

City of Bellevue

**East Link Light Rail B7/C9T to  
NE 2nd Portal (B7 – Revised)  
Alternative**

**TM07 - LRT Ridership Memo**

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### Appendix A

Sound Transit Model – Ridership forecasts



# 1 Executive summary

This memorandum examines transit ridership forecasts prepared by Sound Transit (ST) in conjunction with the Project Team for the proposed East Link Light Rail Transit (LRT), B7-Revised alternative. Ridership forecasts are generated at the daily level. Station-level mode of access and egress person trips during the PM peak period are generated (from which parking demand is estimated and traffic impacts estimated).

Sound Transit's consultant, CH2M Hill, operated the model with input and review from the project team. The project team then interpreted these ridership results.

## Key Findings

- The B7-Revised alternative would generate 4,500 daily boardings at A-2 Station compared to 1,500 boardings at 118th Station for B7/C9T. Overall, ridership at A-2 Station would be comparable to that at B2M/C9T's South Bellevue Station with 5,500 daily boardings.
- The B7-Revised alternative would generate 2,500 daily boardings at East Main Station compared to 3,000 boardings for B7/C9T.
- When compared to B7/C9T, the B7-Revised alternative would have higher boardings in Segment B and lower boardings in Segments A and C.1
- In terms of overall project-wide ridership on East Link, 50,500 daily riders would be generated with B7-Revised compared to 49,000 with B7/C9T. These volumes would be similar to those generated with the B2M/C9T alternative (50,000 daily riders).
- The parking demand at A-2 Station, represented by the three-hour PM peak period, would be 1,437 vehicles. A facility housing 1,450 parking stalls is proposed to handle this demand – this would be 50 spaces larger than B2M/C9T's South Bellevue Station which would have a capacity of 1,400 spaces.

<sup>1</sup> According to Sound Transit, the main reasons for the lower boardings in Segments A and C would owe to: (i) riders choosing to use A-2 Station instead of Mercer Island (in Segment A); and (ii) higher transfers occurring at Bellevue Transit Center and East Main Station (both in Segment C) when the South Bellevue station is at 118<sup>th</sup> Station for B7/C9T instead of at the A-2 Station location for B7-Revised.

## 2 Background

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### 2.1 Project description

The East Link project is an extension to Sound Transit’s Link light rail system that will provide light rail service across Lake Washington, linking Seattle, Bellevue, and Redmond (Overlake).

For the segment of East Link between the Lake Washington crossing and downtown Bellevue, Sound Transit has developed the B7 alternative to a conceptual engineering level of design (approximately five percent design) as part of the Draft Environmental Impact Statement (DEIS) for the project which was issued in December 2008.

A Supplemental Draft EIS, which analyzes new alternatives developed since the DEIS, was published in November 2010. That supplemental document includes updated conceptual engineering for the Sound Transit B7 alternative and a C9T alternative that could connect B7 to a station at the Bellevue Transit Center. A Final EIS is expected in the summer of 2011.

At the September 13, 2010, Bellevue City Council Study Session, the council discussed the need for design variations and for additional analysis of revised East Link B7 and C9T alternatives. The objectives of the additional analysis would be to improve performance, to reduce impacts, and to reduce costs, as compared with the Sound Transit B7 and C9T alternatives. As a result of that discussion the council initiated the development of a modified B7 alternative (“B7-Revised”). The council directed City staff to develop an “apples-to-apples” comparison of the Sound Transit B7 and C9T alternatives with a B7-Revised alternative. ARUP were commissioned by the City to develop the B7-Revised alternative.

The B7-Revised alternative begins at the transition from East Link Segment A to Segment B at the east shore of Lake Washington and connects with a new elevated station (A-2 Station) over south Bellevue Way/I-90 ramps. The alignment continues east from the station along the north side of I-90 and turns north into the BNSF corridor with an at-grade profile. The alignment transitions to elevated as it leaves the BNSF corridor, crosses over SE 8th Street, and transitions back to at-grade prior to a new station (East Main Station) just south of Main Street on the current Red Lion Hotel site. The alignment crosses under Main Street and turns west on the current Sheraton Hotel site before entering a tunnel portal at NE 2nd Street. The B7-Revised alternative is approximately three miles long with a combination of at-grade, elevated, and open-cut sections.

### 2.2 Technical memo scope

This memo reviews transit ridership forecasts prepared by Sound Transit (ST) in conjunction with the Project Team, covering the new B7-Revised alternative, particularly the proposed A-2 Station. Results from the B7-Revised alternative are compared to ridership on the B7/C9T alternative. Ridership for 2030 conditions is

examined, including daily boardings and peak hour mode of access/egress. In addition, parking demand is also reviewed.

This technical memo should be read in conjunction with other technical memos produced for this study, in particular:

- A-2 Station Concept (TM03)
- South Bellevue Traffic Impacts (TM04)
- B7-Revised Optimization (TM13)

## 2.3 Technical memo objectives

The objectives of this technical memo are to:

- Review the LRT transit ridership forecasts prepared by the Sound Transit Model;
- Compare the forecasts for B7-Revised's A-2 Station against those for B7/C9T's 118<sup>th</sup> Station (as well as those for B2M/C9T's South Bellevue Station for a consistency check among the ridership forecasts);
- Compare the forecasts for B7-Revised's East Main Station against those for B7/C9T's East Main Station;
- Compare overall project-wide ridership (or the total number of daily riders that would use East Link) with the B7-Revised alternative versus that with the B7/C9T and B2M/C9T alternatives;
- Compare peak period mode of access and egress person trips for the A-2 and East Main stations from the B7-Revised alternative against those for 118<sup>th</sup> Street and East Main stations from the B7/C9T alternative; and
- Identify likely daily demand for the parking garage at A-2 and establish the design parking capacity for this facility.

## 2.4 Key meetings and background documents

Relevant meetings for this technical memo are noted below:

Date	Meeting	Reference (Minutes)
December 16, 2010	City of Bellevue kick-off meeting	Ref: Kick-off Minutes-Issue 2 Issue Date: (1/10/2011)
January 6, 2011	Sound Transit kick-off meeting	Ref: ST Meeting 1 Minutes (Issue 2) Issue Date: 1/20/2011
January 13, 2011	B7-Revised optimization workshop	Ref: Optimization Workshop Minutes Issue 2 Issue Date: 2/2/2011
January 28, 2011	B7-Revised Ridership Meeting 1	Ref: NA
February 8, 2011	B7-Revised Ridership Meeting 2	Ref: NA

Table 1 - Relevant meetings

Relevant documents and reports used to support the analysis included the following:

Document	Referred to in Technical Memo as:	Relevance to Technical Memo:
Central Puget Sound Regional Transit Authority (February 16, 2011). Link Light Rail – East Main Station Trip Generation. Seattle, WA: Sound Transit.	East Main Station forecasts	Provides ridership forecasts for B7-Revised's and B7/C9T's East Main Station
Central Puget Sound Regional Transit Authority (February 28, 2011). Draft – 2030 Ridership Statistics for East Link B7-Revised. Seattle, WA: Sound Transit.	B7-Revised and B7-C9T forecasts	Provides project-wide and segmental ridership forecast B7-Revised and B7-C9T alternatives.
Central Puget Sound Regional Transit Authority (February 28, 2011). Link Light Rail – 118 <sup>th</sup> Avenue SE Station Trip Generation. Seattle, WA: Sound Transit.	118 <sup>th</sup> Station forecasts	Provides ridership forecasts for B7/C9T's 118 <sup>th</sup> Station
Central Puget Sound Regional Transit Authority (February 7, 2011). Link Light Rail – South Bellevue Station Trip Generation. Seattle, WA: Sound Transit.	A-2 Station forecasts	Provides ridership forecasts for B7-Revised's A-2 Station
Central Puget Sound Regional Transit Authority (October 2007). <i>East Link Integration_2007_10_07</i> . Seattle, WA: Sound Transit	Sound Transit East Link Integration Plan	Identifies revised transit feeder services to South Bellevue station (and thus A-2 Station)
Central Puget Sound Regional Transit Authority (October 2008). <i>Sound Transit Long Range Plan ST2 Planning: Task 2.0 Methodology Development and Documentation Subtask 2.4 Transit Ridership Forecasting Technical Report</i> . Seattle, WA: Sound Transit.	ST Ridership Forecasting Report	Documents ST transit ridership modeling

Document	Referred to in Technical Memo as:	Relevance to Technical Memo:
Central Puget Sound Regional Transit Authority, Washington State Department of Transportation, and Federal Transit Administration, et al (December 2008). <i>East Link Project: Draft Environmental Impact Statement</i> . Seattle, WA: Sound Transit.	DEIS	Provides transit demand forecasts for the B7/C4A alternative and different alignments
Central Puget Sound Regional Transit Authority, Washington State Department of Transportation, and Federal Transit Administration, et al (October 2010). <i>East Link Project: Supplemental Draft Environmental Impact Statement</i> . Seattle, WA: Sound Transit.	SDEIS	Provides updated transit demand forecasts for the B7/C4A alternative as well as the B2M/C9T alternatives and different alignments.
KPF (July 2010). South Bellevue Station: Alternative Location Analysis. Bellevue, WA: City of Bellevue Transportation Department.	SBSALA	Presents original A-2 Station concept to assess and optimize

Table 2 - Relevant documents and reports

## 3 Methodology and data

The project team has been directed by Bellevue City Council to prepare an “apples-to-apples” comparison of the B7-Revised alternative with the Sound Transit Draft Environmental Impact Statement (DEIS) and Supplemental Draft Environmental Impact Statement (SDEIS) B7/C9T alternative. Such a comparison requires consistency of three elements – base data and information, key assumptions, and methodology. The following sections and tables outline the key aspects of the B7-Revised alternative, how these aspects were addressed for the Sound Transit B7/C9T alternative and whether this analysis is considered a true “apples-to-apples” comparison. Comment is made particularly for changes in approach.

### 3.1 Base data and information

B7-Revised	B7/C9T	“Apples-to-Apples”	Comment
The Sound Transit Model was run to estimate demand on the B7-Revised alternative.	A model run for B7/C9T was specifically run to provide an apples-to-apples comparison with the B7-Revised alternative.	Yes	Sound Transit Ridership model was used to forecast transit demand and mode of access trips for all alternatives for the DEIS and SDEIS.

Table 3 - Comparison with Sound Transit DEIS and SDEIS base data and information

### 3.2 Key assumptions

Key assumptions for the modeling are as follows:

B7-Revised	B7/C9T	“Apples-to-Apples”	Comment
Alignment goes through the City of Bellevue and includes two stations: A-2 Station and East Main Station	Alignment goes through the City of Bellevue and includes two stations: 118 <sup>th</sup> Station and East Main Station	Yes	Both alignments have two stations, although the A-2 and 118 <sup>th</sup> Stations are in different locations and have different sizes. The ridership comparison is apples-to-apples..
A-2 Station is located between 113 <sup>th</sup> Avenue SE and Bellevue Way SE, to the west of the I-90 ramps	118 <sup>th</sup> Station is located near the intersection of SE 8th and 118th Avenue SE	Yes	
A-2 Station has a park and ride lot	118 <sup>th</sup> Station has a park and ride lot	Yes	
East Main has no park and ride lot	East Main has no park and ride lot	Yes	

Table 4 - Comparison with Sound Transit DEIS and SDEIS key assumptions

### 3.3 Methodology

The Sound Transit Model is used to forecast ridership for the B7-Revised and the B7/C9T alternatives, as well as for all other LRT ridership modeling for the DEIS and SDEIS. Station-level, segment-level, and project-wide ridership is assessed for the B7-Revised and B7/C9T alternatives.

Parking capacity at A-2 Station is based on an analysis of the three-hour PM peak period auto access trips and the total daily ridership for B7-Revised, as has been done for other LRT alternatives. As assumed in the DEIS/SDEIS, this three-hour PM peak period is assumed to represent the daily parking demand at the A-2 Station.

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## 4 Transit ridership forecasting process

### 4.1 Project team modeling approach

The Sound Transit Model (ST Model) was previously applied to estimate transit ridership for the East Link alternatives in the DEIS and SDEIS. The ST Model is used to compare the B7/C9T with the B7-Revised alternative to maintain consistency with ridership modeling efforts on the other East Link alternatives – thereby providing an apples-to-apples comparison of ridership. The consulting firm of CH2M Hill was employed by ST to prepare and run the B7-Revised ridership forecast and to provide model outputs to the Project Team.

As noted in Section 2.2, the transit demand forecasts for two alignments are assessed in this memo, specifically:

- **B7/C9T alternative** – This alternative extends from the I-90 on the East side of Lake Washington to downtown Bellevue following the north side of I-90 and the west side of I-405. It includes stations at East Main (located at Main Street and 112th Avenue SE) and at 118th Avenue (located at the intersection of SE 8th and 118th Avenue SE). The 118th Avenue Station would include a park-and-ride (PNR) lot. East Main Station would not have a parking lot. This combined alternative is not included in either the DEIS or SDEIS; ridership estimates for B7/C9T were specifically prepared by Sound Transit to provide an apples-to-apples comparison with the B7-Revised alternative.
- **B7-Revised alternative** – This alternative follows a similar alignment and also comprises two stations. East Main Station would be included, at a similar location, while South Bellevue would be served by A-2 Station, which would be located between 113<sup>th</sup> Avenue SE and Bellevue Way SE, to the west of the I-90 ramps. A-2 would include a PNR lot, whereas East Main would not. Refer to TM06 for a map of the B7-Revised alternative.

This memorandum also makes reference to the B2M/C9T alternative from the SDEIS. B2M/C9T includes a South Bellevue Station (at the existing South Bellevue PNR) located north of A-2 Station. Comparison is made between these alternatives - for these two stations only – as a consistency check of the ridership forecasts. Refer to the SDEIS for a map of the B2M/C9T station locations and alignment.

### 4.2 Description of Sound Transit model

The ST Model employs an incremental forecasting process. An incremental model is distinguished from a synthetic travel model in that the former only predicts the changes in ridership associated with a new or modified transit model.

From the ST Transit Ridership Forecasting Report:

“The ST Model predicts changes in transit ridership in stages – incrementally predicting the ridership impacts of elements that affect

transit ridership such as population and economic growth, cost of travel, and then finally transit services and level of transit service.

The ST Model starts with the development of a base-year transit trip table, which involves a rigorous analysis of actual ridership volumes along each transit route, and a realistic simulation of observed transit service characteristics for peak and off-peak periods. External changes in demographics, highway travel time, and costs are distinctly incorporated into the process in phases, prior to estimating the impacts of incremental changes in transit service. The ST Model relies on the Puget Sound Regional Council (PSRC) regional model for data on external changes.

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

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

The ST Model forecasts the change in ridership once the East Link LRT service is introduced from the established baseline condition. The ridership for each project alternative is the sum of the daily boardings at the stations in that alternative. The project-wide ridership represents the total number of daily riders that would use East Link.

Please refer to the ST Transit Ridership Forecasting Report or Appendix H of the DEIS for additional information.

### 4.3 Post-processing of raw model data

ST employs a post-processing methodology for unaccounted factors (such as kiss-and-ride or KNR), and for converting person trips to vehicle trips. ST also aligns forecasts with other data sources to ensure that assumptions used in post-processing are consistent with other planning documents and the East Link environmental impact process. Please refer to the ST Transit Ridership Forecasting Report or the DEIS for additional information.

Post-processing adjustments include:

- **Converting person trips to vehicle trips** – Total person trips are converted to vehicle trips by assuming an average occupancy of 1.1 persons per vehicle. This average vehicle occupancy (AVO) is a reasonable assumption, but could be higher were parking demand to far exceed available spaces. PNR trips are converted to vehicle trips for analyzing future traffic conditions and calculating parking demand.

- **Accounting for Kiss-and-Ride (KNR)** – KNR, or drop off, trips are assumed to be a set percentage of auto access person trips. Based on data from Central Link and other comparable systems such as BART and Tri-Met, ST assumes that 16% of all PNR trips are KNR. KNR trips consist of vehicle trips for transit passengers to access the station, although parking spaces are not taken up.
- **Estimating raw Park-and-Ride (PNR) demand** – PNR demand is calculated by subtracting total auto vehicle trips by the volume of KNR trips. This PNR volume represents the parking demand for a station. According to the DEIS, the three-hour PM peak period PNR auto demand is considered to be the daily parking demand as the characteristics of a PNR lot have vehicles arriving in the AM peak period and leaving in the PM peak period, with limited activity outside these periods.

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## 5 Forecast 2030 East Link LRT boardings

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Daily East Link boardings (Year 2030) for the B7-Revised and the B7/C9T alternatives are presented in Table 5 by station and segment. Key findings are as follows:

- The B7-Revised alternative would generate 4,500 daily boardings at A-2 Station compared to 1,500 boardings at 118<sup>th</sup> Station for B7/C9T. For comparison purposes, ridership at A-2 Station would be more comparable to that at B2M/C9T's South Bellevue Station.
- The B7-Revised alternative would generate 2,500 daily boardings at East Main Station compared to 3,000 boardings for B7/C9T.
- In terms of overall project-wide ridership on East Link, B7-Revised would generate 50,500 daily riders compared to 49,000 daily riders for B7/C9T. These volumes would be similar to those generated with the B2M/C9T alternative (50,000 daily riders).
- When compared to B7/C9T, the B7-Revised alternative would have higher boardings in Segment B and lower boardings in Segments A and C. According to Sound Transit, the main reasons for the lower boardings in Segments A and C would owe to: (i) riders choosing to use A-2 Station instead of Mercer Island (in Segment A); and (ii) higher transfers occurring at Bellevue Transit Center and East Main Station (both in Segment C) when the South Bellevue station is at 118<sup>th</sup> Station for B7/C9T instead of at the A-2 Station location for B7-Revised.

	<b>B2M/C9T</b>	<b>B7-Revised</b>	<b>B7/C9T</b>
<b>Segment A</b>	<b>5,500</b>	<b>5,000</b>	<b>6,000</b>
<b>Segment B</b>			
A-2 Station		4,500	
118th Station			1,500
South Bellevue Station	5,500		
SE 8 <sup>th</sup>	500		
<b>Segment Total</b>	<b>5,500</b>	<b>4,500</b>	<b>1,500</b>
<b>Segment C</b>			
East Main Station		2,500	3,000
Bellevue Transit Center Station	6,000	4,500	5,000
Hospital Station	1,000	1,000	1,000
<b>Segment Total</b>	<b>7,000</b>	<b>8,000</b>	<b>9,000</b>
<b>Segment D</b>	<b>7,000</b>	<b>7,000</b>	<b>7,000</b>
<b>Segment E</b>	<b>3,500</b>	<b>3,500</b>	<b>3,500</b>
<b>Project-wide Ridership</b>	<b>50,000</b>	<b>50,500</b>	<b>49,000</b>

Source: B2M/C9T ridership from DEIS/SDEIS. B7-Revised and B7/C9T ridership from Sound Transit Ridership Model, 2011.

Notes: (i) B7/C9T model run specifically provided by Sound Transit for an apples-to-apples comparison with B7-Revised; (ii) due to rounding, station ridership for B2M/C9T might not sum exactly to segment totals; and (iii) highest ridership alternative shown for B2M/C9T and B7/C9T.

Table 5 – Year 2030 East Link LRT daily boardings

## 6 Forecast mode of access and egress

Modes of access and egress to and from the proposed East Link LRT stations are important to understand the nature of the ridership patterns, and for station planning – specifically the size of the parking facility (see Section 6.3) and the analysis of traffic impacts (see TM04). For example, the number of drive access or egress trips provides valuable data on parking demand and drop-off spaces. Similarly, walk access trips provide information on pedestrian flows and the need for pedestrian enhancements. Directionality of travel to and from the LRT stations is also important to manage peak hour traffic flows.

### 6.1 Assumed transit modes of access/egress

Transit modes of access/egress include the following:

- Walk/bike access/egress from origin or to destination
- Auto access/egress from origin or to destination
- Transfer between LRT and buses or between separate buses

The ST Model expresses modes of access/egress as travel from one mode to another mode. A transit alighting to walk access describes travelers who leave the bus or train and walk. LRT alighting to bus access means a traveler switches from LRT to bus. The principal modes of access/egress in the ST Model are walk access/egress – including walk and bike) and auto access/egress (including park-and-ride (PNR) and kiss-and-ride (KNR)).<sup>2</sup> Transfers at train stations and bus stops result from subsequent travel assignment. The sum of the access-egress trip volumes equals the numbers of persons passing “through” the station during a given peak period. Note, this figure is different than ridership at the station, which is equivalent to the boardings at a station only.

### 6.2 Three-hour PM peak period access/egress

Table 6 presents the three-hour PM peak period model access/egress volumes for the B7-Revised alternative (A-2 and East Main stations). Table 7 presents the volumes for B7/C9T alternative (118<sup>th</sup> Station and East Main Station) for comparison purposes only. From the DEIS, the three-hour PM peak period auto demand from the Sound Transit Model represents a close approximation of daily PNR demand.

Key findings for A-2 Station in the PM peak period are as follows:

- Activity at A-2 Station would be dominated by persons leaving the station via automobile (accounting for nearly 60% of all trips).

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<sup>2</sup> Auto to transit (bus and LRT) boardings are not currently forecasted in the ST Model during the PM peak period as observed travel patterns indicate little to no demand for PM peak drive access trips. In future years, however, demand for PM peak drive access trips to transit might grow.

- Transit transfers between bus and LRT would account for about 37% of all trips.
- Walk trips to or from the A-2 Station would be very low (about 3%).
- Compared to B7/C9T's 118<sup>th</sup> Station, B7-Revised's A-2 Station would have significantly higher transfers between LRT and bus, as well as auto access to transit trips. A-2 Station, however, would see much lower walk/bike access trips than 118<sup>th</sup> Station.
- Compared to B2M/C9T's South Bellevue Station, B7-Revised's A-2 Station would generate 300 more PM peak period person-trips. In addition, A-2 Station would generate 20 more auto access trips than South Bellevue Station. Walk/bike access trips to/from A-2 Station would be lower than that for South Bellevue Station, by about 30 trips.

Key findings for East Main Station in the PM peak period are as follows:

- Access and egress patterns would be much different than at A-2 Station as about 80% of transit patrons would walk to/from the station during the PM peak period.
- Most patrons would walk from nearby locations to the East Main Station, with a smaller number of patrons exiting the station and walking to nearby destinations.
- Transfers between bus and LRT would also occur, although these volumes would be much smaller than those expected at A-2 Station.
- Overall, person trip volumes would be similar at East Main Station for the B7/C9T as well as the B7-Revised alternatives.

Station	From	To	B7-Revised person trips in PM peak period	% of total PM peak period person trips
A-2 Station	Walk/Bike	LRT/Bus	20	0.6%
	Bus	LRT	630	20.1%
	Auto	LRT/Bus	0	0.0%
	Bus/LRT	Walk/Bike	80	2.5%
	LRT	Bus	530	16.9%
	LRT	Auto	1,840	58.6%
	Bus	Auto	40	1.3%
	<b>Total person trips</b>			<b>3,140</b>
East Main Station	Walk/Bike	LRT/Bus	810	52.6%
	Bus	LRT	230	14.9%
	Auto	LRT/Bus	0	0.0%
	Bus/LRT	Walk/Bike	450	29.2%
	LRT	Bus	50	3.2%
	LRT	Auto	0	0.0%
	Bus	Auto	0	0.0%
	<b>Total person trips</b>			<b>1,540</b>

Source: Sound Transit Ridership Model, 2011.

Notes: (i) Auto access trips include both KNR and PNR trips; and (ii) for comparison from the SDEIS, B2M/C9T's South Bellevue Station would generate 2,820 PM peak person trips, 1,860 peak auto access/egress trips, and 130 walk/bike access/egress trips overall.

Table 6 – PM peak period LRT modes of access and egress (B7-Revised alternative)

Station	From	To	B7/C9T person trips in PM peak period	% of total PM peak period person trips
118 <sup>th</sup> Station	Walk/Bike	LRT/Bus	190	15.8%
	Bus	LRT	120	10.0%
	Auto	LRT/Bus	0	0.0%
	Bus/LRT	Walk/Bike	60	5.0%
	LRT	Bus	240	19.9%
	LRT	Auto	585	48.5%
	Bus	Auto	10	0.8%
	<b>Total person trips</b>			<b>1205</b>
East Main Station	Walk/Bike	LRT/Bus	820	53.9%
	Bus	LRT	225	14.8%
	Auto	LRT/Bus	0	0.0%
	Bus/LRT	Walk/Bike	420	27.6%
	LRT	Bus	55	3.6%
	LRT	Auto	0	0.0%
	Bus	Auto	0	0.0%
	<b>Total person trips</b>			<b>1520</b>

Source: Sound Transit Ridership Model, 2011.

Notes: Auto access trips include both KNR and PNR trips.

Table 7 – PM peak period LRT modes of access and egress (B7/C9T alternative)

### 6.3 Proposed parking demand

According to the DEIS, the PM peak period PNR auto demand is considered to be a good approximation of daily parking demand. PNR demand is calculated by subtracting total auto vehicle trips by the volume of KNR trips. This PNR volume represents the daily parking demand for a station.

As noted in Section 4.3, the total PNR demand for B7-Revised's A-2 Station is calculated as follows:

- **PM peak period ridership for LRT station (from Table 6)**
  - LRT Alighting to Auto Access: 1,840 person trips
  - Bus Alighting to Auto Access: 40 person trips
  - Total to Auto Access: 1,880 person trips

- **PM peak period auto access trips**
  - 1,880 person trips in autos / 1.1 (AVO) = 1,710 vehicle trips
- **PM peak period KNR trips**
  - 1,710 vehicle trips x 16% (KNR rate) = 273 KNR vehicle trips (note these represent one-way trips to A-2 Station)
- **Raw PM peak period PNR trips**
  - 1,710 vehicle trips – 273 KNR vehicle trips = 1,437 vehicle trips

For station design purposes, a PNR capacity of 1,450 spaces for A-2 Station is proposed. This capacity would be 50 spaces larger than the PNR capacity planned for B2M/C9T's South Bellevue Station due to higher PNR demand at the A-2 Station for B7-Revised.

## 7 Preliminary findings

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Preliminary findings are as follows:

- The B7-Revised alternative would generate 4,500 daily boardings at A-2 Station compared to 1,500 boardings at 118<sup>th</sup> Station for B7/C9T. For comparison purposes, ridership at A-2 Station would be more comparable to that at B2M/C9T's South Bellevue Station with 5,500 daily boardings.
- The B7-Revised alternative would generate 2,500 daily boardings at East Main Station compared to 3,000 boardings for B7/C9T.
- In terms of overall project-wide ridership on East Link, B7-Revised would generate 50,500 daily riders compared to 49,000 daily riders for B7/C9T. These volumes would be similar to those generated with the B2M/C9T alternative (50,000 daily riders).
- When compared to B7/C9T, the B7-Revised alternative would have higher boardings in Segment B and lower boardings in Segments A and C. According to Sound Transit, the main reasons for the lower boardings in Segments A and C would owe to: (i) riders choosing to use A-2 Station instead of Mercer Island (in Segment A); and (ii) higher transfers occurring at Bellevue Transit Center and East Main Station (both in Segment C) when the South Bellevue station is at 118<sup>th</sup> Station for B7/C9T instead of at the A-2 Station location for B7-Revised.

In terms of access/egress volumes during the busiest period of the day (the three-hour PM peak period) activity at A-2 Station would be dominated by persons leaving the station via automobile – nearly 60% of all trips. Transit transfers between bus and LRT would account for about 37% of all trips. Walk trips to or from the A-2 Station would be low (about 3%). Compared to B7/C9T's 118<sup>th</sup> Station, B7-Revised's A-2 Station would have significantly higher transfers between LRT and bus, as well as auto access to transit trips. A-2 Station, however, would see much lower walk/bike access trips than 118<sup>th</sup> Station.

For East Main Station, the access and egress patterns would be very different than at A-2 Station as about 80% of LRT patrons would walk to/from the station. Transit transfers would also occur, although these volumes would be much smaller than those expected at A-2 Station. Overall, person trip volumes would be similar for the B7/C9T as well as the B7-Revised alternatives.

The parking demand at A-2 Station, represented by the three-hour PM peak period, would be 1,437 vehicles. A facility housing 1,450 parking stalls is proposed to handle this demand – this would be 50 spaces larger than B2M/C9T's South Bellevue Station which would have a capacity of 1,400 spaces.

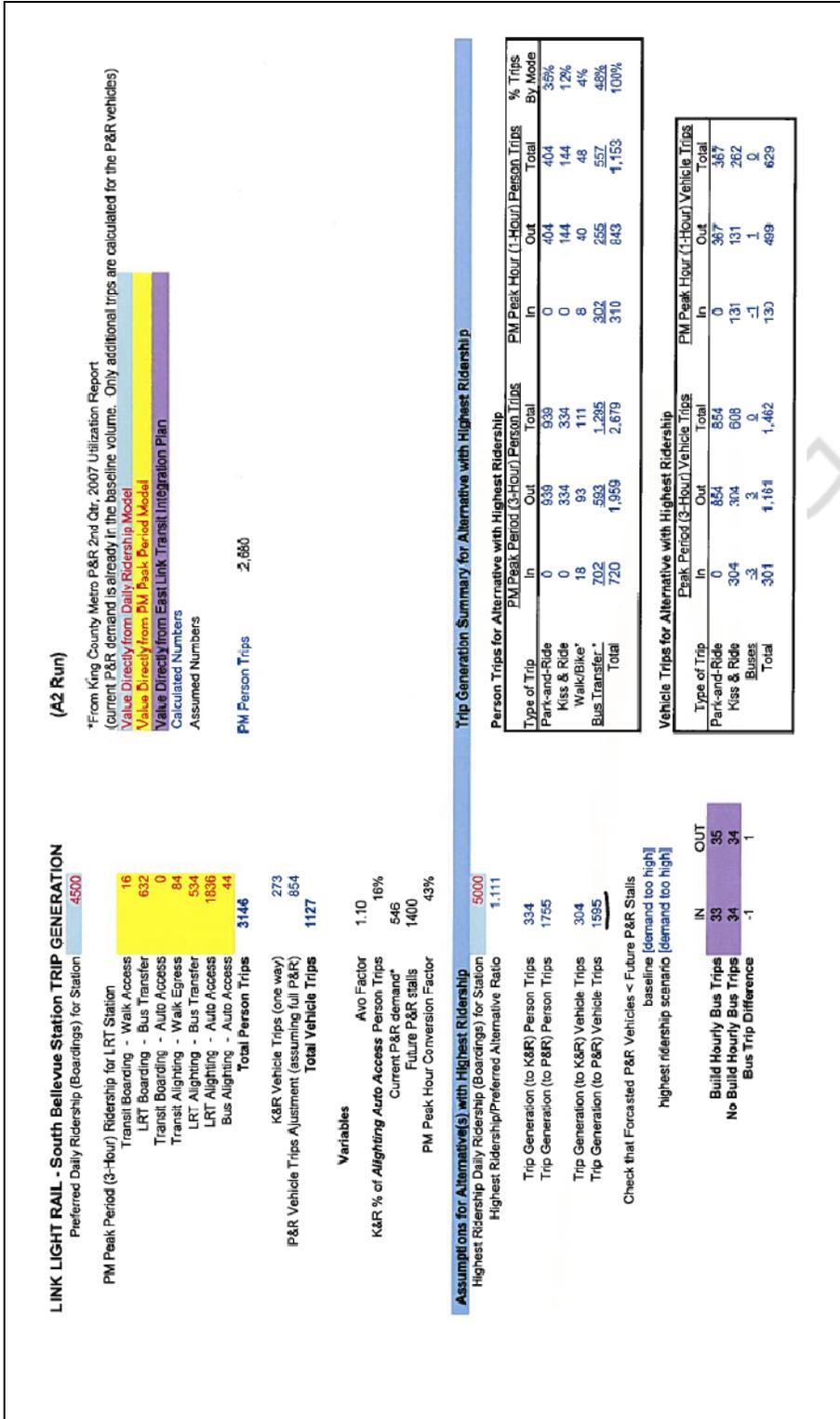
## **Appendix A**

Sound Transit Model –  
Ridership forecasts

Draft



# A1 A-2 Station (B7-Revised alternative)



Notes: Only the yellow numbers were sourced from the Sound Transit Model. Other assumptions including PNR capacity, AVO assumptions, and kiss-and-ride shares were not sourced from the Sound Transit Model. Also there is no highest ridership alternative for the B7-Revised model run, thus 4,500 is the maximum daily boardings at A-2 Station.

Source: Sound Transit, 2011.

# A2 East Main Station (B7-Revised alternative)

### LINK LIGHT RAIL - East Main Station TRIP GENERATION

Preferred Daily Ridership (Boardings) for Station: 2500

Transit Boarding - Walk, Access	810
LRT Boarding - Bus Transfer	225
Transit Boarding - Auto Access	0
Transit Alighting - Walk Egress	454
LRT Alighting - Bus Transfer	47
LRT Alighting - Auto Access	0
Bus Alighting - Auto Access	0
<b>Total Person Trips</b>	<b>1536</b>

K&R Vehicle Trips (one way): 223  
P&R Vehicle Trip Adjustment (assuming full P&R): 0  
**Total Vehicle Trips: 223**

**Variables**

- Avo Factor: 1.10
- K&R % of Total Person Trips: 16%
- Current P&R demand: 0
- Future P&R stalls: 0
- PM Peak Hour Conversion Factor: 43%

### (A2 Run)

\* From King County Metro P&R 2nd Qtr, 2007 Utilization Report (current P&R demands already in the baseline volume. Only additional trips are calculated for the P&R vehicles)

Value Directly from Daily Ridership Model: 2500  
Value Directly from PM Peak Period Model: 1840

Calculated Numbers Assumed Numbers: 1840

PM Person Trips: 1,840

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### Assumptions for Alternative(s) with Highest Ridership

Highest Ridership (Boardings) for Station: 3000  
Highest Ridership/Preferred Alternative Ratio: 1.200

Trip Generation (to K&R) Person Trips: 295  
Trip Generation (to P&R) Person Trips: 0

Trip Generation (to K&R) Vehicle Trips: 268  
Trip Generation (to P&R) Vehicle Trips: 0

Check that Forecasted P&R Vehicles < Future P&R Stalls baseline (within limits)  
highest ridership scenario (within limits)

Build Hourly Bus Trips	IN	OUT
No Build Hourly Bus Trips	12	12
Bus Trip Difference	0	0

### Trip Generation Summary for Alternative with Highest Ridership

#### Person Trips for Alternative with Highest Ridership

Type of Trip	PM Peak Period (3-Hour) Person Trips		PM Peak Hour (1-Hour) Person Trips		% Trips By Mode (%)
	In	Out	In	Out	
Peak-and-Ride	0	0	0	0	0
Kiss & Ride	109	06	85	41	16%
Walk/Bike*	816	458	351	197	69%
Bus Transfer	222	41	20	20	15%
<b>Total</b>	<b>1,242</b>	<b>601</b>	<b>534</b>	<b>258</b>	<b>100%</b>

#### Vehicle Trips for Alternative with Highest Ridership

Type of Trip	Peak Period (3-Hour) Vehicle Trips		PM Peak Hour (1-Hour) Vehicle Trips	
	In	Out	In	Out
Peak-and-Ride	0	0	0	0
Kiss & Ride	268	268	115	115
Buses	0	0	0	0
<b>Total</b>	<b>268</b>	<b>268</b>	<b>115</b>	<b>115</b>

Notes: Only the yellow numbers were sourced from the Sound Transit Model. Other assumptions including PNR capacity, AVO assumptions, and kiss-and-ride shares were not sourced from the Sound Transit Model. Also there is no highest ridership alternative for the B7-Revised model run, thus 2,500 is the maximum daily boardings at East Main Station.

Source: Sound Transit, 2011.

# A3 East Main Station (B7/C9T alternative)

**LINK LIGHT RAIL - East Main Station TRIP GENERATION**  
Preferred Daily Ridership (Boardings) for Station: 2500

PM Peak Period (3-Hour) Ridership for LRT Station	2500
Transit Boarding - Walk Access	817
LRT Boarding - Bus Transfer	226
Transit Boarding - Auto Access	0
LRT Alighting - Walk Egress	417
LRT Alighting - Bus Transfer	54
LRT Alighting - Auto Access	0
Bus Alighting - Auto Access	0
<b>Total Person Trips</b>	<b>1514</b>

K&R Vehicle Trips (one way): 220  
P&R Vehicle Trips Adjustment (assuming full P&R): 0  
**Total Vehicle Trips: 220**

**Variables**

Avo Factor	1.10
K&R % of Total Person Trips	16%
Current P&R Demand*	0
Future P&R stalls	0
PM Peak Hour Conversion Factor	43%

\*From King County Metro P&R 2nd Qtr, 2007 Utilization Report (current P&R demand is already in the baseline volume. Only additional trips are calculated for the P&R vehicles)  
Value Directly from Daily Ridership Model  
Value Directly from PM Peak Period Modal  
Value Directly from East Link Transit Integration Plan  
Calculated Numbers  
Assumed Numbers

PM Person Trips: 1,820

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**Trip Generation Summary for Alternative with Highest Ridership**

**Person Trips for Alternative with Highest Ridership**

Type of Trip	PM Peak Period (3-Hour) Person Trips		PM Peak Hour (1-Hour) Person Trips		% Trips By Mode
	In	Out	In	Out	
Park-and-Ride	0	0	0	0	0%
Kiss & Ride	200	90	86	39	16%
Walk/Bike*	824	420	354	181	69%
Bus Transfer*	228	54	98	23	15%
<b>Total</b>	<b>1,252</b>	<b>564</b>	<b>538</b>	<b>243</b>	<b>100%</b>

**Vehicle Trips for Alternative with Highest Ridership**

Type of Trip	Peak Period (3-Hour) Vehicle Trips		PM Peak Hour (1-Hour) Vehicle Trips	
	In	Out	In	Out
Park-and-Ride	0	0	0	0
Kiss & Ride	264	264	114	114
Buses	0	0	0	0
<b>Total</b>	<b>264</b>	<b>264</b>	<b>114</b>	<b>114</b>

**Assumptions for Alternative(s) with Highest Ridership**  
Highest Ridership Daily Ridership (Boardings) for Station: 3000  
Highest Ridership/Preferred Alternative Ratio: 1.200

Trip Generation (to K&R) Person Trips	291
Trip Generation (to P&R) Person Trips	0
Trip Generation (to K&R) Vehicle Trips	264
Trip Generation (to P&R) Vehicle Trips	0

Check that Forecasted P&R Vehicles < Future P&R Stalls baseline [within limits]  
highest ridership scenario [within limits]

<b>Build Hourly Bus Trips</b>	IN	OUT
12	12	12
<b>No Build Hourly Bus Trips</b>	12	12
<b>Bus Trip Difference</b>	0	0

Alternatives that Generate Highest Daily Ridership: B7

Notes: A B7/C9T model run was conducted by Sound Transit specifically for this study of B7-Revised. Only the yellow numbers were sourced from the Sound Transit Model. Other assumptions including PNR capacity, AVO assumptions, and kiss-and-ride shares were not sourced from the Sound Transit Model.

Source: Sound Transit, 2011.

# A4 118<sup>th</sup> Station (B7/C9T alternative)

### LINK LIGHT RAIL - 118th Ave SE Station TRIP GENERATION

Preferred Daily Ridership (Boardings) for Station: 1500

PM Peak Period (3-Hour) Ridership for LRT Station

Transit Boarding - Walk Access	192
LRT Boarding - Bus Transfer	121
Transit Boarding - Auto Access	0
Transit Boarding - Walk Egress	61
LRT Alighting - Bus Transfer	236
LRT Alighting - Auto Access	595
Bus Alighting - Auto Access	5
<b>Total Person Trips</b>	<b>1204</b>

258

PM Person Trips: 1,610

K&R Vehicle Trips (one way): 86

P&R Vehicle Trip Adjustment (assuming full P&R): 822

**Total Vehicle Trips: 908**

**Variables**

Avo Factor: 1.10

K&R % of **Alighting Auto Access** Person Trips: 16%

Current P&R demand\*: 178

Future P&R stalls: 1000

PM Peak Hour Conversion Factor: 43%

\* From King County Metro P&R 2nd Qtr, 2007 Utilization Report (current P&R demand is already in the baseline volume. Only additional trips are calculated for the P&R vehicles)

Value Directly from Daily Ridership Model

Value Directly from PM Peak Period Model

Calculated Numbers

Assumed Numbers

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### Assumptions for Alternative(s) with Highest Ridership

Highest Ridership Daily Ridership (Boardings) for Station: 1500

Highest Ridership/Preferred Alternative Ratio: 1,000

Trip Generation (to K&R) Person Trips: 95

Trip Generation (to P&R) Person Trips: 499

Trip Generation (to K&R) Vehicle Trips: 86

Trip Generation (to P&R) Vehicle Trips: 454

Check that Forecasted P&R Vehicles < Future P&R Stalls

baseline [within limits]: IN 11, OUT 11

highest ridership scenario [within limits]: IN 11, OUT 11

**Build Hourly Bus Trips: 11**

**No Build Hourly Bus Trips: 11**

**Bus Trip Difference: 0**

**Alternatives that Generate Highest Daily Ridership: 87**

### Trip Generation Summary for Alternative with Highest Ridership

Type of Trip	PM Peak Period (3-Hour) Person Trips		PM Peak Hour (1-Hour) Person Trips		% Trips By Mode
	In	Out	In	Out	
Park-and-Ride	0	904	0	389	56%
Kiss & Ride	0	95	0	41	6%
Walk/Bike*	192	61	253	26	16%
Bus Transfer*	121	236	357	101	22%
<b>Total</b>	<b>313</b>	<b>1,296</b>	<b>135</b>	<b>557</b>	<b>100%</b>

Type of Trip	Peak Period (3-Hour) Vehicle Trips		PM Peak Hour (1-Hour) Vehicle Trips	
	In	Out	In	Out
Park-and-Ride	0	822	0	353
Kiss & Ride	0	86	0	37
Buses	0	0	0	0
<b>Total</b>	<b>0</b>	<b>908</b>	<b>0</b>	<b>380</b>

Notes: A B7/C9T model run was conducted by Sound Transit specifically for this study of B7-Revised. Only the yellow numbers were sourced from the Sound Transit Model. Other assumptions including PNR capacity, AVO assumptions, and kiss-and-ride shares were not sourced from the Sound Transit Model.

Source: Sound Transit, 2011.