operate entity, for a fixed price.
- Joint Development - Involves co-location of public improvements (e.g., a transit station) and private, for profit development (e.g., a mixed-use development) in a coordinated manner on the same site or on adjacent sites.
- Vendor Financing - Involves the extension of credit by an equipment vendor, typically at favorable terms.
- Special Financing Districts – Sometimes referred to as a Local Improvement District (LID). Funds would be generated based on a defined geographical area. Revenue in the in the district would be generated bases on a set formula as to how the transportation improvement may benefit the adjacent property.
- Tax-Exempt Debt Financing - Translates the federal tax exemption into lower interest cost, and is therefore an implicit federal subsidy.
- Congestion Pricing - Involves a schedule of tolls on a presently "free" facility, or on an existing toll road, with the objective of discouraging use during peak periods.
- Special Event Fee – This fee would be an additional fee that could be attached to a special event ticket that would be set to exclusively fund the transportation improvement.

There are many ways in which a project may pursue local funding. Often, it is combinations of multiple approaches that help support both construction and operations that is the most successful.

Document A2: Tacoma Link Expansion AA: Screening Report *(December 5, 2012)*

Tacoma Link Expansion AA: Screening Report

PREPARED FOR: Tacoma Link AA Project Management Team

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DATE: December 5, 2012

1. Introduction

The purpose of the Tacoma Link Expansion Alternatives Analysis (AA) is to evaluate corridors and modes for an expansion of the Tacoma Link system. The existing Tacoma Link system is 1.6 miles long and began operation in 2003. The AA phase of the project began by incorporating and working from the results of a Pre-Alternatives Analysis (Pre-AA), which was conducted in 2010 and 2011.

The AA began in June 2012. Initial tasks included development of the project's Purpose and Need statement and Goals and Objectives (Appendix A) in consultation with the project Technical Advisory Committee (TAC). The public scoping period and agency early scoping for the project ran from August 17, 2012, to September 17, 2012**.** During the early scoping period, members of the public and agencies were asked to comment on the list of corridors and modes to be considered in the AA. The list of corridors assumed to be studied in the AA included the eight corridors identified in the Pre-AA. Public comments resulted in the identification of three new corridors, for a total of 11 corridors. Each corridor had between 1 and 4 options within it, resulting in a total of 24 separate options.

This report describes the results of the screening process. Screening of corridors and modes provides an efficient way to narrow down the options that will be evaluated in greater detail in the next phase of the AA process. The following sections of this memo describe the corridors analyzed in the screening process, the screening methodology used, the results of the screening process, and the next steps in the project.

2. Alternatives Considered

2.1 Corridors

The screening process considered 11 distinct corridors with 24 distinct options within those corridors. Eight of the corridors were analyzed in the Pre-AA and carried forward into the AA, and the remaining three corridors resulted from public comments received during the early scoping period. The corridors and options are described in Table 1. Corridors included from the Pre-AA are marked with an asterisk. Maps depicting all 24 corridor options are provided in Appendix B.

2.2 Modes

The AA process began by assuming that the following transit modes would be assessed in the AA:

- **LRT** is defined as a continuation of the existing technology used for the currently-operating Tacoma Link system. The expansion is assumed to operate in a shared lane with traffic.
- **BRT i**s defined as a rubber-tired vehicle that would operate in a shared lane with traffic, would serve substantial transit stations, would have distinctive branding, low-floor boarding, and transit signal priority.

No public comments were received that suggested substantially different modes. Because of the limited number of modes under consideration, none were screened out, and both modes will be considered in the evaluation process.

Table 1: Corridors and Options Analyzed in the Screening Process

Corridor	Option	Name	Description
A	1	North End*	Extends north from 9th/Theater District Station via Stadium Way; continues northwest and west via North E Street, North First Street, and Division Avenue, and continues west to Alder Street via I Street/North 21st Street.
	2	North End Extended	Extends north from 9th/Theater District Station via Stadium Way; continues northwest and west via North E Street, North First Street, and Division Avenue, and continues west to Orchard Street via I Street/North 21st Street.
	3	North End Loop	Extends north from 9th/Theater District Station via Stadium Way; continues northwest and west via North E Street, North First Street, and Division Avenue, and continues west to Union Street via I Street/North 21st Street. Heads south on Union Avenue to North 6th Street, then follows North 6th Street east to Division Avenue.
B	1	North End Central*	Extends north from 9th/Theater District Station via Stadium Way; continues northwest and west via North E Street, North 1st Street, and Division Avenue, and continues southwest and west via Division Avenue to South 6th Avenue to Alder/Cedar Streets.
	2	North End Central to Point Defiance	Extends north from 9th/Theater District Station via Stadium Way; continues northwest and west via North E Street, North 1st Street, and Division Avenue, and continues southwest and west via Division Avenue to South 6th Avenue to Pearl Street. Heads north on Pearl to Point Defiance.
	3	North End Central to Tacoma Community College (TCC)	Extends north from 9th/Theater District Station via Stadium Way; continues northwest and west via North E Street, North 1st Street, and Division Avenue, and continues southwest and west via Division Avenue to South 6th Avenue to Alder/Cedar Streets. Follows Alder/Cedar Street south to South 12th Avenue, then heads west to TCC.
	4	North End Central to TCC via Orchard	Extends north from 9th/Theater District Station via Stadium Way; continues northwest and west via North E Street, North 1st Street, and Division Avenue, and continues southwest and west via Division Avenue to South 6th Avenue to Orchard. From Orchard, heads south to South 12th Avenue, then heads west to TCC.
C	1	Eastside*	Extends east from Tacoma Dome Station on 25th Street and south towards Salishan along Portland Avenue to 72nd Street Transit Center.
	2	South to Mt. Rainier	Extends east from Tacoma Dome Station on 25th Street and south towards Salishan along Portland Avenue. Continues in a southeasterly direction to Mt. Rainier.
D	1	South End*	Extends from South 25th Street Station south via Pacific Avenue and continues west on 38th Street to Tacoma Mall Boulevard.
	2	South End via Jefferson	Extends from South 25th Street Station west to Jefferson Avenue and follows Jefferson Avenue (which becomes Center Street) to Pine Street. At Pine Street heads south to Tacoma Mall.
	3	South End via Portland and 38th	Extends from South 25th Street Station south via Portland Avenue, and continues west on 38th Street to Tacoma Mall Boulevard.
	4	South End via Portland and 48th	Extends from South 25th Street Station south via Portland Avenue, and continues west on 48th Street to Tacoma Mall Boulevard.
E	1	North Downtown Central*	Extends north from the 9th/Theater District Station via Stadium Way; continues northwest and west via North E Street, North First Street, and Division Avenue,

Table 1: Corridors and Options Analyzed in the Screening Process

Corridor	Option	Name	Description
			and continues south on Martin Luther King Jr. (MLK) Way to South 19th Street.
	2	North Downtown Central Loop	Extends north from the 9th/Theater District Station via Stadium Way; continues northwest and west via North E Street, North First Street, and Division Avenue, and continues south on MLK Way to South 19th Street. At South 19th St, heads east to J Street to 27th Street, then continues east on Jefferson Avenue to connect back to Tacoma Dome Station.
F		South Downtown to MLK*	Extends west from Union Station west to South 19th Street; continues north on MLK Boulevard, through MLK district to Division Avenue, and could potential loop back to the 9th/Theater District Station.
G	1	Pacific Highway*	Extends east from the Tacoma Dome Station to Pacific Highway South to Fife, at 54th Avenue East.
	2	Pacific Highway to Federal Way	Extends east from the Tacoma Dome Station to Pacific Highway South to Federal Way.
	3	Pacific Highway to Tideflats	Extends east from the Tacoma Dome Station to Pacific Highway South to access tideflats via Port of Tacoma Road.
H	1	South Downtown Central*	Extends west from Union Station on South 19th St and continues west to Mildred Street and TCC.
	2	South Downtown Central and North Downtown Central Combined	Extends south from Division and MLK Boulevard to South 19th Street, then continues west along 19th to TCC.
I		Pacific Lutheran University (PLU) via Pacific	Extends from South 25th Street Station south via Pacific Avenue to Pacific Lutheran University (approximately 125th Street South.
J		Point Defiance via Ruston Way	Extends from Tacoma Dome Station along waterfront to Point Defiance via Dock Street, Schuster Parkway, and Ruston Way.
K		Downtown to Sprague Avenue via South 11th	Extends west from South 11th and A Streets to 11th and Sprague.

*Indicates corridor was included in the Pre-AA.

3. Methodology

Beginning with the Purpose and Need Statement and the Goals and Objectives for the project and using input from the Technical Advisory Committee (TAC), the project team developed a series of screening questions to analyze the 11 corridors and 24 options under consideration. The screening questions were developed to analyze each corridor's ability to meet the purpose and need for the project. The corridor screening questions and data sources used are provided in Table 2.

The project management team and TAC held a screening workshop on October 11, 2012. The purpose of the workshop was to evaluate each of the 11 corridors and 24 options as they relate to the screening questions listed in Table 2, and to come to agreement on which corridors should be carried forward for further evaluation. The results of this workshop are discussed below in Section 4.1.

Table 2: Corridor Screening Framework

Element of the Purpose and Need Statement	Screening Question	Data Used to Answer Screening Question
Improve connections to the regional transit system.	1A: Would the corridor improve connections to regional transit, including the Sounder commuter rail, express buses, or Amtrak?	Project team knowledge of local and regional transit system. Sound Transit's adopted Long Range Plan (2005).
Improve transit mobility, serve increases in commuting trips to the downtown core via transit, and help reduce greenhouse gas emissions within the city of Tacoma.	2A: Would the corridor be likely to increase transit ridership and reduce vehicle miles traveled through improvement of ride quality, improvement in the number of direct connections, or decrease in travel time?	Existing Pierce Transit bus route alignments and frequencies, as provided on www.piercetransit.org.
Connect the existing Tacoma Link system with Tacoma neighborhoods and major activity centers and destinations within the city.	3A: Would the corridor connect to an existing neighborhood or major activity center? 3B: Would the corridor improve transit service between at least one Tacoma neighborhood and downtown Tacoma? 3C: Would the corridor serve existing or proposed areas of high-density residential or employment uses?	Locations of City of Tacoma neighborhood districts, using the City of Tacoma's Geographic Information System's shapefile on neighborhood boundaries, downloaded from http://www.cityoftacoma.org/Page.aspx?hid=1925. 2010 population and employment data by traffic analysis zone provided by Puget Sound Regional Council
Serve traditionally underserved populations.	4A: Would the corridor serve an area that contains a high percentage of low-income and/or minority residents, has historically received proportionately low investments in infrastructure, or is currently not well connected to the greater Tacoma community via transit?	Census 2010 data on income and minority status by census tract within the cities of Tacoma, Fife, and Fircrest. Existing Pierce Transit bus route alignments and frequencies, as provided on www.piercetransit.org.
Support economic development in downtown Tacoma and the city of Tacoma and support the City's land use planning goals.	5A: Would the corridor connect to an existing mixed-use center or a designated manufacturing/industrial center?	City of Tacoma's Geographic Information System's shapefile on mixed-use centers and manufacturing/industrial centers, downloaded from http://www.cityoftacoma.org/Page.aspx?hid=1925.
Be cost-effective.	6A: Would the corridor avoid major engineering challenges that would be likely to increase the project cost without providing additional benefit?	Project team knowledge of right-of-way constraints, locations of steep slopes, major utility conflicts, structural insufficiencies, and vertical clearance limitations for overhead catenary systems. Existing Tacoma Link vehicles cannot handle grades over 8% for long distances, and cannot handle grades over 10% for any distance, so this was considered the maximum grade in order to allow for this mode to be considered.

4. Results

4.1 Screening of Corridors

Of the 24 options within 11 corridors, 18 options were eliminated, leaving 6 options within 5 corridors. Options B1, C1, D4, E1, E2, and G1 passed the screening process. Following is a summary of the results by option (options in italics are those carried forward):

1) Corridor A: All three options in this corridor would have right-of-way challenges as 6th Street is a two-lane roadway with many buildings directly adjacent to the sidewalk. This could be overcome through shared right-of-way, but the Tacoma Link project must be at least 50 percent exclusive right-of-way.

a. A1: This option was not advanced because it does not serve underserved populations and it has limited economic development potential.

b. A2: This option was not advanced because it does not serve underserved populations and it has limited economic development potential. In addition, electric transmission lines on 21st Street west of Alder could be an engineering constraint. The terminus at Orchard for this option provides no additional benefit and it is not an activity center.

c. A3: This option was not advanced because it has limited economic development potential and could conflict with transmission lines on 21st west of Alder. Although the southern leg of the option (along 6th) would travel along the edge of a census block that is predominantly low-income and minority population, this area would also be served by Option B1.

2) Corridor B:

a. B1: This option was retained because it would provide service to underserved populations, has some potential for economic development, and does not have any major engineering constraints. It would be extended to Union Street to reach University of Puget Sound and to maximize the potential for economic development.

b. B2: This option was not advanced because it does not reach any mixed-use centers (MUCs) beyond the Westgate MUC, and economic development potential is limited at the Westgate MUC. Other MUCs served by this option are also served by Option B1. In addition, it does not serve underserved populations beyond what is served by Option B1.

c. B3: This option was not advanced because of the limited economic development potential between the 6th Avenue and Pine MUC and the James Center MUC, and because of engineering constraints crossing under SR 16.

d. B4: This option was not advanced because of the limited economic development potential between the 6th Avenue and Pine MUC and the James Center MUC, and because of engineering constraints crossing under SR 16.

3) Corridor C:

a. C1: This option was retained because it would provide service to underserved populations, particularly at Salishan, and it has potential for economic development. The option was shortened to end at E 44th Street (the entrance to Salishan) because household and employment density decreases south of this point.

b. C2: This option was not advanced because it did not access any MUC beyond the 72nd and Pacific MUC, the destination is outside the Sound Transit service area, and the cost to reach Mt. Rainier would be prohibitive.

4) Corridor D:

a. D1: This option was not advanced because of steep grades on Pacific and because accessing Tacoma Mall on 38th would also be a challenge with existing traffic and right-of-way limitations.

b. D2: This option was not advanced because of little potential for economic development and low population density in this area, as well as steep grades on 25th between Pacific and Jefferson.

c. D3: This option was not advanced because there is little potential for economic development and there are engineering challenges on 38th, including the crossing of SR 7.

d. *D4: This option will be carried forward, but would turn west at 38th and continue on 38th to Yakima, then turn south on Yakima to 48th, where it would turn west to cross over I-5 and reach Tacoma Mall. This revision would allow access to Salishan, add access to the Lincoln Center MUC, and avoid engineering challenges on 38th.*

5) Corridor E:

    a. *E1: This option was retained because it would provide service to underserved populations and has more potential for economic development than most other corridors.*

    b. *E2: This corridor was retained because it would provide service to underserved populations and has more potential for economic development than most other corridors. However, 27th between Jefferson and Pacific Avenue is approximately a 7 percent grade, which is near the maximum for the Tacoma Link system. For cost-estimating purposes, this will be assumed to be a double-track loop.*

6) Corridor F: This option was eliminated because the grade on 19th between South I Street and Market Street ranges from 12 to 16 percent, beyond what is allowable for the Tacoma Link system.

7) Corridor G:

    a. *G1: This option was retained because it would provide service to underserved populations and serve proposed areas of high-density residential or employment. This corridor could be a start toward connecting to Link in Federal Way. One issue noted is that the Eels Street bridge from Portland to Milwaukee is set to be replaced by the City in the next 3 to 5 years. The City has completed plans for the replacement of the easternmost structure; however, the plans at this time do not accommodate light rail.*

    b. G2: This option was not advanced because this connection will be evaluated under a separate study to be conducted by Sound Transit.

    c. G3: This option was not advanced because it did not provide any additional benefits beyond G1, and there is low potential for economic development.

8) Corridor H

    a. H1: This option was not advanced because of the length and because the grade on 19th between South I Street and Market Street reaches 12 to 16 percent. Economic development potential on this corridor was considered to be low.

    b. H2: This option was eliminated because of the crossing of SR 16 on 19th, which would involve crossing left turns from the SR 16 on- and off-ramps, and require substantial traffic mitigation. Economic development potential on this corridor was considered to be low.

9) Corridor I: This option was not advanced because it did not access any MUC beyond the 72nd and Pacific MUC, it would have long freeway crossings, it would have grades greater than 10 percent on Pacific, it would need to go under the new Sounder commuter rail bridge, and Tacoma Link may not provide service on this corridor comparable to Pierce Transit's existing Route 1 bus. Route 1 has the highest ridership for Pierce Transit and reaches speeds greater than 25 mph on Pacific, which is the speed that Tacoma Link would be limited to. Changes in service could possibly reduce ridership from existing conditions on this route.

10) Corridor J: This option was not advanced because it did not access any MUC and there are multiple engineering constraints along Dock Street, Schuster Parkway, and Ruston Way, including limited right-of-way, extensive structure length, and roundabouts.

11) Corridor K: This option was not advanced because the grades on 11th are between 7 and 13 percent, it does not provide access to any Mixed Use Centers, and there is little potential for economic development on this corridor.

Table 3 provides the results of each corridor's analysis under each screening question. Figure 1 depicts the six corridors that passed the first-level screening process.

4.2 Modes

As discussed in Section 2.2, no modes were screened out during the screening process. The evaluation process will consider light rail and BRT.

5. Next Steps

The content of this memorandum was presented to the TAC at a meeting on November 9, 2012. Following incorporation of the TAC's comments, this memorandum was reviewed by the Project Management Team, and the findings were presented to the public at an open house on December 5, 2012.

The next step in the project is to conduct a detailed evaluation of the corridors and modes that have advanced from the screening process (listed in Section 4 of this memorandum). The evaluation will consider mobility and access, ridership, potential for economic development, ability to serve underserved populations, impacts on the natural and built environment, costs, and funding.

Table 3: Results of Corridor Screening Process (text in red indicates that a corridor did not pass the screening question)

Corridor #	Corridor Name	Results by Screening Question[1]							
		1A	2A	3A	3B	3C	4A	5A	6A
A1	North End	Yes. It would connect to existing Tacoma Link, which connects to Tacoma Dome Station.	Yes. It is currently served by bus route #16 UPS-TCC, but frequency is low - only runs every hour on weekdays.	Yes. It connects to North End neighborhood.	Yes. It would improve transit to the North End neighborhood.	Yes. It would serve a census tract that has 12.9 plus employees per acre and 6.5 plus households per acre.	No. It would not travel through areas of predominantly low-income or minority populations.	Yes. It would connect to Stadium MUC. No MUC from Stadium to end of line.	Yes. Challenges would include transmission lines along N I St west of N 13th St and N 21st St west of N Steele Street and 8% grade on North 1st St between E St and Tacoma Ave would be extremely expensive to relocate.
A2	North End Extended	Yes. It would connect to existing Tacoma Link, which connects to Tacoma Dome Station.	Yes. 21st from Alder to Orchard is not currently served by transit.	Yes. It connects to North End neighborhood.	Yes. It would improve transit to the North End neighborhood.	Yes. It would serve a census tract that has 12.9 plus employees per acre and 6.5 plus households per acre.	No. It would not travel through areas of predominantly low-income or minority populations.	Yes. It would connect to Stadium MUC. No MUC from Stadium to end of line.	No. Challenges would include transmission lines along N I St west of N 13th St and N 21st St west of N Steele Street and 8% grade on North 1st St between E St and Tacoma Ave. The

[1] Question 1A: Would the corridor improve connections to regional transit, including the Sounder commuter rail, express buses, or Amtrak?

Question 2A: Would the corridor be likely to increase transit ridership and reduce vehicle miles traveled through improvement of ride quality, improvement in the number of direct connections, or decrease in travel time?

Question 3A: Would the corridor connect to an existing neighborhood or major activity center?

Question 3B: Would the corridor improve transit service between at least one Tacoma neighborhood and downtown Tacoma?

Question 3C: Would the corridor serve existing or proposed areas of high-density residential or employment uses?

Question 4A: Would the corridor serve an area that contains a high percentage of low-income and/or minority residents, has historically received proportionately low investments in infrastructure, or is currently not well connected to the greater Tacoma community via transit?

Question 5A: Would the corridor connect to an existing mixed-use center or a designated manufacturing/industrial center?

Question 6A: Would the corridor avoid major engineering challenges that would be likely to increase the project cost without providing additional benefit?

Table 3: Results of Corridor Screening Process (text in red indicates that a corridor did not pass the screening question)

Corridor #	Corridor Name	Results by Screening Question[1]							
		1A	2A	3A	3B	3C	4A	5A	6A
									area west of Alder could be extremely expensive to relocate. In addition, there is a substation at 21st & Adams. In addition, there is a substation at 21st & Adams.
A3	North End Loop	Yes. It would connect to existing Tacoma Link, which connects to Tacoma Dome Station.	Yes. This loop is currently served but requires two transfers (#16, #51, #1).	Yes. It connects to North End and Central neighborhoods.	Yes. It would improve transit to the North End and Central neighborhood.	Yes. It would serve a census tract that has 12.9 plus employees per acre and 6.5 plus households per acre.	No. The portions of it that run along 19th and Union would not serve underserved populations. The southern leg of this option (along 6th) would travel through areas of predominantly low-income or minority populations, but this area would also be served by Option B1.	Yes. It would connect to Stadium MUC and 6th & Pine MUC.	No. Challenges would be transmission lines along N I St west of N 13th St and N 21st St west of N Steele St and 8% grade on N 1st St between E St and Tacoma Ave (approximately 300'). The area west of Alder could be extremely expensive to relocate In addition; there is a substation at 21st & Adams.
B1	North End Central	Yes. It would connect to existing Tacoma Link, which connects to Tacoma Dome Station.	Yes. It would travel along part of bus route #1, which has highest ridership in county. Would present an improvement in	Yes. It connects to North End and Central neighborhoods.	Yes. It would improve transit to the North End and Central neighborhood.	Yes. It would serve a census tract that has 12.9 plus employees per acre and 6.5 plus households per acre.	Yes. It would travel through areas of predominantly low-income or minority populations.	Yes. It would connect to Stadium MUC and 6th & Pine MUC.	Yes. Challenge would be North 1st St between E St and Tacoma Ave, which has approximately an 8% grade for

Table 3: Results of Corridor Screening Process (text in red indicates that a corridor did not pass the screening question)

Corridor #	Corridor Name	Results by Screening Question[1]							
		1A	2A	3A	3B	3C	4A	5A	6A
			ride quality that could increase ridership.						about 300’.
B2	North End Central to Point Defiance	Yes. It would connect to existing Tacoma Link, which connects to Tacoma Dome Station.	Yes. This route is served by the #1 and the #10 buses, but requires a transfer. Also, the #10 only offers 30-minute headways.	Yes. It would connect to North End, Central, and West End neighborhoods.	Yes. It would improve transit to the North End, Central, and West End neighborhoods.	Yes. It would serve a census tract that has 12.9 plus employees per acre and 6.5 plus households per acre.	No. It would not access underserved areas beyond what is served by Option B1.	Yes. It would connect to Stadium MUC, 6th & Pine MUC, and Westgate MUC. No MUC from Westgate to end of line.	Yes. Challenges would be passing under SR 16 on N Pearl and again on 6th Ave, which would have OCS clearance concerns/issues, and N 1st St between E St and Tacoma Ave has an 8% grade for about 300'.
B3	North End Central to TCC	Yes. It would connect to existing Tacoma Link, which connects to Tacoma Dome Station.	Yes. This route is served by the #1, the #51, and the #28 buses, but requires two transfers.	Yes. It would connect to Central and West End neighborhoods.	Yes It would improve transit to the Central and West End neighborhoods.	Yes. It would serve a census tract that has 12.9 plus employees per acre and 6.5 plus households per acre.	No. It would not access underserved areas beyond what is served by Option B1.	Yes. It would connect to Stadium MUC, 6th & Pine MUC, and James Center MUC.	Yes. Challenges would be passing under SR 16 on N Pearl and again on 6th Ave, which would have OCS clearance concerns/issues, and N 1st St between E St and Tacoma Ave has an 8% grade for about 300'.
B4	North End Central to TCC via Orchard	Yes. It would connect to existing Tacoma Link, which connects to Tacoma Dome Station.	Yes. Orchard between 6th and 12th is not currently served by transit.	Yes. It would connect to Central and West End neighborhoods.	Yes. It would improve transit to the Central and West End neighborhoods.	Yes. It would serve a census tract that has 12.9 plus employees per acre and 6.5 plus households per acre.	No. It would not access underserved areas beyond what is served by Option B1.	Yes. It would connect to Stadium MUC, 6th & Pine MUC, and James Center MUC.	Yes. Challenges would be passing under SR 16 on N Pearl and again on 6th Ave, which would have OCS clearance concerns/issues, and N 1st St between E St and

Table 3: Results of Corridor Screening Process (text in red indicates that a corridor did not pass the screening question)

Corridor #	Corridor Name	Results by Screening Question[1]							
		1A	2A	3A	3B	3C	4A	5A	6A
									Tacoma Ave has an 8% grade for about 300'.
C1 (as modified)	Eastside	Yes. It would connect to existing Tacoma Link, which connects to Tacoma Dome Station.	Yes. Currently this route is served by the #41 bus, Portland Ave, which runs at 30-minute headways on weekdays.	Yes. It would connect to the Eastside neighborhood.	Yes. It would improve transit to the Eastside neighborhood.	Yes. It would travel adjacent to Salishan, which has high-density residential.	Yes. It would travel through areas of predominantly low-income or minority populations.	Yes. It would connect to Lower Portland Ave MUC and 72nd & Portland MUC.	Yes. Challenges would be passing under E L St on E 25th St, and Sound Transit/Tacoma Rail and I-5 on E Portland Ave with potential OCS clearance concerns/issues; needs further research.
C2	South to Mt. Rainier	Yes. It would connect to existing Tacoma Link, which connects to Tacoma Dome Station.	Yes. Currently this route is served by the #41 bus, Portland Ave, which runs at 30-minute headways on weekdays.	Yes. It would connect to the Eastside neighborhood.	Yes. It would improve transit to the Eastside neighborhood.	Yes. It would travel adjacent to Salishan, which has high-density residential.	Yes. It would travel through areas of predominantly low-income or minority populations.	Yes. It would connect to Lower Portland Ave MUC and 72nd & Portland MUC. No MUC between 72nd & Portland and end of line.	No. Extremely long corridor that would be beyond the project budget.
D1	South End	Yes. It would connect to existing Tacoma Link, which connects to Tacoma Dome Station.	Yes. This corridor is only partially served by the #1 bus and the #54 bus. 38th west of Thompson is not currently served.	Yes. It would connect to South End and South Tacoma neighborhoods.	Yes. It would improve transit to the South End and South Tacoma neighborhoods.	Yes. It would serve a census tract that has over 4.8 employees per acre.	Yes. It would travel through areas of predominantly low-income or minority populations.	Yes. It would connect to 34th & Pacific MUC, 38th & G MUC, and Tacoma Mall Regional Growth Center (RGC).	No. Grades in excess of 10% on Pacific in vicinity of S Tacoma Way intersections and I-5 crossings. Crossings of I-5 at Pacific and 38th would require significant bridge design or considering wireless vehicle option for

Table 3: Results of Corridor Screening Process (text in red indicates that a corridor did not pass the screening question)

Corridor #	Corridor Name	Results by Screening Question[1]							
		1A	2A	3A	3B	3C	4A	5A	6A
									crossings. Would also cross under the new commuter rail bridge just north of South Tacoma Way, which has OCS clearances concerns/issues.
D2	South End via Jefferson	Yes. It would connect to existing Tacoma Link, which connects to Tacoma Dome Station.	Yes. This corridor is only partially served by the #52 bus (along Pine).	Yes. It would connect to South Tacoma neighborhood.	Yes. It would improve transit to the South Tacoma neighborhood.	Yes. It would serve a census tract that has over 4.8 employees per acre.	No. It would travel through areas of predominantly low-income or minority populations; however, the overall population is very low.	No. It would connect to Tacoma Mall RGC but would not connect to any city MUC.	No. Grades in excess of 17% on 25th between Pacific & Jefferson. Requires crossing of Sounder Commuter Rail mainline at Pine St; a grade-separated crossing isn't infeasible but may be excessively expensive given other opportunities for reaching South End/South Tacoma.
D3	South End via Portland and 38th	Yes. It would connect to existing Tacoma Link, which connects to Tacoma Dome Station.	Yes. This corridor is only partially served by the #41 and the #54 buses. 38th west of Thompson is not currently served.	Yes. It would connect to Eastside, South End, and South Tacoma neighborhoods.	Yes. It would improve transit to the Eastside, South End, and South Tacoma neighborhoods.	Yes. It would serve a census tract that has over 4.8 employees per acre.	Yes. It would travel through areas of predominantly low-income or minority populations.	Yes. It would connect to Lower Portland Ave MUC, 34th & Pacific MUC, and Tacoma Mall RGC.	No. The crossing of the I-5 and 38th interchange would be extremely challenging due to right-of-way and traffic constraints. It would require

Table 3: Results of Corridor Screening Process (text in red indicates that a corridor did not pass the screening question)

Corridor #	Corridor Name	Results by Screening Question[1]							
		1A	2A	3A	3B	3C	4A	5A	6A
									significant bridge design or considering wireless vehicle option for crossings of SR 7 and I-5 along 38th.
D4 (as modified)	South End via Portland and 48th	Yes. It would connect to existing Tacoma Link, which connects to Tacoma Dome Station.	Yes. This corridor is served by the #41 and the #54 buses, but requires a transfer.	Yes. It would connect to Eastside, South End, and South Tacoma neighborhoods.	Yes. It would improve transit to the Eastside, South End, and South Tacoma neighborhoods.	Yes. It would serve a census tract that has over 4.8 employees per acre.	Yes. It would travel through areas of predominantly low-income or minority populations.	Yes. It would connect to Lower Portland Ave MUC and Tacoma Mall RGC.	Yes. Challenges would include significant bridge design or considering wireless vehicle option for crossings of SR 7 along 38th and I-5 along 48th. Avoids at-grade crossing of Tacoma Rail lines that occur south of 38th.
E1	North Downtown Central	Yes. It would connect to existing Tacoma Link, which connects to Tacoma Dome Station.	Yes. This corridor is currently served (#11, #102, #57) but requires at least two transfers.	Yes. It would connect to MLK Subarea.	Yes. It would improve transit to MLK Subarea.	Yes. It would serve a census tract that has 12.9 plus employees per acre and 6.5 plus households per acre.	Yes. It would travel through areas of predominantly low-income or minority populations.	Yes. It would connect to Stadium MUC and MLK MUC.	Yes. Challenges would include an 8% grade on North 1st St between E St and Tacoma Ave for about 300'.

Table 3: Results of Corridor Screening Process (text in red indicates that a corridor did not pass the screening question)

Corridor #	Corridor Name	Results by Screening Question[1]							
		1A	2A	3A	3B	3C	4A	5A	6A
E2	North Downtown Central Loop	Yes. It would connect to existing Tacoma Link, which connects to Tacoma Dome Station.	Yes. There are several bus lines that serve pieces of this loop, but there is no way to fully complete it.	Yes. It would connect to Central neighborhood.	Yes. It would improve transit to Central neighborhood.	Yes. It would serve a census tract that has 12.9 plus employees per acre and 6.5 plus households per acre.	Yes. It would travel through areas of predominantly low-income or minority populations.	Yes. It would connect to Stadium MUC and MLK MUC.	Yes. Challenges would include an 8% grade on North 1st St between E St and Tacoma Ave for about 300'. 17th between Jefferson and Pacific Ave and J St between Center and 27th have short stretches with grades in excess of 10%, but opportunities may exist to reconstruct the roadway in these areas to grades within vehicle operating limits.
F	South Downtown to MLK	Yes. It would connect to existing Tacoma Link, which connects to Tacoma Dome Station.	Yes. The southern part of downtown is not currently connected to MLK via a bus line; this would be a new connection.	Yes. It would connect to Central neighborhood.	Yes. It would improve transit to Central neighborhood.	Yes. It would serve a census tract that has between 4.2 and 6.4 households per acre and 12.9 plus employees per acre.	Yes. It would travel through areas of predominantly low-income or minority populations.	Yes. It would connect to MLK MUC.	No. The grade on 19th St between S I St and Market St ranges from 12 to 16%.
G1	Pacific Highway	Yes. It would connect to existing Tacoma Link, which connects to Tacoma Dome Station.	Yes. This corridor is currently served by Sound Transit's Regional Express Route 500 bus to Federal Way,	Yes. It would connect to Fife City Center.	Yes. It would connect to Fife City Center (outside Tacoma, but a planned center/neighbor	Yes. Fife City Center proposes mixed-use, high-density land uses.	Yes. It would travel through areas of predominantly low-income or minority populations. However, this	Yes. It would connect to Port of Tacoma manufacturing/industrial center.	Yes. Challenges include crossing the BNSF Railway and Puyallup River. The current completed design for the first

Table 3: Results of Corridor Screening Process (text in red indicates that a corridor did not pass the screening question)

Corridor #	Corridor Name	Results by Screening Question[1]							
		1A	2A	3A	3B	3C	4A	5A	6A
			which currently runs at 1-hour headways.		hood).		population is located on the south side of I-5, which serves as a substantial barrier to access.		replacement structure currently does not accommodate light rail. This crossing would provide a critical connection to light rail extending to Federal Way. However, this connection would utilize Tacoma Link technology and would require future conversion to Central Link technology, for connection at Tacoma Dome Station, to provide direct airport access from downtown Tacoma.
G2	Pacific Highway to Federal Way	Yes. It would connect to existing Tacoma Link, which connects to Tacoma Dome Station.	Yes. This corridor is currently served by Sound Transit's Regional Express Route 500 bus to Federal Way, which currently runs at 1-hour headways.	Yes. It would connect to Fife City Center.	Yes. It would connect to Fife City Center (outside Tacoma, but a planned center/neighborhood).	Yes. Fife City Center proposes mixed-use, high-density land uses.	Yes. It would travel through areas of predominantly low-income or minority populations. However, this population is located on the south side of I-5, which serves as a substantial barrier	Yes. It would connect to Port of Tacoma manufacturing/industrial center.	No. Extremely long corridor that would be beyond the project budget. Issues beyond Sproule Road (54th Ave East) were not evaluated as the future connection to

Table 3: Results of Corridor Screening Process (text in red indicates that a corridor did not pass the screening question)

Corridor #	Corridor Name	Results by Screening Question[1]							
		1A	2A	3A	3B	3C	4A	5A	6A
							to access.		Federal Way is to be determined.
G3	Pacific Highway to Tideflats	Yes. It would connect to existing Tacoma Link, which connects to Tacoma Dome Station.	Yes. There is no transit connection in this area.	Yes. It would connect to Fife City Center.	Yes. It would connect to Fife City Center (outside Tacoma, but a planned center/neighborhood).	Yes. Fife City Center proposes mixed-use, high-density land uses.	Yes. It would travel through areas of predominantly low-income or minority populations. However, this population is located on the south side of I-5, which serves as a substantial barrier to access.	Yes. It would connect to Port of Tacoma manufacturing/industrial center.	No. The Port of Tacoma road crosses over SR 509 and Port of Tacoma freight rail tracks (on structure about 900'-1000'). The Port of Tacoma road also travels under East 3rd Street, which has OCS clearance concerns/issues. Other challenges include crossing over the BNSF Railway and Puyallup River between Portland Ave and Milwaukee Way.
H1	South Downtown Central	Yes. It would connect to existing Tacoma Link, which connects to Tacoma Dome Station.	Yes. This corridor is well served by the #2 bus (19th St-Bridgeport) with 20-minute headways, but Tacoma Link could improve ride quality.	Yes. It would connect to Central and West End neighborhoods.	Yes. It would improve transit to Central and West End neighborhoods.	Yes. It would serve a census tract that has between 4.2 and 6.4 households per acre.	Yes. It would travel through areas of predominantly low-income or minority populations.	Yes. It would connect to MLK MUC, Tacoma Central MUC, and James Center MUC.	No. The grade on 19th St between S I St and Market St ranges from 12 to 16%. The 19th crossing over SR 16 presents challenges and costly traffic mitigation in addition to the cost of adding overhead catenary system to an existing structure.

Table 3: Results of Corridor Screening Process (text in red indicates that a corridor did not pass the screening question)

Corridor #	Corridor Name	Results by Screening Question[1]							
		1A	2A	3A	3B	3C	4A	5A	6A
									Existing traffic signals would need to be modified and additional communication systems would need to be added to the trains to accommodate coordination with traffic signals.
H2	South Downtown Central and North Downtown Central Combined	Yes. It would connect to existing Tacoma Link, which connects to Tacoma Dome Station.	Yes. This corridor is well served by the #2 bus (19th St-Bridgeport) with 20-minute headways, but Tacoma Link could improve ride quality.	Yes. It would connect to Central and West End neighborhoods.	Yes. It would improve transit to Central and West End neighborhoods.	Yes. It would serve a census tract that has 12.9 plus employees per acre and 6.5 plus households per acre.	Yes. It would travel through areas of predominantly low-income or minority populations.	Yes. It would connect to MLK MUC, Tacoma Central MUC, and James Center MUC.	No. The 19th crossing over SR 16 presents challenges and costly traffic mitigation in addition to the cost of adding Overhead Catenary System to an existing structure. Existing traffic signals would need to be modified and additional communication systems would need to be added to the trains to accommodate coordination with traffic signals.

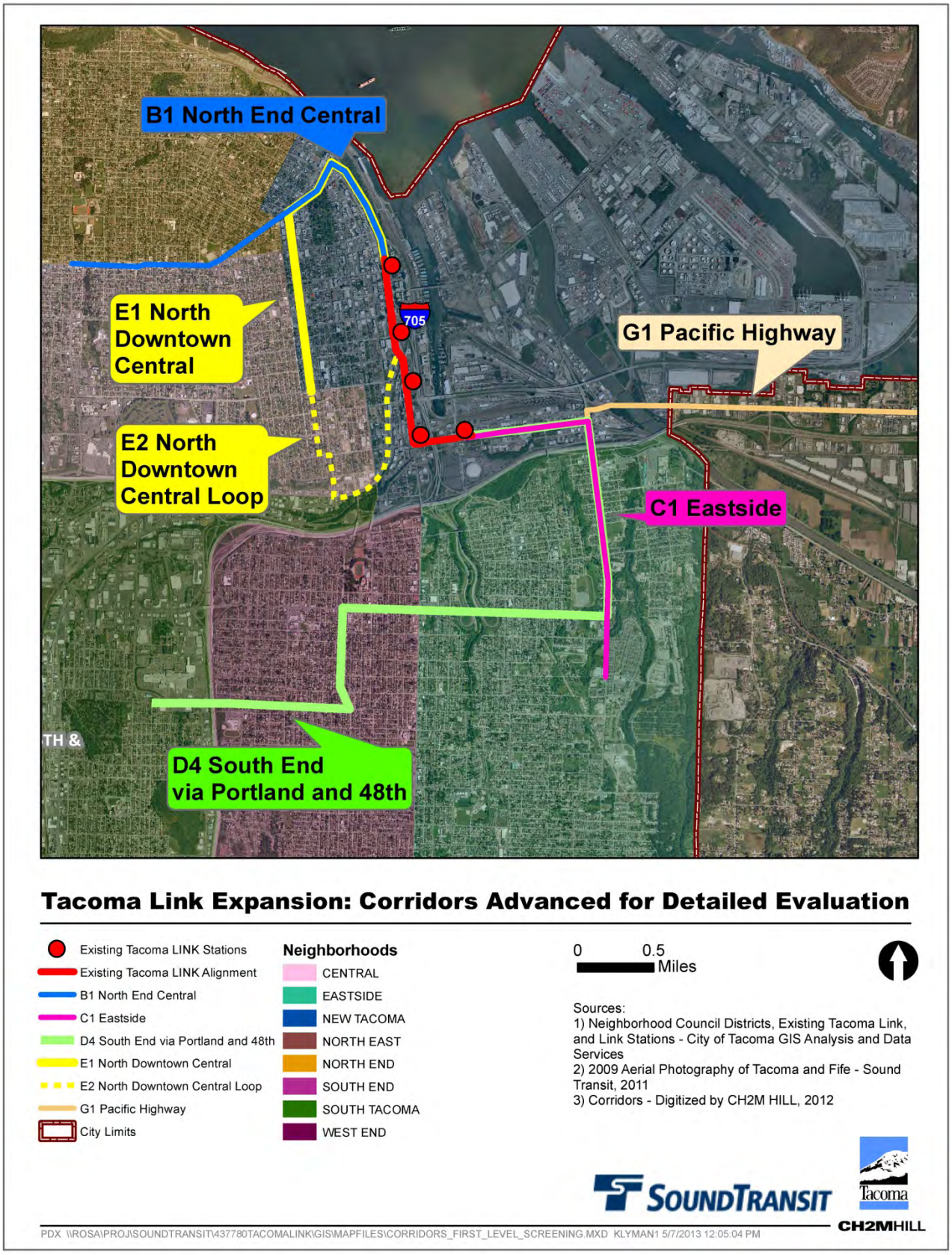
Table 3: Results of Corridor Screening Process (text in red indicates that a corridor did not pass the screening question)

Corridor #	Corridor Name	Results by Screening Question[1]							
		1A	2A	3A	3B	3C	4A	5A	6A
I	Pacific Highway to PLU	Yes. It would connect to existing Tacoma Link, which connects to Tacoma Dome Station.	Yes. This corridor is currently well served by the #1 bus (Pacific), but an improvement in ride quality could increase ridership.	Yes. It would connect to Eastside and South End neighborhoods.	Yes. It would improve transit to Eastside and South End neighborhoods.	Yes. It would serve an area that has between 4.8 and 12.8 jobs per acre.	Yes. It would travel through areas of predominantly low-income or minority populations.	Yes. It would connect to 34th & Pacific MUC. No MUC between 34th and PLU.	No. Grades in excess of 10% on Pacific in vicinity of I-5 crossing. Crosses under the new commuter rail bridge just north of South Tacoma Way, which has OCS clearance concerns/issues. Other challenges include significant bridge design or wireless vehicle option for crossings of I-5 and SR 512 along Pacific.
J	Point Defiance via Ruston Way	Yes. It would connect to existing Tacoma Link, which connects to Tacoma Dome Station.	Yes. This corridor is currently not served by transit.	Yes. It would connect to North End and West End neighborhoods.	Yes. It would improve transit connections to the North End and West End neighborhoods.	Yes. It would serve a census tract that has 12.9 plus employees per acre and 6.5 plus households per acre.	Yes. It would not travel through areas of predominantly low-income or minority populations, but this area is currently not well connected to the greater Tacoma community via transit.	No.	Yes. D St crosses freight rail tracks on structure approximately 500' to 600' in length. Dock St travels under SR 509, which has OCS clearance concerns/issues. Dock St travels onto S 4th St connecting to Schuster Parkway on a structure 600' to 700' in length. Schuster Parkway accesses Ruston Way traveling over N

Table 3: Results of Corridor Screening Process (text in red indicates that a corridor did not pass the screening question)

Corridor #	Corridor Name	Results by Screening Question[1]							
		1A	2A	3A	3B	3C	4A	5A	6A
									30th St on structure 900' to 1200' in length. Two roundabouts to navigate where Ruston Way meets Gallagher and 51st (roundabouts are problematic with light rail systems, due to traffic interface, need to signalize etc. It would be very expensive to signalize roundabouts or buy exclusive right-of-way to avoid them). Terminus could be very problematic as 8 lanes of traffic converge from 6 directions.
K	Downtown to Sprague Avenue via S 11th	Yes. It would connect to existing Tacoma Link, which connects to Tacoma Dome Station.	Yes. This corridor is served by the #28 bus (S 12th St), which has approximately 30-minute headways. Tacoma Link could improve frequency and ride quality.	Yes. It would connect to the Central neighborhood.	Yes. It would improve transit to the Central neighborhood.	Yes. It would serve a census tract that has 12.9 plus employees per acre and between 4.2 and 6.4 households per acre.	Yes. It would travel through areas of predominantly low-income or minority populations.	No.	Yes. Grades on 11th St between S I St and Market St range from 7 to 13%.

Figure 1: Corridors Advanced for Detailed Evaluation



Appendix A: Purpose and Need Statement and Project Goals and Objectives

Tacoma Link Expansion Alternatives Analysis: Purpose and Need Statement

The purpose of the Tacoma Link Expansion is to improve mobility and access to the regional transit system for Tacoma residents, employees, and visitors by connecting the existing Tacoma Link system with Tacoma's major activity centers and destinations within the City. The project will strive to serve traditionally underserved populations and neighborhoods in Tacoma while providing economic benefit to the City as a whole with a cost-effective and environmentally sensitive investment. The need for this project arises from:

- **The need to meet the rapidly growing connectivity needs of the corridor and the region's future residents and workers** by increasing mobility, access, and transportation capacity to and from regional growth and activity centers in Tacoma and the rest of the region, as called for in the region's adopted plans, including the Puget Sound Regional Council's VISION 2040 and Transportation 2040, the Countywide Planning Policies for Pierce County, 2012, as well as related county and city comprehensive plans.
- **The need to link downtown with other growth centers in the City and encourage economic development within those areas**. The City of Tacoma's Comprehensive Plan includes policies that specify the City's intention to locate major residential and employment growth in Mixed Use and Manufacturing/Industrial Centers. Expanding the Tacoma Link to these centers would encourage denser, more transit-oriented development and further concentrate higher-wage manufacturing and industrial jobs. This would provide greater opportunities to reduce the number of vehicle miles traveled as commute trips.
- **The need to serve increasing commute trips to the downtown core via transit**. The Puget Sound Regional Council's 2002 report on the Downtown Tacoma Regional Growth Center indicates that the downtown core contains a majority of the jobs within the city today and is projected to continue to do so in the future. Increasing numbers of commuters will need alternative ways to access jobs within the downtown core.
- **The need to support the land use planning goals of the South Downtown Subarea Plan, the MLK Subarea Plan, and the other Growth and Employment centers**. The City of Tacoma is currently undertaking planning processes for the South Downtown subarea and the MLK subarea. Both planning processes are designed to encourage transit-oriented, mixed-use development, and economic revitalization in areas of Tacoma that are designated for future regional growth concentrations. Expanding the Tacoma Link within either or both of these areas would help to bring those goals to fruition.
- **The need to reduce greenhouse gas emissions within the City of Tacoma**. The City of Tacoma has established an Office of Sustainability to implement its Climate Action Plan. The plan calls for a reduction in greenhouse gas emissions to 40 percent below 1990 levels by the year 2020, and a reduction in greenhouse gas emissions to 80 percent below 1990 levels by the year 2050. Transportation results in 53 percent of the greenhouse gas emissions within the City of Tacoma. To reduce that, the City has the goal of increasing the use of all public transportation modes. According to the 2010 Census, only 4 percent of workers ages 16 and older within Tacoma used public transportation to commute to work. This number will need to increase substantially if the goals of the Climate Action Plan, the South Downtown Subarea Plan, and the MLK Subarea Plan are to be met.
- **The need to support economic development in downtown Tacoma**. The Downtown Tacoma Economic Development Strategy lists the existing Tacoma Link as a key asset within downtown Tacoma. One of the City of Tacoma's primary goals for economic development is to stimulate investor interest in downtown. The expansion of Tacoma Link presents an opportunity to achieve the City's economic development goals.
- **The following goals and objectives, which are a part of Sound Transit's Regional Transit Long-Range Plan (2005)**:

  - Help ensure long-term mobility, connectivity, and convenience;
  - Preserve communities and open space;
  - Contribute to the region's economic vitality;
  - Preserve our environment; and
  - Strengthen communities' use of the regional transit network.

- **The need to serve underserved communities and neighborhoods within the city of Tacoma**. Underserved communities and neighborhoods are defined as those that meet all of the following criteria:
  - Have received proportionately fewer infrastructure investments in the past 10 years than other areas of Tacoma,
  - Have a greater proportion of minority or low-income residents than the city as a whole, and
  - Contain vacant and/or underutilized parcels that could be redeveloped to be transit-supportive.

Tacoma Link Expansion Alternatives Analysis: Project Goals and Objectives

Goal 1: Improve mobility and transportation access for Tacoma residents and visitors.

- Objective 1A: Improve access to the regional transit system.
- Objective 1B: Improve transit connections between Tacoma's neighborhoods and downtown.
- Objective 1C: Connect to major regional destinations via transit.

Goal 2: Increase transit ridership within the city of Tacoma.

- Objective 2A: Reduce vehicle miles traveled within the city.
- Objective 2B: Improve the quality of transit service within the city by increasing connections to multimodal facilities specified in the City of Tacoma's Mobility Master Plan, improving speed and reliability, and expanding the area served.

Goal 3: Serve underserved neighborhoods and communities in the city of Tacoma.

- Objective 3A: Serve areas that historically have received proportionately few infrastructure investments.
- Objective 3B: Serve areas that are ethnically and economically diverse.

Goal 4: Use transit to spur economic development and other types of investments.

- Objective 4A: Connect to areas and neighborhoods that have the potential to develop transit-oriented development, high-density development, or concentrations of employment.
- Objective 4B: Attract and retain businesses in Tacoma through development of a high-quality transit system.
- Objective 4C: Enhance existing investments and leverage pending investments in downtown.
- Objective 4D: Attract visitors and new residents to downtown and the mixed use centers.

Goal 5: Ensure that the project is environmentally sensitive and sustainable.

- Objective 5A: Avoid major environmental constraints.
- Objective 5B: Develop consistent with Sound Transit's Sustainability Plan, the City of Tacoma's Climate Action Plan, and the City of Tacoma's Comprehensive Plan.

Goal 6: Establish a project that is competitive for federal funding.

- Objective 6A: Develop a cost-effective corridor.

Appendix B: Maps of All Corridors and Options Analyzed in the Screening Process

Map 1: Corridors A1-A3

Map 2: Corridors B1-B4

Map 3: Corridors C1, C2, and D1-D4

Map 4: Corridors E1-E2

Map 5: Corridor F

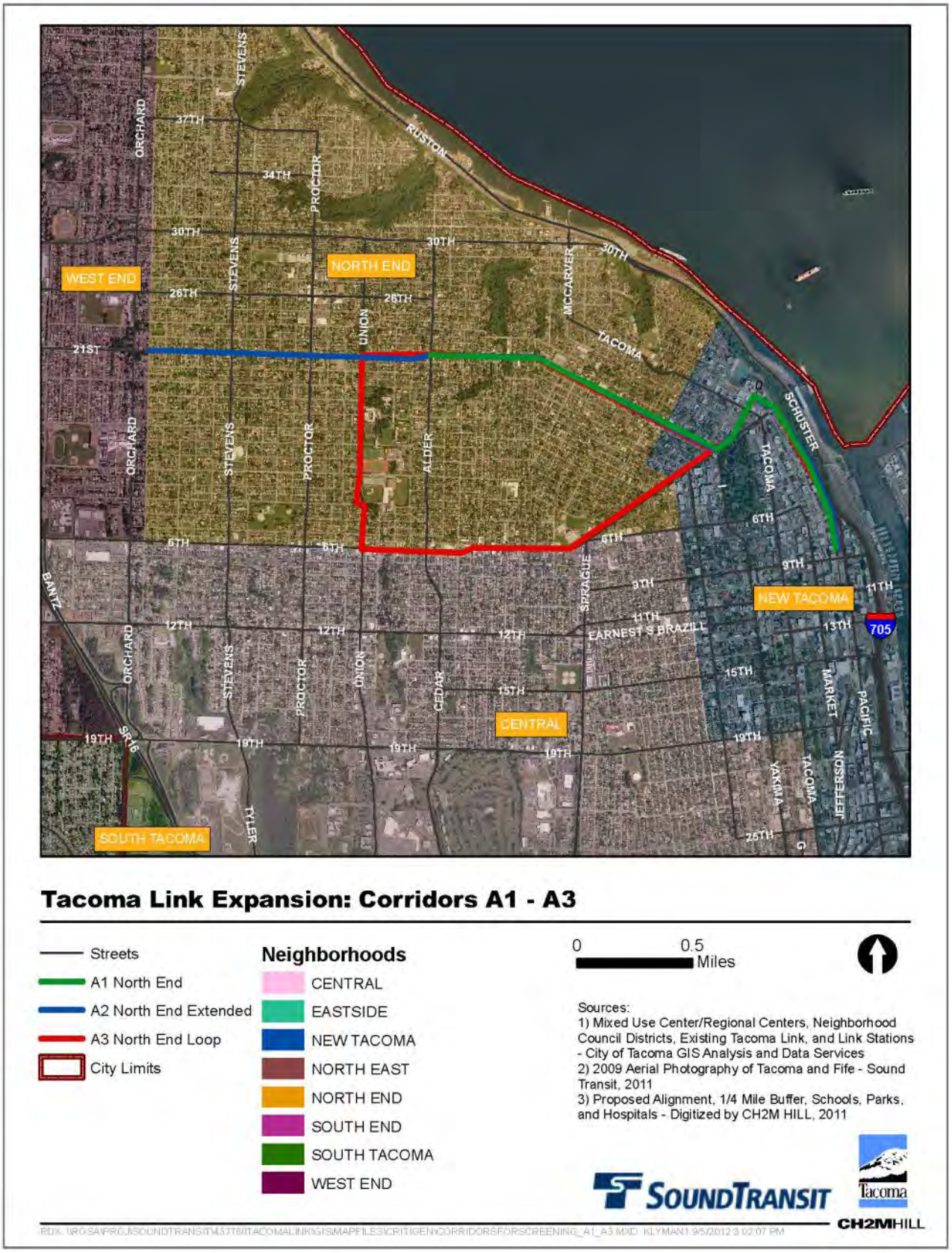
Map 6: Corridors G1-G3

Map 7: Corridor H1, H2, and K

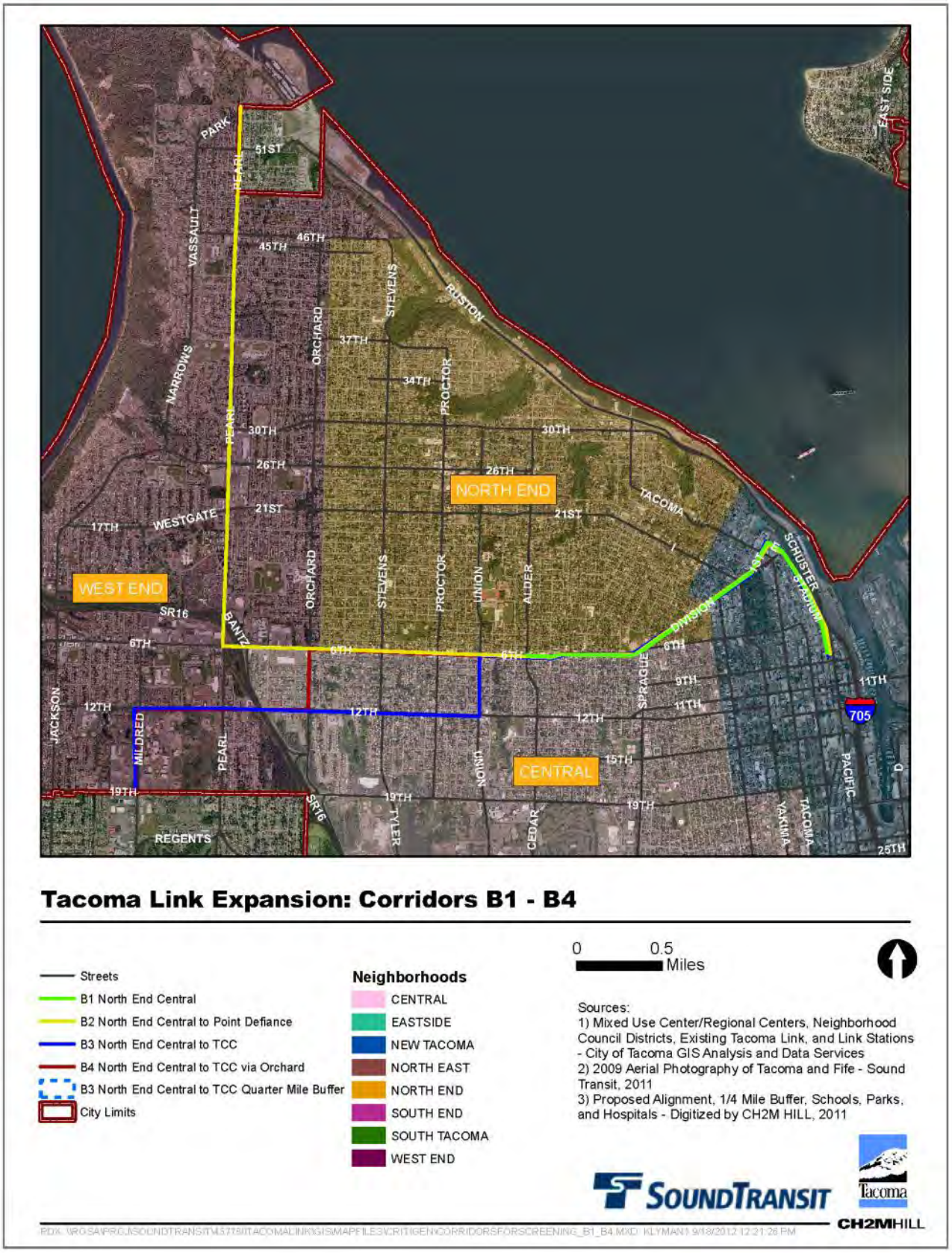
Map 8: Corridor I

Map 9: Corridor J

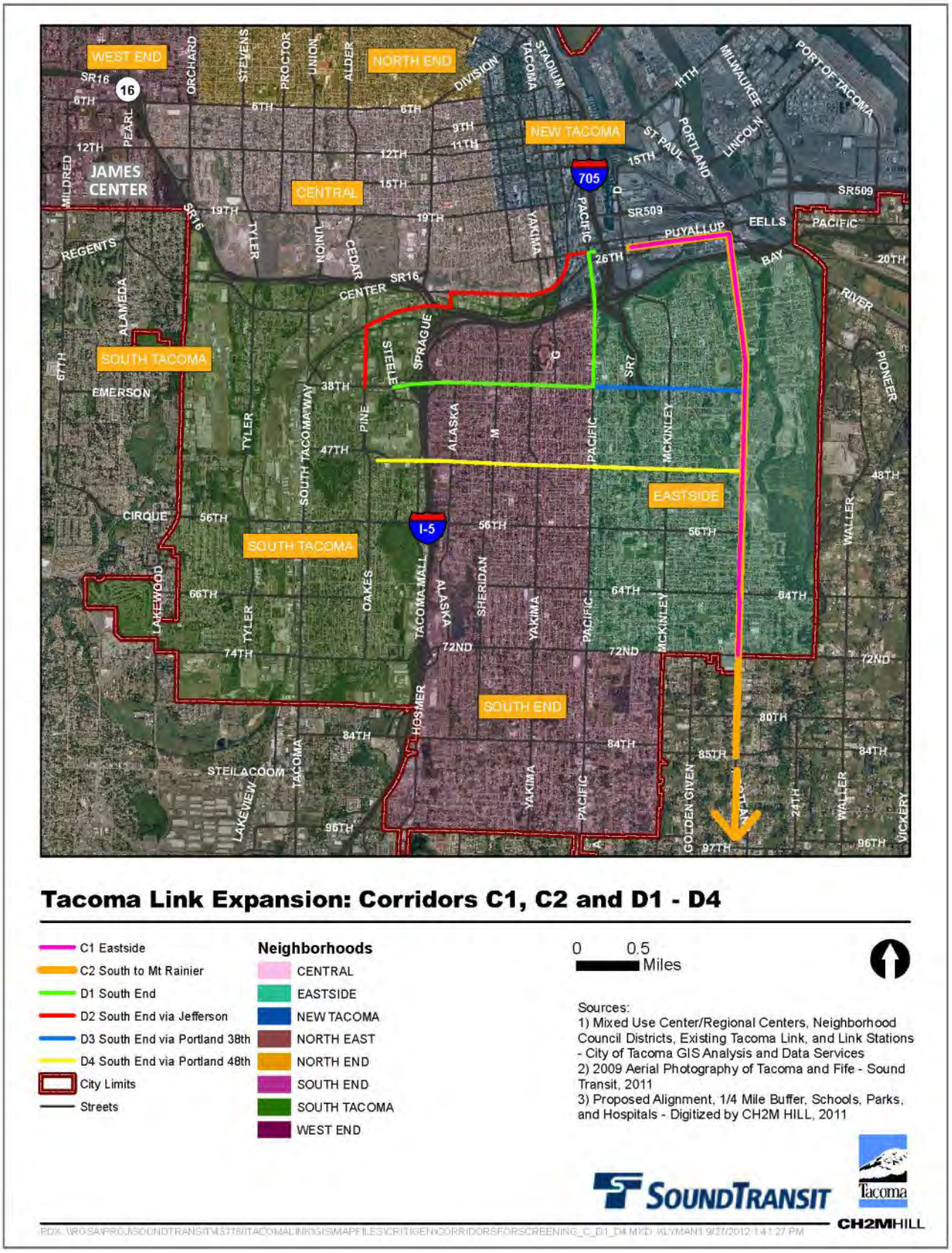
Map 1: Corridors A1-A3



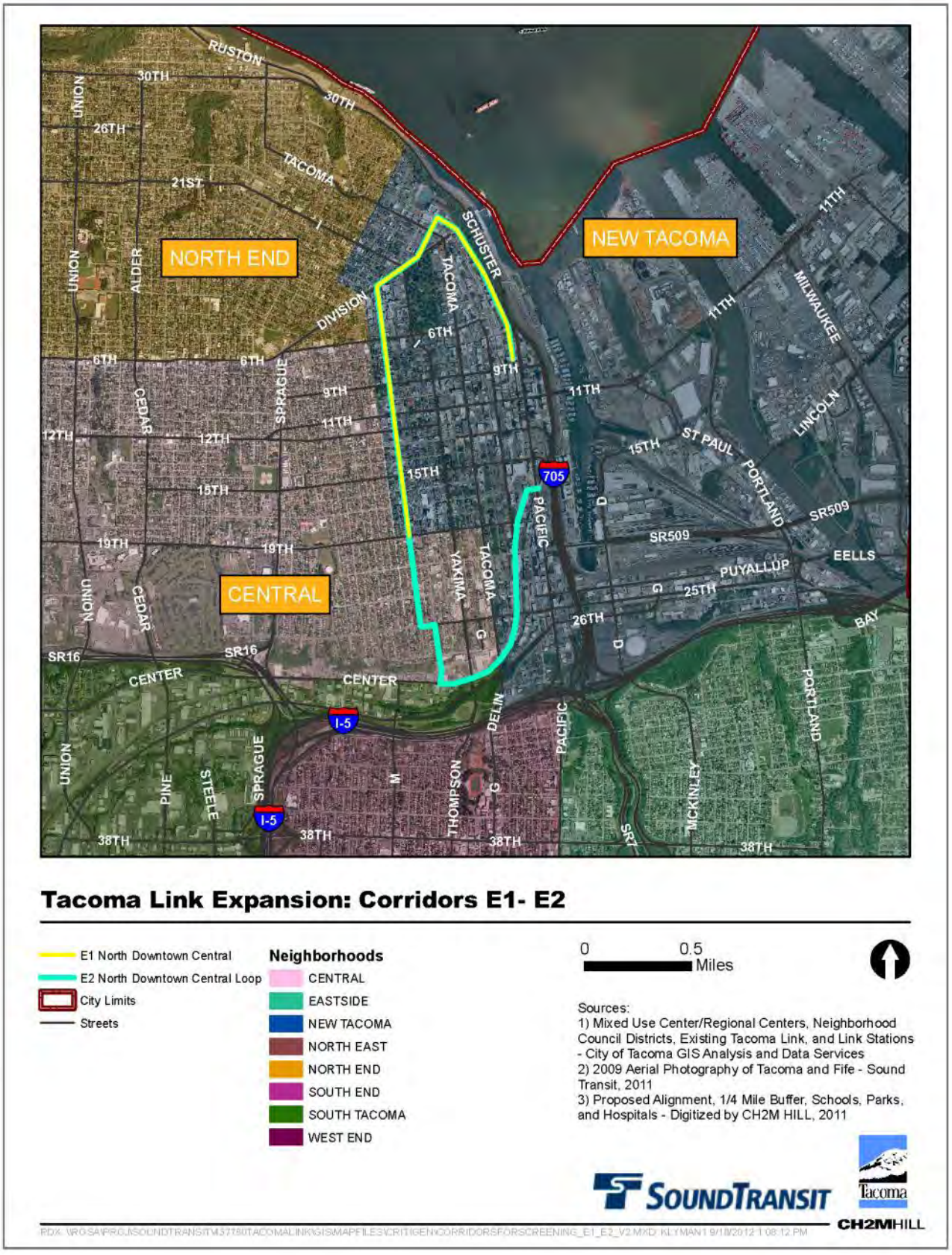
Map 2: Corridors B1-B4



Map 3: Corridors C1, C2, and D1-D4



Map 4: Corridors E1-E2



Tacoma Link Expansion: Corridors E1- E2

E1 North Downtown Central
E2 North Downtown Central Loop
City Limits
Streets

Neighborhoods
CENTRAL
EASTSIDE
NEW TACOMA
NORTH EAST
NORTH END
SOUTH END
SOUTH TACOMA
WEST END

0 0.5 Miles

Sources:
1) Mixed Use Center/Regional Centers, Neighborhood Council Districts, Existing Tacoma Link, and Link Stations - City of Tacoma GIS Analysis and Data Services
2) 2009 Aerial Photography of Tacoma and Fife - Sound Transit, 2011
3) Proposed Alignment, 1/4 Mile Buffer, Schools, Parks, and Hospitals - Digitized by CH2M HILL, 2011

SOUNDTRANSIT
Tacoma
CH2MHILL

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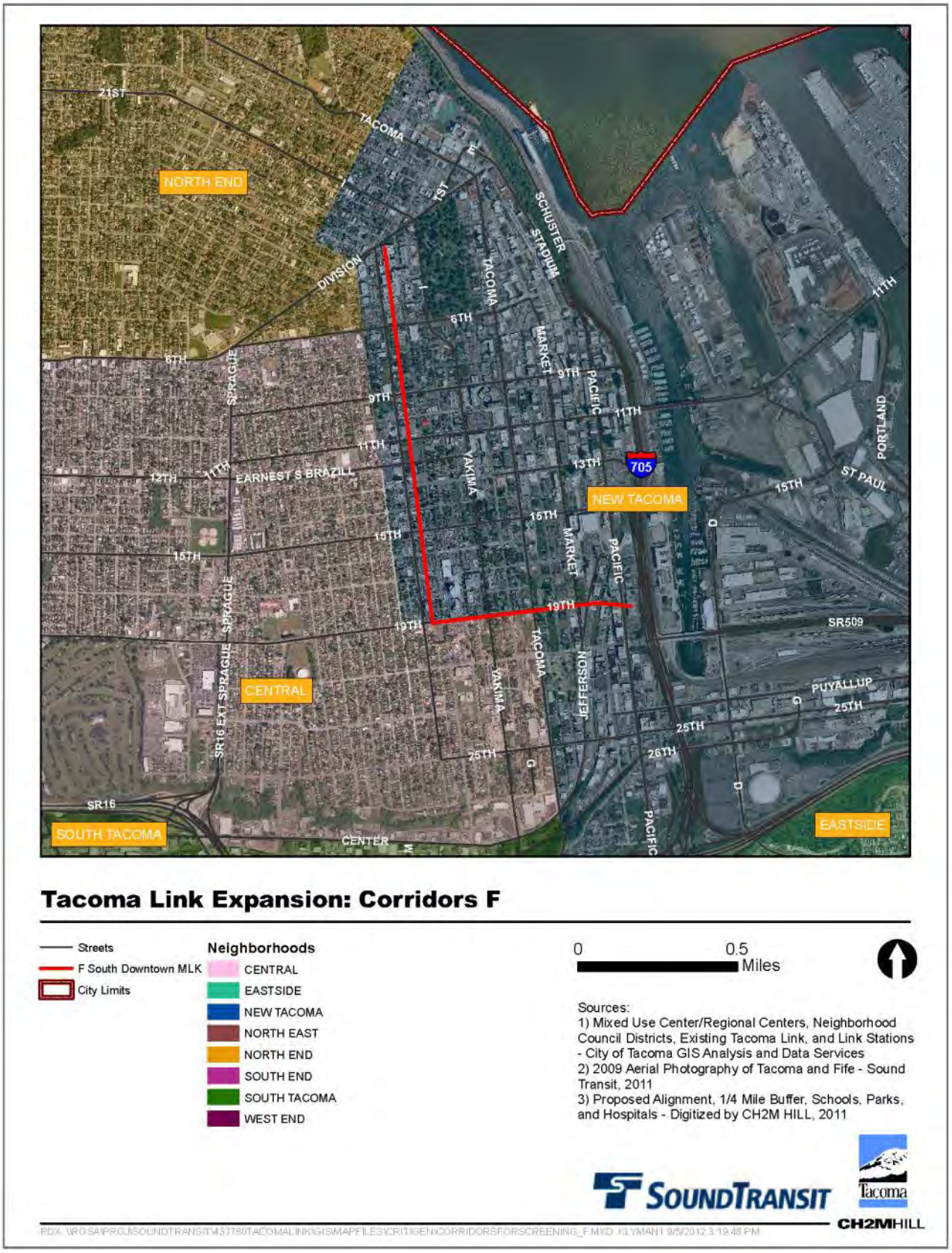
Map 5: Corridor F



Tacoma Link Expansion: Corridors F

Streets
F South Downtown MLK
City Limits

Neighborhoods
CENTRAL
EASTSIDE
NEW TACOMA
NORTH EAST
NORTH END
SOUTH END
SOUTH TACOMA
WEST END

0 0.5 Miles

Sources:
1) Mixed Use Center/Regional Centers, Neighborhood Council Districts, Existing Tacoma Link, and Link Stations - City of Tacoma GIS Analysis and Data Services
2) 2009 Aerial Photography of Tacoma and Fife - Sound Transit, 2011
3) Proposed Alignment, 1/4 Mile Buffer, Schools, Parks, and Hospitals - Digitized by CH2M HILL, 2011

SOUNDTRANSIT
Tacoma
CH2MHILL

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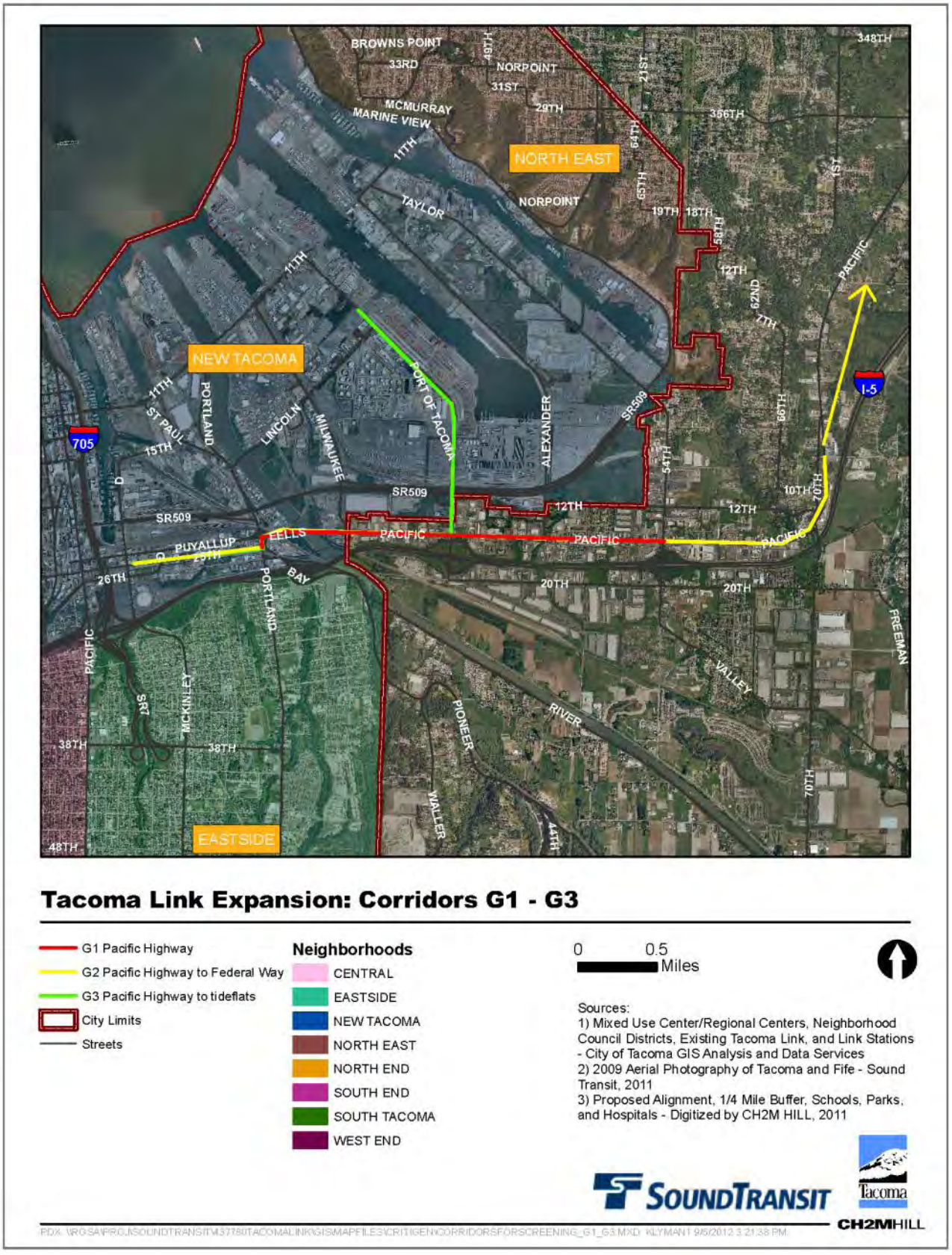
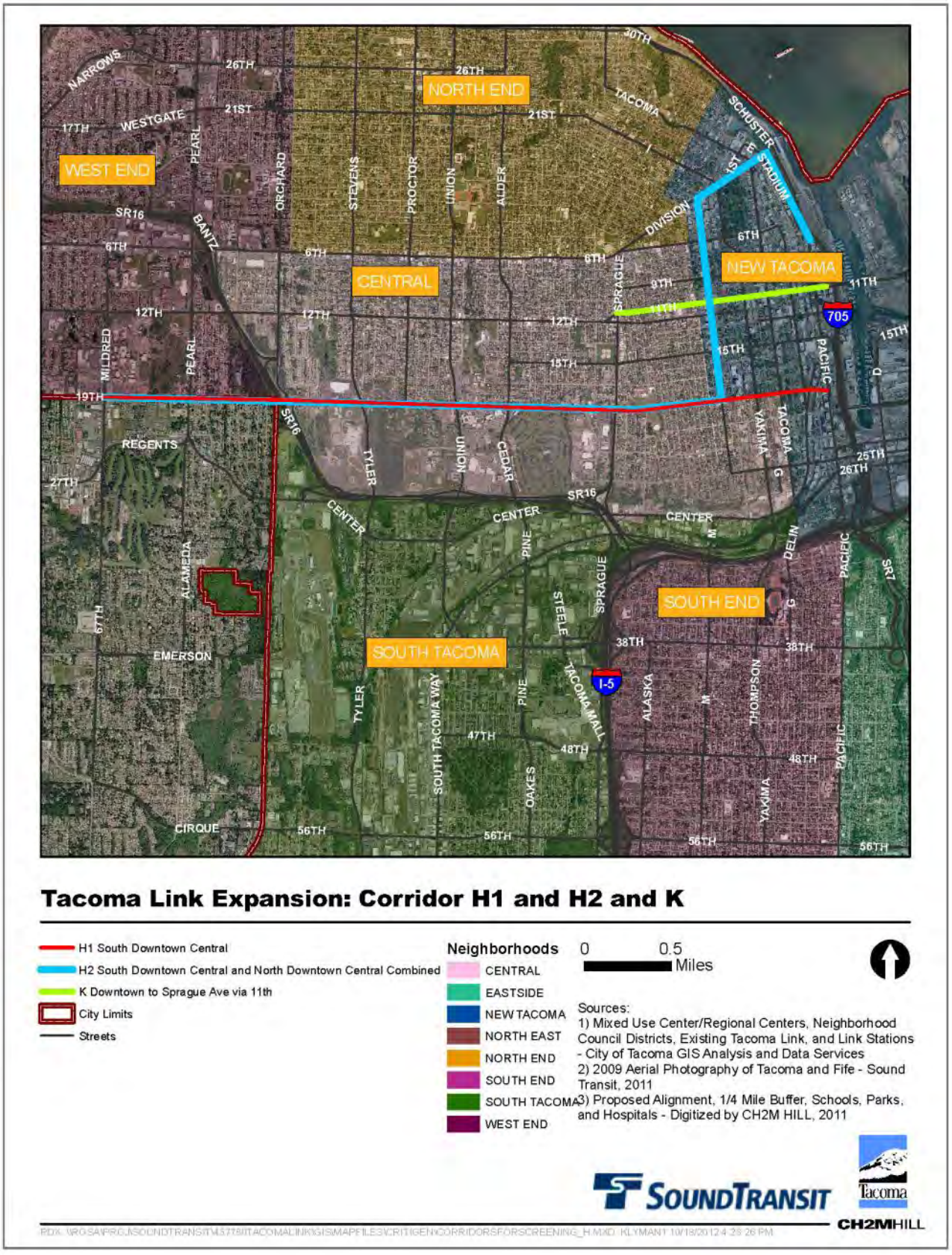
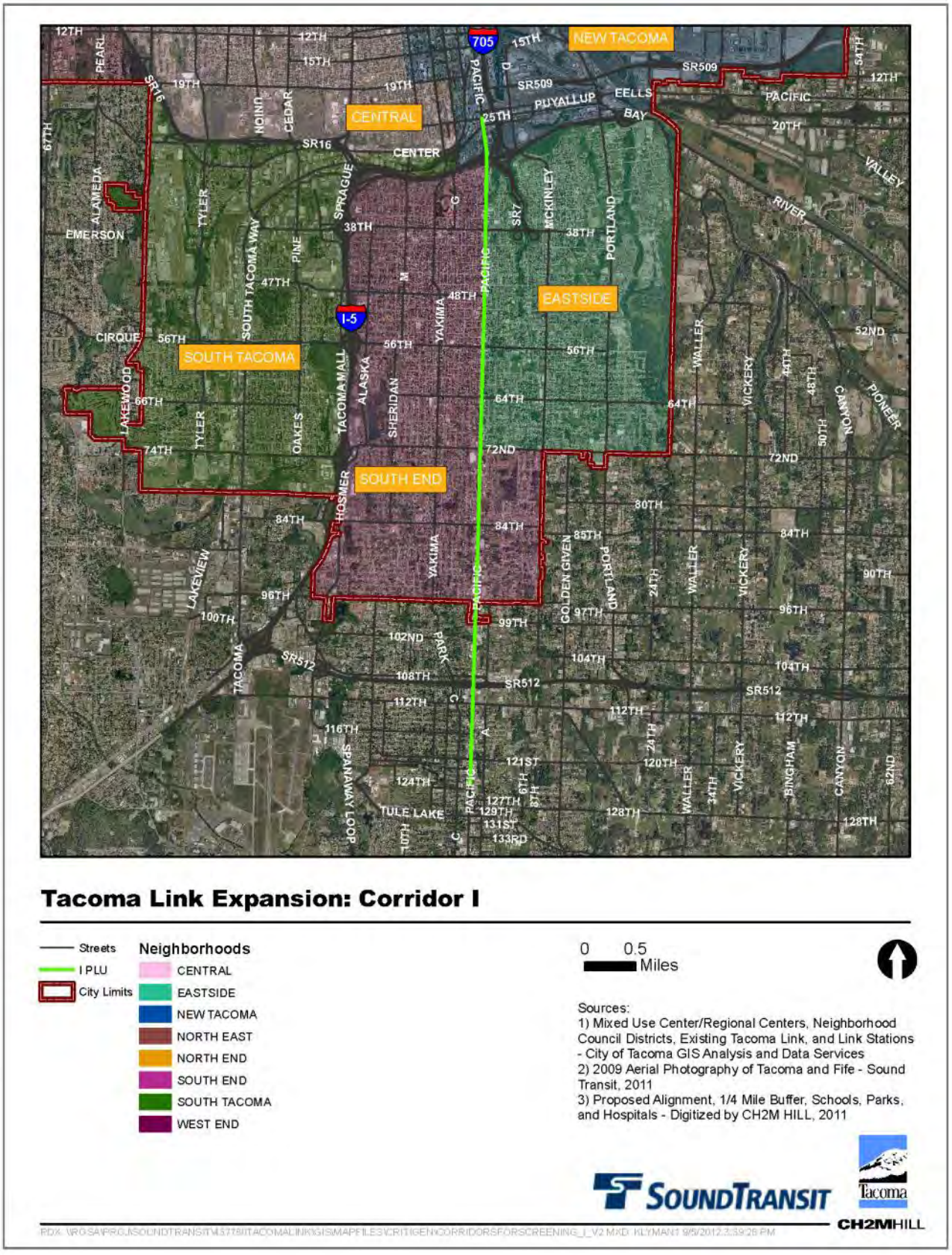
Map 6: Corridors G1-G3



Map 7: Corridor H1, H2, and K



Map 8: Corridor I



Map 9: Corridor J

Tacoma Link Expansion: Corridor J

Streets
J Point Defiance RustonWy
City Limits

Neighborhoods
CENTRAL
EASTSIDE
NEW TACOMA
NORTH EAST
NORTH END
SOUTH END
SOUTH TACOMA
WEST END

0 0.5 Miles

Sources:
1) Mixed Use Center/Regional Centers, Neighborhood Council Districts, Existing Tacoma Link, and Link Stations - City of Tacoma GIS Analysis and Data Services
2) 2009 Aerial Photography of Tacoma and Fife - Sound Transit, 2011
3) Proposed Alignment, 1/4 Mile Buffer, Schools, Parks, and Hospitals - Digitized by CH2M HILL, 2011

SOUNDTRANSIT
Tacoma
CH2MHILL

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Document A3: Tacoma Link Expansion AA: Methodologies for Evaluation Process *(February 28, 2013)*

Tacoma Link Expansion AA: Methodologies for Evaluation Process

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DATE: February 28, 2013

The purpose of the Tacoma Link Expansion Alternatives Analysis (AA) effort is to identify the corridor and mode (vehicle technology) for expanding the current Tacoma Link system. This memorandum sets out the proposed methodologies that will be used to evaluate a set of corridors and modes that could serve this purpose. These corridors and modes have all been forwarded beyond a screening evaluation against the project's Purpose and Need statement, as described in the "Tacoma Link Expansion AA: Screening Report". The methodologies described in this memo implement the evaluation criteria that were originally presented in the document titled "Tacoma Link Expansion AA: Draft Evaluation Framework" and are included below in Table 1. The sections below describe the method by which each evaluation criterion will be addressed and are organized by the six goals of the project. Each goal contains one or more objectives, and each objective has one or more evaluation criteria for each corridor and each mode being evaluated.

TABLE 1
Summary of Tacoma Link Expansion Objectives and Evaluation Criteria

Objectives	Evaluation Criteria for Corridors	Evaluation Criteria for Modes (BRT and LRT)
Goal 1: Improve mobility and transportation access for Tacoma residents and visitors.		
• Objective 1A: Improve access to the regional transit system.	• Travel time to the Tacoma Dome Station, as compared to existing transit travel times	• Number of transfers needed to reach Tacoma Dome Station
• Objective 1B: Improve transit connections between Tacoma's neighborhoods and downtown.	• Travel time from Tacoma neighborhoods to downtown Tacoma, as compared to existing transit travel times	• Does not differentiate modes
• Objective 1C: Connect to major regional destinations via transit.	• Number of Regional Growth Centers served	• Does not differentiate modes
Goal 2: Increase transit ridership within the City of Tacoma.		
• Objective 2A: Reduce vehicle miles traveled within the city.	• Travel Market Assessment/Likely ridership response	• Does not differentiate modes

TABLE 1
Summary of Tacoma Link Expansion Objectives and Evaluation Criteria

Objectives	Evaluation Criteria for Corridors	Evaluation Criteria for Modes (BRT and LRT)
• Objective 2B: Improve the quality of transit service within the city by increasing connections to multimodal facilities specified in the City of Tacoma's Mobility Master Plan, improving speed and reliability, and expanding the area served.	• Number of connections to major bicycle and pedestrian facilities • Likely change in transit travel time reliability	• Does not differentiate modes
Goal 3: Serve underserved neighborhoods and communities in the City of Tacoma.		
• Objective 3A: Serve areas that historically have received proportionately few infrastructure investments.	• Amount of transportation and public infrastructure investments within the past 10 years within ¼ mile of each corridor	• Does not differentiate modes
• Objective 3B: Serve areas that are ethnically and economically diverse.	• Population within ¼ mile of each corridor that is considered low-income and/or minority, and percentage of households with no vehicles	• Does not differentiate modes
Goal 4: Use transit to spur economic development and other types of investments.		
• Objective 4A: Connect to areas and neighborhoods that have the potential to develop transit-oriented development, high-density development, or concentrations of employment.	• Amount of vacant land within ¼ mile of the corridor that could potentially be developed • Ratio of building value to land value to determine developed but "underutilized" parcels	• Does not differentiate modes
• Objective 4B: Attract and retain businesses in Tacoma through development of a high-quality transit system.	• Number of parcels zoned for commercial and industrial use within ¼ mile of the corridor	
• Objective 4C: Enhance existing investments and leverage pending investments in downtown.	• Does not differentiate corridors	• Qualitative assessment of the potential to spur private investment
• Objective 4D: Attract visitors and new residents to downtown and the mixed use centers.	• Likely ridership response • Ease of connection to downtown	• Ease of connection to downtown and mixed use centers
Goal 5: Ensure that the project is environmentally sensitive and sustainable.		
• Objective 5A: Avoid major environmental constraints.	• Presence of historic districts and distance to the corridor • Presence of habitat corridors and distance to the corridor • Presence of parks and distance to the corridor • Presence of sensitive noise receptors and distance to the corridor • Potential to cause visual impacts	• Potential to cause noise and vibration impacts • Potential to cause visual impacts

TABLE 1
Summary of Tacoma Link Expansion Objectives and Evaluation Criteria

Objectives	Evaluation Criteria for Corridors	Evaluation Criteria for Modes (BRT and LRT)
• Objective 5B: Develop consistent with Sound Transit's Sustainability Plan, the City of Tacoma's Climate Action Plan, and the City of Tacoma's Comprehensive Plan.	• Consistency with Sound Transit's Sustainability Plan • Consistency with City of Tacoma's Climate Action Plan • Consistency with City of Tacoma's Comprehensive Plan • Consistency with UW Tacoma's Master Plan	• Consistency with Sound Transit's Sustainability Plan • Consistency with City of Tacoma's Climate Action Plan • Consistency with City of Tacoma's Comprehensive Plan
Goal 6: Establish a project that is competitive for federal funding.		
• Objective 6A: Develop a cost-effective corridor.	• Affordability • Availability of federal funding • Redevelopment potential • Potential for Local Improvement District	• Competitiveness for Federal Small Starts • Local funding alternatives

Goal 1: Improve mobility and transportation access for Tacoma residents and visitors.

Objective 1A: Improve access to the regional transit system.

Evaluation Criteria for Corridors

Measure: Travel Time to the Tacoma Dome Station compared with Existing Transit Travel Times

This measure will estimate a person's travel time between the corridor's end-point and Tacoma Dome Station. Travel times will be developed for the corridors and compared with existing transit travel times.

The travel times for the corridors will be estimated using the travel times for the current Tacoma Link system and operating service. Existing transit travel times between the corridor end-points and Tacoma Dome Station will include the in-vehicle time(s) and transfer time for connections to destination, and will be calculated from existing Pierce Transit field reliability data for an afternoon peak trip starting at 5 p.m., including required transfers. If multiple existing Pierce Transit routes serve all or part of the trip, the most efficient (fastest travel time) will be used. The existing transit travel time will include the in-vehicle time(s) and transfer time for connections to destination.

Based on this analysis, each corridor will be assigned a score of high, medium, or low according to its travel time savings relative to existing travel times.

Evaluation Criteria for Modes

Measure: Number of Transfers needed to reach Tacoma Dome Station

This measure will assess the efficiency of transit connectivity from the corridor's end-point to Tacoma Dome Station by determining number of transfers required, if any.

Each mode will be assigned a score of high, medium, or low according to the number of transfers required compared with the number required in existing conditions.

Objective 1B: Improve transit connections between Tacoma's neighborhoods and downtown.

Evaluation Criteria for Corridors

Measure: Travel Time from Tacoma Neighborhoods to Downtown Tacoma, compared with Existing Transit Travel Times

This measure will estimate a person's travel time using transit services between the corridors end-point and the first stop in Downtown Tacoma (using the Regional Growth Center boundaries as defined by Puget Sound Regional Council (PSRC)). The travel time will incorporate factors such as walk time, service frequency, vehicle speeds, and the number of transfers required. Travel times will be developed for the corridor and compared with travel times for existing transit.

The travel times for the corridors will be estimated using travel times for the current Tacoma Link system and operating service. Existing transit travel times between the corridor end-points and the first stop in downtown Tacoma will include the in-vehicle time(s) and transfer time for connections to destination, and will be calculated from existing Pierce Transit field reliability data for an afternoon peak trip starting at 5 p.m., including required transfers If multiple existing Pierce Transit routes serve all or part of the trip, the most efficient (fastest travel time) will be used. The existing transit travel time will include the in-vehicle time(s) and transfer time for connections to destination.

Based on this analysis, each corridor will be assigned a relative score of high, medium, or low based on its travel time savings compared with existing travel times.

Evaluation Criteria for Modes

Not applicable for Objective 1B.

Objective 1C: Connect to major regional destinations via transit.

Evaluation Criteria for Corridors

Measure: Number of Regional Growth Centers Served

This measure will assess the ability of each corridor to connect to the Puget Sound Regional Council-designated Regional Growth Centers within the study area; namely, the Tacoma Mall and downtown Tacoma. Corridors that serve both Regional Growth Centers will be given a score of high, corridors that serve one Regional Growth Center will be given a score of medium, and corridors not serving any Regional Growth Center will be given a score of low.

Evaluation Criteria for Modes

Not applicable for Objective 1C.

Goal 2: Increase transit ridership within the City of Tacoma.

Objective 2A: Reduce vehicle miles traveled within the city.

Evaluation Criteria for Corridors

Measure: Travel Market Assessment

Likely ridership response is based on the travel market assessment conducted for each corridor. The travel market assessment is based on land use and socioeconomic data. These data are grouped by census tract boundaries; the grouping provides a common geography for each data category. The study area includes census tracts that intersect the ¼ mile buffer around each corridor, and includes portions of the cities of Tacoma and Fife, as well as parts of Fircrest and University Place.

Five data categories related to transit usage were chosen: minority population, household income, autos available, and household and employment densities. Regional and national information indicated these categories have the greatest effect on transit use.

The land use and socioeconomic information for the area surrounding the corridor will be synthesized and compared with the study area's average for each category and a rating will be determined using the composite summary of all five categories. No weighting is proposed as all of these five categories are relatively equal indicators of transit usage. A composite rating of high, medium, or low will be calculated for each corridor.

Evaluation Criteria for Modes

Not applicable for Objective 2A. Because the corridor evaluation considers land use and socioeconomic data, not mode or service information, it is assumed that ridership between different modes is similar and therefore is not a differentiating criterion.

Objective 2B: Improve the quality of transit service within the city by increasing connections to multimodal facilities specified in the City of Tacoma's Mobility Master Plan.

Evaluation Criteria for Corridors

Measure: Number of Connections to Major Bicycle and Pedestrian Facilities

The City of Tacoma's Mobility Master Plan will be used to determine the existing and planned "bicycle and pedestrian facilities" within the study area and quantify the number of these facilities accessible by each corridor.

The accessibility of the "bicycle and pedestrian facilities" in the study area will be determined by visually assessing any barriers, such as river, railroad, or highway crossings.

Based on this evaluation each corridor will be assigned an aggregate score of high, medium, or low.

Measure: Likely Change in Travel Time Reliability

This measure will determine the percent of improvement in the on-time reliability of the corridors compared to the existing bus reliability.

The on-time reliability for the corridors will be estimated using reliability for the current Tacoma Link system. The service reliability for existing transit will be determined using actual bus times at transit stops available from existing Pierce Transit field reliability data and comparing that to existing route schedules.

Based on the analysis, the corridors that have around 30% or more improvement in the reliability will be assigned a score of high, corridors with some improvement in reliability will be assigned a score of medium, and corridors with no improvement or similar performance for reliability will be assigned a score of low.

Evaluation Criteria for Modes

Not applicable for Objective 2B.

Goal 3: Serve underserved neighborhoods and communities in the City of Tacoma.

Objective 3A: Serve areas that historically have received proportionately few infrastructure investments.

Evaluation Criteria for Corridors

Previous infrastructure investments will be identified in the corridors using information from the City of Tacoma, Pierce County, Sound Transit, and Pierce Transit.

For this task, infrastructure investments are defined to include the following types of transportation systems: roadway improvements; transit service including bus, light rail/streetcar, and commuter rail; bicycle facilities including trails and bicycle lanes; and pedestrian facilities. In addition, other public infrastructure investments will be taken into consideration including sewer system, stormwater systems, parks, and street lighting.

Information on the infrastructure improvements will be collected from available sources including transportation plans for the cities and counties, and through communications with the cities, counties, and local transportation agencies. It is assumed that the cities, counties, and agencies will provide any information not available through their respective websites.

Information on infrastructure will be compiled into a matrix to allow comparison between the corridors and the existing and planned improvements to determine any areas that have received proportionately fewer infrastructure improvements. The matrix will identify the corridors and the types of infrastructure improvements defined above. Rankings in the matrix will be high, medium, or low for their potential to serve the underserved neighborhoods, depending on the type of existing and planned improvements.

Evaluation Criteria for Modes

Not applicable for Objective 3A.

Objective 3B: Serve areas that are ethnically and economically diverse.

Evaluation Criteria for Corridors

The latest available U.S. Census Bureau report (2010) will be used to determine demographic characteristics of the smallest geographical divisions within a ¼-mile from the centerline of each corridor. Data will be collected on the number of minority, low-income, and transit-dependent households. Corridors will be compared to identify any with higher concentrations of the demographic characteristics of interest. Larger geographic areas (the cities of Tacoma and Fife and Pierce County) will also be compared.

The following sources will be used:

- 2010 U.S. Census Bureau data (to identify minority populations at the Census Block level)
- American Community Survey (ACS)[1] data (to identify low-income populations at the Census Tract level). The latest available ACS data will be used in the analysis which is currently 2007-2011.
- ACS data (to identify transit-dependent households at the Census Tract level)

In addition, 2010 U.S. Census data at the Census Block level on those blocks with zero population will be used to identify areas within each corridor where there are no populations.

Population concentrations within each corridor will be mapped using quartiles. Demographic characteristics for each corridor and for the cities of Tacoma and Fife and Pierce County will also be provided in tabular form to aid comparison of corridors and larger geographic areas.

Evaluation Criteria for Modes

Not applicable for Objective 3B.

Goal 4: Use transit to spur economic development and other types of investments.

Objective 4A: Connect to areas and neighborhoods that have the potential to develop transit-oriented development, high-density development, or concentrations of employment.

Evaluation Criteria for Corridors

Measure: Amount of vacant land within ¼ mile of the corridor centerline that could potentially be developed

The analysis team will use GIS and the city's parcel layer to select all parcels within ¼ mile of the corridor centerline. Those parcels with an improvement value of $0 will be defined as vacant, and considered developable.

[1] ACS data provide a 5-year average of sample survey results. Sample surveys may have larger margins of error than do larger surveys; however, the 2010 Census did not provide margin of error for the surveys.

Measure: Ratio of value of developed land to total land value to determine developed but "underutilized" parcels.

In addition to the vacant parcels, the ratio of building to land value will be determined through the GIS layer. Parcels for which the ratio of building to land value is 150 percent or lower will be considered underutilized and re-developable.

Measure: Presence of zoning that supports Transit-Oriented Development (TOD), high-density development, or concentrations of employment.

The analysis team will use GIS and the city's zoning layer to determine the base and potential overlay zoning layers within ¼ mile of the corridor centerline to determine what development is currently allowed. Mixed-use zoning, high-density residential, and employment/commercial zones or overlays that allow higher density will support development potential. Additionally, the analysis team will use GIS to identify areas with large parcel sizes and common ownership, as these areas are likely to be easier to develop into TOD, high density development, or employment concentrated areas.

Evaluation Criteria for Modes

Not applicable for Objective 4A.

Objective 4B: Attract and retain businesses in Tacoma through development of a high-quality transit system.

Evaluation Criteria for Corridors

Measure: Number of parcels zoned for commercial and industrial use within ¼ mile of the corridor centerline

The analysis team will use GIS and the city's zoning layer to determine the number of parcels zoned commercial and industrial within ¼ mile of the corridor centerline.

Evaluation Criteria for Modes

Not applicable for Objective 4B.

Objective 4C: Enhance existing investments and leverage pending investments in downtown.

Evaluation Criteria for Corridors

Not applicable for Objective 4C.

Evaluation Criteria for Modes

Measure: Qualitative assessment of the potential to spur private investment

Both bus rapid transit and light rail or trolley transit can be catalysts for economic development. There is some evidence that light rail or trolley transit has a wider catchment area than bus rapid transit, which suggests that areas around rail or trolley stations are more likely to develop more intensely.

The analysis team will qualitatively compare possible modes and rank them low, medium, or high for potential to spur private investment. Additionally, the analysis team will use GIS to identify areas with large parcel sizes and common ownership, as these areas are likely to be easier to develop into TOD, high density development, or employment concentrated areas.

Objective 4D: Attract visitors and new residents to downtown and the mixed use centers.

Evaluation Criteria for Corridors

Measure: Likely ridership response

This evaluation will be a summary of the results of the evaluation for Goal 2.

Ease of connection to downtown and mixed use centers

The analysis team will use the travel model to estimate travel time for each corridor to downtown. The corridors that would have the shortest travel time to downtown will score higher than the corridors that would have longer travel times.

Additionally, the analysis team will identify mixed use centers and evaluate travel time by corridor to them.

Evaluation Criteria for Modes

Measure: Ease of connection to downtown and mixed use centers

The analysis team will use the travel model to estimate the travel time by mode to downtown. The corridors that would have the shortest travel time to downtown will score higher than the corridors that would have longer travel times.

The mixed use centers will be analyzed by mode for travel time.

Goal 5: Ensure that the project is environmentally sensitive and sustainable.

Objective 5A: Avoid major environmental constraints.

Evaluation Criteria for Corridors

Presence of historic districts and distance to the corridor

The city's Historic Areas GIS data layer, the Washington State Department of Historic Preservation website, and the National Register of Historic Places website will be used to determine historic districts and structures that exist within ¼ mile of each corridor. Corridors will be ranked low, medium, or high based on the number and type of historic structures present within the corridor and for potential for new transit routes to adversely affect historic resources. The URLs for the websites are:

- Washington Heritage Register – http://www.dahp.wa.gov/pages/HistoricSites/WashingtonHeritageRegister.htm
- Washington State GIS site – https://fortress.wa.gov/dahp/wisaard/
- National Historic Register – http://www.nps.gov/nr/

Presence of habitat corridors and distance to the corridor

Habitat corridor and wetlands GIS data from the city will be used to determine the proximity of each transit corridor to sensitive environmental features. Transit corridors will be ranked low, medium, or high for potential to impact environmental features or their associated buffers.

Presence of parks and distance to the corridor

GIS data from the city will be used to determine area of park facilities that exist within ¼ mile of each corridor. The analysis team will discuss with the city potential "informal" parks or other locations that are used as parks in addition to parks identified in the GIS data layer. Both data sources will be used to determine whether any corridor may trigger Section 4(f) protection.

Presence of sensitive noise receptors and distance to the corridor

GIS data, Google Maps, and internet search engines will be used to determine whether sensitive noise receptors are present within 350 feet of each corridor. Noise-sensitive land uses include:

- Schools
- Churches
- Youth centers
- Apartment buildings/residences

- Libraries
- Theaters
- Cemeteries
- Hotels and motels
- Daycare centers
- Medical offices
- Parks and other recreational facilities
- Museums

Noise-sensitive land uses within 350 feet of each corridor centerline will be categorized according to relative sensitivity using the following FTA methodology:

- Category 1: Land where quiet is an essential element for the intended purpose. Includes land set aside for serenity and quiet, land uses such as outdoor amphitheaters and concert pavilions, and National Historic Landmarks with significant outdoor use. Recording studios and concert halls are also sensitive.
- Category 2: Residences and buildings where people normally sleep. Includes homes, hospitals, and hotels where nighttime sensitivity is assumed to be of utmost importance.
- Category 3: Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, theaters, and churches where it is important to avoid interference with activities such as speech, meditation, and concentration on reading material. Also includes places for meditation or study associated with cemeteries, monuments, museums, campgrounds, and recreational facilities. Certain historical sites and parks are also included.

Each corridor will be ranked low, medium, or high for overall potential to impact noise-sensitive receptors.

Potential to cause visual impacts

The analysis team will conduct a qualitative assessment of the potential visual impacts of high capacity transit on each corridor. The impacts of each mode will be determined using United States Department of Transportation (USDOT) visual impact assessment methodology. The analysis team will assess the defining aesthetic characteristics of each corridor, including important views, natural landscape features, historic structures, etc. and the potential for high capacity transit to have visual impacts on each corridor. Each corridor will be analyzed to assess the potential for high capacity transit to detract from, improve, or have minimal effect on the visual integrity of each transit corridor.

Evaluation Criteria for Modes

Potential to cause noise and vibration impacts

The analysis team will review available literature to qualitatively assess noise and vibration generated by each mode.

Potential to cause visual impacts

The analysis team will conduct a qualitative assessment of the potential visual impacts on each corridor. The impacts of each mode will be determined using Federal Highway Administration (FHWA) visual impact assessment methodology as follows:

- The analysis team will describe the major physical features of each mode and its associated infrastructure, and the aesthetics of each mode will be assessed.
- Each transit corridor will be reviewed to identify view corridors, historic structures, and natural landscape features important to the visual integrity of the transit corridor.
- The analysis team will qualitatively assess the potential for each mode to detract from, improve, or have minimal effect on the visual integrity of each transit corridor.

Objective 5B: Develop in ways that are consistent with Sound Transit's Sustainability Plan, the City of Tacoma's Climate Action Plan, and the City of Tacoma's Comprehensive Plan.

Evaluation Criteria for Corridors

Consistency with Sound Transit's Sustainability Plan

The analysis team will review the Sustainability Plan's goals and objectives and qualitatively assess each corridor with respect to the following two "Action Areas" and corresponding objectives:

- Action Area #1 - Ridership: Increase the availability and use of regional transit.
  - Provide safe, secure and reliable transportation choices
  - Support healthy, diverse, transit-oriented communities.
  - Increase community support for transit investments and services.
- Action Area # 2 – Conservation: Promote environmental stewardship by conserving natural resources. Reduce energy use, greenhouse gas emissions and air pollution
  - Protect natural habitats and conserve water resources.
  - Reduce materials consumption and increase recycling and environmentally preferable procurement.

Each corridor will be evaluated to determine whether it is consistent with these Action Areas and objectives.

Consistency with City of Tacoma's Climate Action Plan

The analysis team will conduct a qualitative review of the Climate Action Plan's goals and objectives and assess whether each corridor is consistent with following plan goals:

- By 2020, reduce Tacoma's greenhouse gas emissions to 40% below 1990 levels.
- By 2050, reduce Tacoma's greenhouse gas emissions to 80% below 1990 levels.

Each corridor will be evaluated based on its potential for greenhouse gas emission reductions based on potential ridership.

Consistency with City of Tacoma's Comprehensive Plan

Each mode will be qualitatively assessed to determine consistency with goals and policies of the Comprehensive Plan with respect to the following relevant Plan Elements:

- Element 2: Growth Strategy and Development Concepts
- Element 5: Capital Facilities
- Element 7: Transportation
- Element 8: Environmental Policy
- Element 11: Historic Preservation
- Element 13: Neighborhood
- Element 14: Downtown
- Element 16: Economic Development Plan
- Element 22: MLK Jr. Way Design Plan
- Element 25: Sixth Avenue Design Plan
- Element 26: South 38th Street Design Plan

Each corridor will be evaluated to determine whether it is consistent with the goal statements in each applicable Plan Element and whether it is consistent or not consistent with corresponding policies.

Evaluation Criteria for Modes

Consistency with Sound Transit's Sustainability Plan

Each mode will be qualitatively assessed to determine consistency with goals and objectives of the Sustainability Plan. Each mode will be assessed for consistency with the following two "Action Areas" and corresponding objectives:

- Action Area #1 - Ridership: Increase the availability and use of regional transit.
  - Provide safe, secure and reliable transportation choices
  - Support healthy, diverse, transit-oriented communities.
  - Increase community support for transit investments and services.
- Action Area # 2 – Conservation: Promote environmental stewardship by conserving natural resources.
  - Reduce energy use, greenhouse gas emissions and air pollution
  - Protect natural habitats and conserve water resources.
  - Reduce materials consumption and increase recycling and environmentally preferable procurement.

Each mode will be evaluated to determine whether it is consistent with these Action Areas and objectives.

Consistency with City of Tacoma's Climate Action Plan

Each mode will be qualitatively assessed to determine consistency with goals and objectives of the Climate Action Plan. The analysis team will conduct a qualitative review of the Climate Action Plan's goals and assess whether each corridor is consistent with the following goals of the plan:

- By 2020, reduce Tacoma's greenhouse gas emissions to 40% below 1990 levels.
- By 2050, reduce Tacoma's greenhouse gas emissions to 80% below 1990 levels.

Each mode will be evaluated based on its potential for greenhouse gas emission reductions.

Consistency with City of Tacoma's Comprehensive Plan

Each mode will be qualitatively assessed to determine consistency with goals and policies of the Comprehensive Plan with respect to the following relevant Plan Elements:

- Element 5: Capital Facilities
- Element 7: Transportation
- Element 8: Environmental Policy
- Element 11: Historic Preservation
- Element 16: Economic Development Plan
- Element 22: MLK Jr. Way Design Plan
- Element 25: Sixth Avenue Design Plan
- Element 26: South 38th Street Design Plan

Each mode will be evaluated to determine whether it is consistent with the overall goal statement in each Plan Element and whether it is consistent with the policies of each Element.

Goal 6: Establish a project that is competitive for federal funding.

Objective 6A: Develop a cost-effective corridor.

Measure: Affordability

An order-of-magnitude cost estimate based on national and local historical streetcar construction data will be developed for each corridor. The estimates will include civil construction, utilities, structures, stations, traction power and communication systems, right-of-way, professional services, and contingencies.

Evaluation Criteria for Corridors

Each corridor will be reviewed and compared for:

- Cost
- Constructability
- Utility relocation
- Potential for new structures
- Modifications to existing structures
- Potential traffic improvements/impacts
- Potential traffic signal upgrades
- Parking impacts

Additional data requirements: Field visits to each corridor will be performed to assess existing conditions, and data gathered will be used to further develop the corridor comparisons.

Measure: Availability of Funding

This measure will evaluate the potential for funding sources to match ST2 funding. The measures are identical for both corridor and mode.

Evaluation Criteria for Corridors/Modes

Each corridor/mode will be qualitatively evaluated for its competitiveness for FTA Small Starts grants and for potential for local funding alternatives, such as local improvements districts.

Competiveness for Federal Small Starts grants

Competiveness for Small Starts grants will be evaluated using the following questions:

1) Is the project cost less than $250 million?
2) Could the corridor have a fixed guideway for at least 50 percent of the project length in the peak period?
3) Could the corridor and mode be designed and operated to have some or all of the following:
    - Substantial Transit Stations?
    - Signal Priority/Pre-emption (for Bus/LRT)?
    - Low Floor / Level Boarding Vehicles?
    - Special Branding of Service?
    - Frequent Service - 10 min peak/15 min off peak?
    - Service offered at least 14 hours per day?

To qualify for a Small Starts Grant, each corridor or mode must answer “yes” to either questions #1 and #2 or questions #1 and #3

In addition, each corridor will be evaluated for the quantity, type and density of existing development and the quantity of existing employment and residents.

Local Funding Alternatives

The measures in Objectives 4A, 4B and 4C will be used to evaluate the potential for a local improvement district. Other potential funding sources will be discussed qualitatively with the city based on potential for future development in each corridor.

Document A4: Tacoma Link Evaluation Results: Revised to Include Hybrid Corridors *(April 4, 2013)*

TECHNICAL MEMORANDUM

Tacoma Link Evaluation Results: Revised to Include Hybrid Corridors

PREPARED FOR: Tacoma City Council and Tacoma Link Alternatives Analysis Stakeholder Roundtable

PREPARED BY: Val Batey, Sound Transit

DATE: April 4, 2013

This document provides results of the technical evaluation of the six corridors advanced for detailed evaluation, two hybrid corridors, and two modes for the Tacoma Link Expansion. Each corridor, hybrid corridor, and mode has been evaluated based on its ability to fulfill the six goals of the project and their corresponding objectives. The corridors and hybrid corridors evaluated in this report are listed in Table 1 below. Maps of all of the corridors can be found in the document titled *Tacoma Link Expansion AA: Screening Report*, dated December 5, 2012.

Table 1: Corridors Evaluated

Corridor	Description
B1 North end Central	Extends north from 9th/Theater District Station via Stadium Way; continues northwest and west via North E Street, North 1st Street, and Division Avenue, and continues southwest and west via Division Avenue to South 6th Avenue to Alder/Cedar Streets.
C1 Eastside	Extends east from Tacoma Dome Station on 25th Street and south towards Salishan along Portland Avenue to 72nd Street Transit Center.
D4 South end via Portland and 48th	Extends from South 25th Street Station south via Portland Avenue, and continues west on 48th Street to Tacoma Mall Boulevard.
E1 North Downtown Central	Extends north from the 9th/Theater District Station via Stadium Way; continues northwest and west via North E Street, North First Street, and Division Avenue, and continues south on Martin Luther King Jr. (MLK) Way to South 19th Street.
E2 North Downtown Central Loop	Extends north from the 9th/Theater District Station via Stadium Way; continues northwest and west via North E Street, North First Street, and Division Avenue, and continues south on MLK Way to South 19th Street. At South 19th St, heads east to J Street to 27th Street, then continues east on Jefferson Avenue to connect back to Tacoma Dome Station.
G1 Pacific Highway	Extends east from the Tacoma Dome Station to Pacific Highway South to Fife, at 54th Avenue East.
H1 Hybrid with South Connection to MLK Way	Beginning at existing 25th Avenue station, travels east on 25th Avenue then north along MLK Way to 6th Ave Beginning at the Tacoma Dome Station, west along 25th Avenue to Pacific Avenue then south to Portland and 29th
H2 Hybrid with North Connection to MLK Way	Beginning at existing Theater District station, travels north along Stadium Way, west along Division Ave, then south along MLK Way to 19th St. Beginning at the Tacoma Dome Station, west along 25th Avenue to Pacific Avenue then south to Portland and 29th Avenue

This document also analyzes two modes for their ability to fulfill the goals and objectives of the project. The modes analyzed include light rail transit (LRT) and bus rapid transit (BRT). For the purposes of this project, LRT and BRT are defined as follows:

- **LRT** is defined as a continuation of the existing technology used for the currently-operating Tacoma Link system. The expansion is assumed to operate in a shared lane with traffic.
- **BRT** is defined as a rubber-tired vehicle that would operate in a shared lane with traffic, would serve substantial transit stations, would have distinctive branding, low-floor boarding, and transit signal priority.

Goal 1: Improve mobility and transportation access for Tacoma residents and visitors

The objectives for this goal include 1a: improving access to the regional transit system, 1b: improving transit connections between Tacoma neighborhoods and downtown, and 1c: connecting to major regional destinations and activity centers via transit.

Corridor Results

Objective	1a	1b	1c
Measure:	**Travel Time to Tacoma Dome**	**Travel Time to Downtown Tacoma**	**Number of Major Regional Destinations Served**
B1	High - There is a high travel time savings (2-3 min. per mile) to Tacoma Dome compared to existing transit	Medium - There is a medium travel time savings (under 1 min. per mile) to Downtown Tacoma compared to existing transit	Medium - Serves the Downtown Tacoma Regional Growth Center
C1	Medium - There is medium-low travel time savings (within 1 min. per mile) to Tacoma Dome compared to existing transit	High - There is a high travel time savings (2-3 min. per mile) to Downtown Tacoma compared to existing transit	Medium - the Downtown Tacoma Regional Growth Center
D4	Low – High capacity transit in this corridor is expected to take longer to reach the Tacoma Dome than existing transit	Low – High capacity transit in this corridor is expected to take longer to reach Downtown Tacoma compared to existing transit	High - Serves the Downtown Tacoma Regional Growth Center and the Tacoma Mall Regional Growth Center
E1	High - There is a high travel time savings (2-3 min. per mile) to Tacoma Dome compared to existing transit	Medium - There is a medium travel time savings (under 1 min. per mile) to Downtown Tacoma compared to existing transit	Medium - the Downtown Tacoma Regional Growth Center
E2	High – This corridor has the highest travel time savings (greater than 3 min. per mile) to Tacoma Dome compared to existing transit	Low – High capacity transit in this corridor is expected to take longer to reach Downtown Tacoma compared to existing transit	Medium - the Downtown Tacoma Regional Growth Center
G1	Low – High capacity transit in this corridor is expected to take longer to reach Tacoma Dome than existing transit	Medium - There is a medium travel time savings (under 1 min. per mile) to Downtown Tacoma compared to existing transit	Medium - the Downtown Tacoma Regional Growth Center
H1	High – This corridor has the highest travel time savings (greater than 3 min. per mile) to Tacoma Dome compared to existing transit	Low – High capacity transit in this corridor is expected to take longer to reach Downtown Tacoma compared to existing transit	Medium - the Downtown Tacoma Regional Growth Center
H2	Medium - There is medium-low travel time savings (within 1 min. per mile) to Tacoma Dome compared to existing transit	Low – High capacity transit in this corridor is expected to take longer to reach Downtown Tacoma compared to existing transit	Medium - the Downtown Tacoma Regional Growth Center

Corridors B1, E1, E2, and both hybrid corridors save travel time to the Tacoma Dome. Corridor C1 has moderate potential travel time savings to the Tacoma Dome, but high travel time savings to Downtown Tacoma. Corridors D4 and E2 do not improve travel time to downtown, and may actually take longer than existing service. Corridor E1 saves between 2 and 3 minutes per mile to the Tacoma Dome, and up to 1 minute per mile to downtown. Corridor E2 saves the most amount of time to the Tacoma Dome, but takes longer than existing transit to reach downtown Tacoma. Both hybrid corridors would take longer to reach downtown Tacoma than existing service. Most corridors serve an average number of regional destinations and activity centers, though D4 serves the most and G1 serves the least.

Mode Results

Objective	1a
Measure:	**Number of transfers needed to reach Tacoma Dome Station**
BRT	BRT would require one transfer for corridors B1, E1, and E2, and no transfers would be required for G1, C1, and D4.
LRT	No transfers would be required

Goal 2: Increase Transit ridership within the City of Tacoma

Objectives for Goal 2 include 2a: reducing vehicle miles traveled (VMT) within Tacoma and 2b: improving quality of transit service in the City by increasing connections to multimodal facilities in the Tacoma Mobility Master Plan.

Corridor Results

Objective	2a	2b	2b
Measure:	**Travel Market Assessment/Likely Ridership Response**	**Number of Connections to Major Bicycle and Pedestrian Facilities**	**Reliability**
B1	High - This corridor has a high potential to attract riders	High - This corridor has a high number of pedestrian and bicycle connections	High – corridor will have around 30% improvement compared to existing bus reliability
C1	Low - This corridor has a low potential to attract riders	Low - This corridor has a low number of pedestrian and bicycle connections	High – corridor will have greater than 30% improvement compared to existing bus reliability
D4	Medium - This corridor has a medium potential to attract riders	Medium - This corridor has a medium number of pedestrian and bicycle connections	Low – the corridor will be similar to existing bus reliability
E1	High - This corridor has a high potential to attract riders	High - This corridor has a high number of pedestrian and bicycle connections	Medium –corridor will be slightly better (10%) than existing bus reliability
E2	High - This corridor has a high potential to attract riders	High - This corridor has a high number of pedestrian and bicycle connections	Medium –corridor will be slightly better (10%) than existing bus reliability
G1	Low - This corridor has a very low potential to attract riders	Low - This corridor has a low number of pedestrian and bicycle connections	Medium –corridor will be slightly better (10%) than existing bus reliability
H1	High - This corridor has a high potential to attract riders	High - This corridor has a high number of pedestrian and bicycle connections	High – corridor will have greater than 30% improvement compared to existing bus reliability
H2	High - This corridor has a high potential to attract riders	High - This corridor has a high number of pedestrian and bicycle connections	High – corridor will have greater than 30% improvement compared to existing bus reliability

Corridor B1 is likely to attract riders and has a high number of pedestrian and bicycle connections, while corridor C1 has a lower potential to attract riders and few pedestrian and bicycle connections. Corridor D4 is moderate for both attractiveness to riders and pedestrian and bicycle connections. Both E1 and E2 have a high potential to attract riders, and both E1 and E2 have a high number of pedestrian and bicycle connections. G1 is not likely to attract a high number of riders and has few pedestrian and bicycle connections. Both hybrid corridors have a high potential to attract riders, have a high number of pedestrian and bicycle connections, and would have greater than 30% improvement in travel time reliability compared to existing transit service.

There are no mode differentiators for this goal – BRT and LRT would operate the same.

Goal 3: Serve underserved neighborhoods and communities in the City of Tacoma

Objectives for Goal 3 include 3a: serving areas that historically have received proportionately fewer infrastructure investments, and 3b: serving areas that are ethnically and economically diverse.

Corridor Results

Objective	3a	3b
Measure:	**Serve areas that historically have received proportionally fewer infrastructure investments**	**Serve areas that are ethnically and economically diverse. (Information provided to identify the concentrations as a whole - minority, low-income, and transit-dependent).**
B1	Medium - This area has seen a moderate amount of infrastructure investment including existing and proposed local transit routes and pedestrian and bicycle improvements.	Medium – 25.9% minority, 23.2% low-income, 18.8% HH with no vehicle
C1	High –There have been relatively few infrastructure investments in this area – few local transit and pedestrian and/or bicycle improvements.	High – 68% minority, 23.0% low-income, 7.9% HH with no vehicle
D4	High - There have been relatively few infrastructure investments in this area – few local transit or improved bicycle or pedestrian facilities, although there is a direct connection to Tacoma Dome Station	Medium – 49% minority, 18.8% low-income, 7.9% HH with no vehicle
E1	Low – This area has received a high number of infrastructure investments with a large number of local bus routes, pedestrian and bicycle improvements.	High – 41.3% minority, 34.9% low-income, 24.2% HH with no vehicle
E2	Low – This area has received a high number of infrastructure investments with a large number of local bus routes, pedestrian and bicycle improvements.	High – 43.8% minority, 31.4% low-income, 24.2% HH with no vehicle
G1	High - There have been relatively few infrastructure investments in this area – few local transit or improved bicycle or pedestrian facilities, although there is a direct connection to Tacoma Dome Station	Low – 55.2% minority, 10.2% low-income, 1.9% HH with no vehicle
H1	Low – This area has received a high number of infrastructure investments with a large number of local bus routes, pedestrian and bicycle improvements.	High – 56.6% minority, 28.8% low-income, 18.1% HH with no vehicle
H2	Low - This area has received a high number of infrastructure investments with a large number of local bus routes, pedestrian and bicycle improvements.	High– 44.3% minority, 31.9% low-income, 23.6% HH with no vehicle.

Corridors C1, D4, and G1 have received fewer infrastructure investments than B1, E1, E2, and both hybrid corridors. The downtown E1 and E2 corridors and the two hybrid corridors have seen the most infrastructure investments of all of the corridors. C1, E1, E2, and the two hybrid corridors have relatively high minority populations, the highest low-income populations, and the highest number of census tracts with no access to vehicles. The combined information from these indicators shows that these corridors would serve ethnically and economically diverse areas. Corridor B1 has moderate concentrations of minority, low-income, and households with no vehicles, while D4 and G1 have the lowest concentrations.

There were no mode evaluation criteria for this goal.

Goal 4: Use transit to spur economic development and other types of investments

Goal 4 objectives include 4a: connecting to areas and neighborhoods that have the potential to develop transit-oriented development, high-density development, or concentrations of employment; 4b: attracting and retaining businesses in Tacoma through development of a high-quality transit system, 4c: enhancing existing investments and leverage pending investments in downtown, and 4d: attracting visitors and new residents to downtown and the mixed use centers.

Corridor Results

Objective Measure:	4a Amount of vacant land within 1/4 mile of the corridor centerline that could potentially be developed	4a Ratio of building value to land value to determine developed but "underutilized" parcels.	4a Presence of zoning that supports TOD, high-density development, or concentration of employment	4b Number of parcels zoned for commercial within 1/4 mile of the corridor centerline	4d Likely ridership response[1] – same results as objective 2a	4d Ease of connection to downtown and mixed use centers
B1	Low - 8% of total land is vacant	Low - 25% of parcels have a ratio of building to land value below 150%	High- Adjacent to a mixed-use or high density zoning (except for the historic area) throughout	Medium - 13% commercial parcels	High	High - Connects 6th Avenue and Pine Street MUC and downtown, passing through Stadium MUC, MLK MUC, and Downtown RGC
C1	High - 32% of total land is vacant	High - 50% of parcels have a ratio of building to land value below 150%	Low - Mostly industrial and low-density residential. The Hope VI development has very little commercial, and the mixed-use zoning are isolated pockets	High - 20% commercial parcels	Low	Medium - Connects Downtown RGC and Lower Portland Ave MUC
D4	Medium - 17% of total land is vacant	Low - 29% of parcels have a ratio of building to total land value below 150%	Low - Mostly low-density residential with detached, single-family homes. Some segments are along neighborhood streets not appropriate for TOD. There are isolated pockets of mixed-use zoning.	Low - 7% commercial parcels	Medium	Low - Connects to Downtown, lower Portland Ave MUC, McKinley MUC, and 24th and Pacific MUC, and the Tacoma Mall RGC, the connection is circuitous and travel times will be long
E1	Low - 14% of total land is vacant	Medium - 33% of parcels have a ratio of building to total land value below 150%	High - Every section is adjacent to mixed-use or high-density areas. Redevelopment at both hospital sites could increase employment	Medium - 14% commercial	High	High - Connects Downtown RGC, Stadium MUC, and MLK MUC
E2	Medium - 15% of total land is vacant	Medium - 40% of parcels have a ratio of building to total land value below 150%	Medium - Similar to E1, though the southern section is near downtown residential and some mixed-use zones, but there are also some R2 areas not as conducive to TOD	Medium - 11% commercial	High	High - Connects Downtown RGC, Stadium MUC, and MLK MUC
G1	High - 42% of total land is vacant	High - 82% of parcels have a ratio of building to total land value below 150%	Low - Large lot commercial and industrial, though the planned city center redevelopment may support higher density development and increased employment	High - 46% commercial	Low	Low - Connects downtown and the future planned Fife Town Center which includes general mixed-use, neighborhood commercial and special retail/TOD. The Fife town center straddles I-5 and may not be as accessible.
H1	Medium – 26% of total land is vacant	Medium -45% of parcels have a ratio of building to total land value below 150%	Medium – Most of the alignment is adjacent to Hospital Mixed Use, Neighborhood Commercial Mixed Use, Residential Commercial Mixed Use, though there are segments with Residential and Industrial zoning that are not as supportive for TOD.	High – 23% commercial	Medium	Medium – Connects the Martin Luther King MUC, the Downtown RGC, and the Lower Portland Avenue MUC

[1] Likely ridership response is determined through combining census data on: 1. number of households earning below $35,000 per year, 2. households with no vehicle available, 3. jobs per acre, 4. minority populations, and 5. households per acre, and is consistent with the evaluation in objective 2a with the exception of the G1 corridor, as the Fife Town Center Plan is likely to increase the likely ridership response at full build-out

Objective	4a	4a	4a	4b	4d	4d
Measure:	**Amount of vacant land within 1/4 mile of the corridor centerline that could potentially be developed**	**Ratio of building value to land value to determine developed but "underutilized" parcels.**	**Presence of zoning that supports TOD, high-density development, or concentration of employment**	**Number of parcels zoned for commercial within 1/4 mile of the corridor centerline**	**Likely ridership response[1] – same results as objective 2a**	**Ease of connection to downtown and mixed use centers**
H2	Medium – 25 % of total land is vacant	Medium – 39% of parcels have a ratio of building to total land value below 150%	Medium – Most of the alignment is adjacent to Hospital Mixed Use, Neighborhood Commercial Mixed Use, Residential Commercial Mixed Use, though there are segments with Residential and Industrial zoning that are not as supportive for TOD.	High – 32% commercial	Medium	Medium – Connects the Martin Luther King MUC, the Downtown RGC, and the Lower Portland Avenue MUC

Both B1 and E1 corridors have low amounts of vacant land to be developed, and B1 has few parcels with a building to land value below 150%, meaning there are fewer parcels likely to be redeveloped. E1 has a moderate amount of parcels with the building to land value ratio below 150%. Corridors D4 and E2 have low to moderate amounts of land available for development or redevelopment, while corridor C1 has large amounts of vacant land, with a number of parcels with building to land value ratio below 150%. Corridor G1 has the most amount of vacant land and the most parcels with low ratio of building to land value. There is a large amount of zoning that supports TOD, employment and high-densities in corridors B1 and E1, as these corridors pass through areas zoned for high density and mixed-use zoning. Corridors E2 and G1 have a moderate amount of zoning that supports TOD and high-density development. There is little supportive zoning in C1 and D4, which is characterized by small low-density residential lots and industrial parcels. The two corridors that have the most commercial zoning are C1 and G1, and Corridors B1, E1, and E2 have moderate amounts of commercial zoning. Corridor D4 has the lowest amount of commercial zoning. Likely ridership results are the same as the results from objective 2a. Corridors B1, E1, and E2 scored highest in ease of connection to downtown and mixed use centers: corridorB1 is adjacent to a large number of centers and connects directly to downtown, and corridors E1 and E2 are both within the downtown and MLK MUC and Stadium MUC. Corridor C1 provides moderate connections via a direct connection to downtown and to one mixed use center, while corridors D4 and G1 have low connectivity due to a circuitous route (corridor D4) and a lack of mixed use centers (corridor G1). While Corridor C1 scores high on vacant land and land available for redevelopment, there are few destinations and the existing urban form is unlikely to encourage economic development or spur investment. It is a corridor sandwiched between I-5 and the Port of Tacoma characterized by large lots, warehousing, and trucking businesses. None of these conditions lend themselves to potential investment or economic development. The two hybrid corridors fare similarly in the analysis for this goal; the Hybrid with South Connection to MLK has slightly more vacant parcels than the Hybrid with North Connection to MLK, but the Hybrid with North Connection to MLK has more commercial land within ¼ mile of its alignment.

Mode Results

Objective	4c	4d
Measure:	Qualitative assessment of the potential to spur private investment	Ease of connection to downtown and mixed use centers
BRT	Low – infrastructure is not as permanent	Low – would require a transfer from a bus to the existing Tacoma Link vehicle
LRT	High – more permanent, studies show increased investment along corridors	High – would be a “one-seat ride” linking to existing Tacoma Link alignment

Bus transit is less likely to spur private investment because investors are likely to perceive buses as less permanent and the routes could change fairly easily. With rail transit, investment is more assured due to the permanence of rails embedded in the road. Comparison studies indicate that rail is more likely to increase property values near stations and serve as a catalyst for higher-density development patterns. For ease of connection to downtown, BRT would require a transfer between the existing Tacoma Link alignment and the bus vehicle, while rail would be a “one-seat ride” for the connection into downtown.

Goal 5: Ensure that the project is environmentally sensitive and sustainable

Goal 5 objectives include 5a: avoiding major environmental constraints and 5b: developing in ways that are consistent with Sound Transit's Sustainability Plan, the City of Tacoma's Climate Action Plan, and the City of Tacoma's Comprehensive Plan.

Corridor Results

Objective	5a	5a	5a	5a	5a	5b	5b	5b	5b
Measure:	**Presence of historic districts and distance to the corridor**	**Presence of habitat corridors and distance to the corridor**	**Presence of parks and distance to the corridor**	**Presence of sensitive noise receptors and distance to the corridor**	**Potential to avoid visual impacts**	**Consistency with Sound Transit's Sustainability Plan**	**Consistency with City of Tacoma's Climate Action Plan**	**Consistency with City of Tacoma's Comprehensive Plan**	**Consistency with UW Tacoma's Master Plan**
B1	Low - ~70 registered historic properties are immediately adjacent to or within ¼ mile.	High – minimal impacts. Passes near designated habitat corridor and within 75' of delineated wetland.	Medium - adjacent to Wright Park, could trigger 4f or other review.	Medium - adjacent to many Category 2 and 3 sensitive noise receptors: medical offices, hospitals, and multi-family housing.	High - Minimal effect	High - All corridors are consistent.	High - consistent with relevant goals and policies	High - consistent with relevant Plan Elements, goals and policies.	N/A
C1	High - one historic property is located within 1/4 mile.	Medium - passes through designated habitat corridors and within 50' of known wetlands.	Medium - adjacent to Portland Avenue Park and within 1/4 miles of Rogers Park. Could trigger 4f or other review.	High -adjacent to a few Category 2 and 3 sensitive noise receptors: several churches, two hotels and several multifamily housing complexes.	High - Minimal effect	High - All corridors are consistent.	High - consistent with relevant goals and policies	High - consistent with relevant Plan Elements, goals and policies.	N/A
D4	High - five registered historic properties are located within 1/4 mile. One property is on the National Historic Register.	Medium- passes through designated habitat corridors and within 50' of known wetlands.	Medium - adjacent to Portland Avenue Park and is within 1/4 miles of Rogers Park. Could trigger 4f or other review.	High -adjacent to some Category 2 and 3 sensitive noise receptors; several churches, four schools, and several multifamily housing complexes.	Medium-Potential to detract	High - All corridors are consistent.	High - consistent with relevant goals and policies	High - consistent with relevant Plan Elements, goals and policies.	N/A
E1	Low - ~ 84 historic properties are located immediately adjacent to or within 1/4 mile.	High - minimal impacts. Passes near designated habitat corridor and within 75' of delineated wetland.	Medium - adjacent to Wright Park and People's Park. Could trigger 4f or other review.	Low - passes within 350' of one Category 1 noise receptor, many Category 2 and 3 receptors; many multifamily housing units, churches, medical offices and funeral services, and a high school.	High - Minimal effect	High - All corridors are consistent.	High - consistent with relevant goals and policies	High - consistent with relevant Plan Elements, goals and policies.	N/A
E2	Low - passes through three historic districts, including the union station historic conservation district. ~100 historic properties within ¼ mile.	High - minimal impacts. Passes near designated habitat corridor and within 75' of delineated wetland.	Medium - adjacent to Wright Park and People's Park. Could trigger 4f or other review.	Low - passes within 350' of one Category 1 noise receptor (Broadway Center for the Performing Arts), many Category 2 and 3 receptors; many multifamily housing units, several churches, medical offices, several schools and colleges.	Medium-Potential to detract	High - All corridors are consistent.	High - consistent with relevant goals and policies	High - consistent with relevant Plan Elements, goals and policies.	Low - Inconsistent. Route conflict at Jefferson Street.
G1	High - adjacent to one historic property.	Medium - crosses the Puyallup River and its associated wetlands and habitat corridor.	Low - No park facilities within 1/4 mile	High - adjacent to several Category 2 noise receptors; a few multifamily units and ~12 hotels.	High - Minimal effect	High - All corridors are consistent.	High - consistent with relevant goals and policies	High - consistent with relevant Plan Elements, goals and policies.	N/A

H1	Low - passes through three historic districts, including the union station historic conservation district. ~30 historic properties within ¼ mile.	High - minimal impacts. Passes near designated habitat corridor and within 75' of delineated wetland.	Medium - adjacent to Wright Park and People's Park. Could trigger 4f or other review.	Medium - adjacent to many Category 2 and 3 sensitive noise receptors: medical offices, hospitals, and multi-family housing.	Medium-Potential to detract	High - All corridors are consistent.	High - consistent with relevant goals and policies	High - consistent with relevant Plan Elements, goals and policies.	N/A (assuming alignment avoids UW campus)
H2	Low - ~ 84 historic properties are located immediately adjacent to or within 1/4 mile.	High - minimal impacts. Passes near designated habitat corridor and within 75' of delineated wetland.	Medium - adjacent to Wright Park and People's Park. Could trigger 4f or other review.	Low - passes within 350' of one Category 1 noise receptor (Broadway Center for the Performing Arts), many Category 2 and 3 receptors; many multifamily housing units, several churches, medical offices, several schools and colleges.	High - Minimal effect	High - All corridors are consistent.	High - consistent with relevant goals and policies	High - consistent with relevant Plan Elements, goals and policies.	N/A

Corridors B1, E1, E2, and the two hybrid corridors are near historic districts and registered historic properties. Corridors B1 and E2 are near Historic Special Review Districts and E1 is near a number of registered historic properties. The other corridors, C1, D4, and G1 are likely to have few historic impacts do to the limited number of historic properties nearby. There are few habitat corridors present; only C1, D4, and G1 pass through habitat corridors or near wetlands. B1, E1, and E2 and the two hybrid corridors are within 75 feet of designated wetlands, but do not pass through a habitat or wetland. All corridors except for G1 are adjacent to parks and could have moderate impacts to park lands. Corridors C1, D4, and G1 are likely to have few impacts to sensitive noise receptors, and are rated low – mostly impacts are to Category 2 and 3 receptors including multifamily housing units, churches, and hotels. The corridors with the highest likely noise receptors are E1, E2, and the hybrid with south connection to MLK, with a one category 1 noise receptor and other receptors including medical offices, schools, and colleges. B1 has moderate potential noise impacts, with many Category 2 and 3 noise receptors. Corridors B1, C1, E1, and G1 will have minimal effects to visual resources, while D4 and E2 have a potential to detract from viewsheds associated with these corridors. All of the corridors are consistent with the three applicable plans: Sound Transit's Sustainability Plan, City of Tacoma's Climate Action Plan, and the City of Tacoma's Comprehensive Plan. Only corridor E2 conflicts with the University of Washington Tacoma Master Plan.

Mode Results

Objective	**5a**	**5a**	**5b**	**5b**	**5b**
Measure:	**Potential to avoid noise and vibration impacts**	**Potential to avoid visual impacts**	**Consistency with Sound Transit's Sustainability Plan**	**Consistency with City of Tacoma's Climate Action Plan**	**Consistency with City of Tacoma's Comprehensive Plan**
BRT	Diesel buses generate more noise than electric-drive rail systems. Buses generally generate minor vibration impacts.	Bus systems have low potential for negative visual impacts. Bus stops or stations may generate some visual impact. Overall, bus transit has less visual impact than does rail transit. Bus rapid transit may have similar visual impacts as light rail, depending on design.	BRT is consistent with the relevant goals and policies	BRT is consistent with the relevant goals and policies	BRT is consistent with relevant elements, goals and policies
LRT	Electric-drive rail systems produce slightly less noise than diesel buses, but noise impacts are dependent on vehicle speed. Vibration impacts from rail systems are higher than bus transit.	Overhead catenary lines, station infrastructure and elevated guideway structures are primary visual impacts of rail. Street aesthetics may be improved by reducing street clutter, improving landscaping, lighting, etc. Catenary lines and other structures can affect views, shadows, and lighting and may have visual impacts when constructed close to buildings.	LRT is consistent with the relevant goals and policies	LRT is consistent with the relevant goals and policies	LRT is consistent with relevant elements, goals and policies

Buses are likely to generate more noise, but create fewer vibrations compared to rail vehicles. While bus transit has fewer visual impacts, stops and other infrastructure may clutter the streetscape. Rail vehicles may have visual impacts with catenary lines that can affect views, shadows, and lighting. Both bus and rail modes are consistent with the applicable City and Sound Transit plans.

Goal 6: Establish a project that is competitive for federal funding

The sole objective for Goal 6 is to develop a cost effective corridor.

Corridor Results

Objective	6a	6a	6a	6a	6a
Measure:	**Affordability (Cost estimates are for LRT)**	**Availability of Federal Funding**	**Assessed Value**	**Redevelopment Potential – based on a combination of Goal 4 results**	**Potential for Local Improvement District – combination of assessed value and redevelopment**
B1	Medium – higher cost than C1 and E1 $163.4 M	Eligible – meets the criteria for Federal Small Starts Funding (less than $250 million, fixed guideway for at least 50 percent of project length, and presence of specific design elements)	High $965 million	High – high-density zoning support, moderate amount of commercial zoning, and ease of connection to downtown increases redevelopment potential.	High - high assessed value and redevelopment potential combined makes this a high potential LID corridor
C1	High – least expensive option $119.0 M	Eligible – meets the criteria	Low $206 million	Low – few redevelopable parcels, mostly residential zoning, and only small amounts of mixed-use zoning.	Low –low assessed value and low development potential make it difficult to create a successful LID
D4	Low – most expensive option $292.3 M	Not eligible – does not meet criterion 1: total project cost is over $250 million	Medium $849 million	Low – mostly low-density residential zoning, few commercial parcels, moderate amounts of vacant and redevelopable land, with sporadic small mixed-use zoning.	Medium – the third highest value corridor and a low redevelopment potential make this a moderate potential for LID
E1	High – second lowest cost option $133.9 M	Eligible – meets the criteria	Medium $790 million	High – supportive zoning with mixed-use and high-density areas, moderate amounts of commercial zoning and good connections to mixed use centers.	High – medium assessed value in the corridor and high redevelopment potential make this a high potential for LID
E2	Low – second most expensive option $249.6 M	Eligible– meets the criteria	High $1.1 billion	High - – lots of supporting zoning with mixed-use and high-density areas, and redevelopment plans for both hospitals. Moderate amounts of vacant and redevelopable lands and good connections to existing mixed use centers.	High – high assessed value corridor and high redevelopment potential make this a high potential for LID
G1	Medium – higher cost than C1, E1, and B1 $164.8 M	Eligible– meets the criteria	Low $493 million	Medium – Lots of vacant and redevelopable land, though few connections to mixed-use centers. Lots of large lot commercial and industrial plots.	Low – low assessed value corridor and moderate redevelopment potential make this a low potential for LID
H1	Low – both options more expensive than B1, E1, or C1; Delin Option $187.3M, 25th Option $199.4M	Eligible – meets the criteria	Medium $600 million	High – supportive zoning with mixed-use and high density areas, though there is less vacant land and a moderate amount of redevelopable land with good connections to existing mixed use centers.	High – medium assessed value in the corridor and high redevelopment potential make this a high potential for LID
H2	Low –both options more expensive than B1, E1, or C1; $170.9M	Eligible – meets the criteria	High $956 million	High – supportive zoning with mixed-use and high density areas, there is a moderate amount of vacant land and redevelopable land with good connections to existing mixed use centers.	High – high assessed value corridor and high redevelopment potential make this a high potential for LID

The affordability criterion is based on the cost estimates for rail vehicles on the corridors. It is likely that the bus option on the same corridors will be less expensive, but the corridors will remain in the same order from highest to lowest cost based on length and complexity of the corridor. All corridors are eligible for Small Starts Funding except D4, based on three criteria including project costs less than $250 million, fixed guideway, and specific design elements required by the program. Assessed value is based on the value of parcels within ¼ mile of the corridor for taxable parcels. Redevelopment potential is based on a combination of results from goal 4, and the potential for a Local Improvement District (LID) is based on a combination of assessed value and the redevelopment potential. Corridors B1, E1, E2, and the two hybrid corridors have the highest potential for LID, while D4 has a moderate potential for LID, and C1 and G1 have the lowest potential for LID.

Mode Results

Mode results are based on the same criteria as the corridors: availability for funding including competitiveness for Small Starts grants.

Objective	6	
Measure:	Competitiveness for Federal Small Starts	Local Funding alternatives
BRT	High – meets the three criteria for cost, fixed guideway, and design elements	Eligible
LRT	High – meets the three criteria for cost, fixed guideway, and design elements	High

Both BRT and LRT are assessed the same for competitiveness for Small Starts Funding. Local funding (ST2) only provides funding for an LRT extension, not for BRT.

Document A5: Tacoma Link Expansion: Engineering Assessment of Hybrid Corridors *(April 4, 2013)*

TECHNICAL MEMORANDUM

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Tacoma Link Expansion: Engineering Assessment of Hybrid Corridors

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DATE:	April 4, 2013

The purpose of this memorandum is to describe and provide a high-level feasibility assessment of two hybrid corridors, based on engineering opportunities and constraints, and to provide an assessment of probable capital costs for each. The hybrid corridors were presented by the Tacoma City Council to Sound Transit on March 22, 2013 and are titled:

- H1 Hybrid with South Connection to MLK Way
- H2 Hybrid with North Connection to MLK Way

Each hybrid corridor comprises elements of two corridors previously studied in the Alternatives Analysis, C1 and E1. The elements of each hybrid corridor are presented in Table 1, below. For purposes of conducting an engineering evaluation, and in response to specific requests from the Tacoma City Council, alignments were assumed for both H1 and H2.

Table 1- Description of Alternative Segments

Hybrid Corridor	Segment(s)	Segment Alignment	Segment Length (miles)	Total Length of Hybrid Corridor (miles)
H1 Hybrid with South Connection to MLK	25th to MLK and 6th Ave	Beginning at existing 25th Avenue station, travels west along 25th, southwest across a vacant lot to intersect Jefferson, west along Jefferson to Center St, north along J St, west along 19th St, and north along MLK Way to 6th Ave	2.4	3.3
	C1 to 29th St and Portland Ave	Beginning at existing Tacoma Dome station, travels east along 25th St, south along Portland Ave to 29th St	0.9	
H2 Hybrid with North Connection to MLK	E1 to MLK and 19th St.	Beginning at existing Theater District station, travels north along Stadium Way, west along Division Ave, then south along MLK Way to 19th St.	2.3	3.2
	C1 to 29th St and Portland Ave	Beginning at existing Tacoma Dome station, travels east along 25th St, south along Portland Ave to 29th St	0.9	

Each segment of the hybrid corridors was evaluated based on data and observations gathered by the project team during the AA and Pre-AA phases. The methodology and sources of information are described in the technical memorandum *Tacoma Link Extension: Engineering Considerations* prepared by HDR in August 2011.

The engineering considerations of the segments of both hybrid corridors are described in Table 2, below.

Table 2 Key Engineering Considerations of Each Segment

Segment	Key Engineering Considerations
E1 to MLK and 19th St	▪ This segment is already included in the Alternatives Analysis screening ▪ Segment is 2.3 mi if endpoint is S 19th St ▪ Segment is 1.7 mi if endpoint is S 11th St ▪ Segment is 1.4 mi if endpoint is S 6th St
C1 to 29th St and Portland	▪ This segment is already included in the Alternatives Analysis screening, however for the Hybrid corridors, it is truncated at 29th St.

Segment	Key Engineering Considerations
Ave	
25th to MLK and 6th Ave	▪ On 25th Ave, the alignment climbs a 9% grade west on 25th St from Pacific Ave to S Hood St. The existing grade is in excess of 14%.This requires the track to be grade-separated from the roadway, in a trench. The trench would be 20' feet deep at S Hood St, and if placed in the center of the street would act as a median. ▪ Traffic access to 25th St between Pacific and Hood would have right-turn-in and right-turn-out access, due to the median trackway trench. ▪ At Hood Street, the alignment turns southwesterly across a vacant lot, climbing at 9% to reach Jefferson Ave. ▪ The alignment continues along Jefferson Ave/Center St to S J St, then S 19th St to MLK Way. ▪ Segment is 1.5 mi if endpoint is S 19th St ▪ Segment is 2.1 mi if endpoint is S 11th St ▪ Segment is 2.4 mi if endpoint is S 6th St

A conceptual cost estimate for both hybrid corridors was developed using the methodology developed for the other cost estimates. This methodology is fully described the technical memorandum *Tacoma Link Extension: Cost Estimating Methodology and Opinion of Probable Capital Cost* prepared by HDR in January 2013. A summary of the opinion of probable capital cost of both hybrid corridors is presented in Table 3, below.

Table 3 - Summary of Opinion of Probable Capital Cost

	Segment	Segment Cost	Total Estimated Capital Cost (2012 Dollars)*
H1 Hybrid with South Connection to MLK	to MLK and 19th Ave	$127.4 M	• $173.0 M to 19th Ave • $206.7 M to 11th Ave • $227.4 M to 6th Ave
	to MLK and 11th Ave	$161.1 M	
	to MLK and 6th Ave	$181.8 M	
	C1 to 29th St and Portland Ave	$45.6 M	
H2 Hybrid with North Connection to MLK	E1 to MLK and 6th Ave	$79.4 M	• $125 M to 6th Ave • $145.7 M to 11th Ave • $179.5 M to 19th Ave
	E1 to MLK and 11th Ave	$100.1 M	
	E1 to MLK and 19th St	$133.9 M	
	C1 to 29th St and Portland Ave	$45.6 M	

*Capital costs are provided in 2012 dollars for comparison with existing capital costs developed for other corridors

Table 3 provides costs for three different terminus options along MLK Way – 6th Ave, 11th Ave, and 19th Ave. These termini were analyzed at the request of the City Council. The differences in the costs for construction along MLK from 6th Ave – 10th Avenue are as follows*:

- Full Segment, 19th Ave – 6th Ave = $68.7 M
- Partial Segment, 19th Ave – 11th Ave = $33.7 M
- Partial Segment, 11th Ave – 6th Ave = $14.3 M

*Capital costs are provided in 2012 dollars for comparison with capital costs developed previously for other corridors.

In conclusion, both hybrid corridors (appear to be feasible from an engineering perspective, and the estimated costs for each option would likely be within the allowable threshold for a federal Small Starts grant.