City of Bellevue

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

## TM03 – A-2 Station Concept Report

215382/TM03

Final | June 2011

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Job number 215382-00

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# Document Verification

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# 1 Executive summary

The A-2 Station is the preferred station in South Bellevue for the B7-Revised alternative. This Station would be located along the west side of Bellevue Way between 113th Ave SE and the I-90 on-ramps. The South Bellevue Station Alternative Location Analysis (SBSALA) first proposed the A-2 Station concept (this concept will be referred to as the SBSALA A-2 Station).

The purpose of this subsequent study is to build on the SBSALA A-2 Station design and further optimize it. Several alternatives both on the A-2 site and on alternative sites were considered. However for the B-7-Revised alternative, the A-2 site is still considered the preferred location considering potential impacts on the local community and the nearby Mercer Slough National Park, as well as traffic and transit operations considerations. See Technical Memo 13 (TM13) for additional explanation.

The initial station program requirements for the SBSALA A-2 Station included 1,400 parking spaces, layover for five buses and five vans, two bus bays and one van bay (with each bay accommodating two vehicles simultaneously), kiss-and-ride facilities, as well as passenger facilities to accommodate up to 4,000 daily boardings (Year 2030). The LRT forecasts for B7-Revised indicate that A-2 Station would serve 4,500 daily boardings in 2030, which would necessitate a park-and-ride (PNR) facility with 1,450 spaces. See Technical Memo 07 (TM07) for additional information.[1]

In addition a number of station planning goals were established to inform the development of the preferred station concept:

- Provide convenient access to/from the light rail platform
- Reduce station cost
- Minimize neighborhood impact west of A-2 Station
- Minimize traffic impacts on surrounding area
- Provide pedestrian and bicycle access to the station from surrounding community
- Prioritize pedestrian safety within the facility
- Provide redundant parking access/egress
- Maintain safe and efficient I-90 on-/off-ramp operations
- Allow safe and efficient transit operations into/out of the transit center

[1] The three-hour PM peak period PNR demand is assumed to represent the daily PNR demand at A-2 Station.

Based on the team's review of the SBSALA A-2 Station concept along with feedback from the City of Bellevue and Sound Transit, the optimized A-2 Station concept was developed.

**Optimized A-2 Station Concept**

- A five-level structure including a transit center and parking.
- A transit center on the top level (Level 5) with bus/van layover, bus/van bays, and kiss-and-ride facilities.
- Four full levels of parking to accommodate up to 1,450 vehicles.
- A terraced parking structure to reduce visual impacts along 113th Ave SE.
- A new road bridge over the I-90 ramps to provide access to the station without having to cross Bellevue Way at-grade.
- A ramp on the east side of the facility to link to the Level 5 transit center.
- One dedicated entry/exit point at Level 4 from the east side ramp, one entry point at Level 3 on the north end of the facility allowing "right-in" movements only, and an exit point at Level 3 onto 113th SE Ave.
- A partially signalized SE 30th Street and Bellevue Way junction that controls the southbound Bellevue Way and the southbound SE 30th Street onto the I-90 on-ramps – northbound movements would not be impacted by the signal.

Compared to the SBSALA A-2 Station, the optimized A-2 Station would:

- Improve transfers from bus to rail by placing the transit center atop the structure, closer to the rail platform;
- Reduce the average walking distance to the ends of the rail platform by connecting the pedestrian bridge to the middle of the platform;
- Reduce the number of parking levels and excavation required by reconfiguring the station access road at the north end of the facility;
- Improve traffic distribution with three access points; and
- Reduce visual impacts along 113$^{th}$ SE Avenue by terracing the parking garage and leaving the Level 4 parking lot uncovered; and

Based on subsequent feedback from the City of Bellevue, Sound Transit, and King County Metro, potential design enhancements were formulated to improve transit operations and pedestrian/cycle access. Potential enhancements included a pedestrian/bicycle path on the new road bridge to connect the east side of Bellevue Way with the station as well as a modified transit center layout to better segregate transit vehicles and private automobiles.

# 2 Background

## 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 the station program and the SBSALA A-2 Station concept; identifies key station design considerations; presents alternate concepts considered; and defines the preferred A-2 Station concept. It includes a discussion of internal station circulation and external access to the station, as well as a high-level assessment of utilities and geotechnical conditions.

The preferred concept has been developed from the initial A-2 Station concepts presented at the B7-Revised Optimization Workshop on January 13, 2011 (or the Project Team Workshop), which are summarized in the B7-Revised Optimization Technical Memo (Technical Memo 13).

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

- South Bellevue Traffic Impacts (TM04)
- Cost Estimate Update A-2 Station (TM05)
- Early Concept Alignment (TM06)
- LRT Ridership (TM07)
- B7-Revised Optimization (TM13)

## 2.3 Technical memo objectives

The objectives of this technical memo are to:

- Define the program for A-2 Station;
- Review the SBSALA A-2 Station concept and identify means of optimizing the concept;
- Identify the key A-2 Station design considerations and requirements; and
- Describe the preferred A-2 Station concept, including internal circulation, external access, as well as transit connectivity.

## 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<br>Issue Date: 1/10/2011 |
| January 6, 2011 | Sound Transit kick-off meeting | Ref: ST Meeting 1 Minutes (Issue 2)<br>Issue Date: 1/20/2011 |
| January 13, 2011 | B7-Revised Project Team Optimization Workshop (Project Team Workshop) | Ref: Optimization Workshop Minutes Issue 2<br>Issue Date: 2/2/2011 |
| January 13, 2011 | WSDOT Meeting<br>City of Bellevue | Ref: WSDOT Meeting 1 Minutes (Issue 1)<br>Issue Date: 1/26/2011 |
| January 25, 2011 | Open House 1 | Ref: OH Notes WB 2011 01 25<br>Issue Date: 1/31/2011 |
| February 3, 2011 | Staff Check-in 3 – Station and Alignment Update | Ref: Staff Check-in3 Minutes (Draft 2)<br>Issue Date: 2/16/2011 |

| Date | Meeting | Reference (Minutes) |
|---|---|---|
| February 24, 2011 | Staff Check-in 5 – Station, Sturtevant, Public Meeting | Not finalized at time of submittal. |
| March 23, 2011 | Technical Memo 03 Feedback from WSDOT | Ref: WSDOT Meeting 3 Minutes (Issue 1)<br>Issue Date: 3/30/2011 |
| March 23, 2011 | Technical Memo 03 Feedback from Sound Transit and King County Metro | Ref: KC-ST Meeting 1 Minutes (Draft 1)<br>Issue Date: 3/24/2011 |

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 (October 2007). *East Link Integration_2007_10_07.* 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, (November 2005*). Sound Transit Link Light Rail Design Criteria, Chapter 9. Stations.* Seattle, WA: Sound Transit. | Sound Transit Link Light Rail Station Design Criteria | Establishes relevant design requirements for A-2 Station and transit center |
| Central Puget Sound Regional Transit Authority, East Corridor HCT, Final Draft - Summary Geotechnical Report for Preliminary Route Selection. Seattle, WA: Sound Transit. | East Corridor HCT Summary Geotechnical Report | Geotechnical report for preliminary route selection |
| Central Puget Sound Regional Transit Authority, *Extract Review of KPFF Report.* Seattle, WA: Sound Transit. | Sound Transit Review of KPFF A-2 | Provides comments on KPFF Study and input to A-2 optimization |
| Central Puget Sound Regional Transit Authority, Washington State Department of Transportation, and Federal Transit Administration, et al (December 2008). *East Link Project: Draft Environmental Impact Statement.* Seattle, WA: Sound Transit. | DEIS | Provides station program details for South Bellevue Station, used to design A-2 Station |
| Central Puget Sound Regional Transit Authority, Washington State Department of Transportation, and Federal Transit Administration, et al (October 2010). *East Link Project: Supplemental Draft Environmental Impact Statement.* Seattle, WA: Sound Transit. | SDEIS | Provides station program details for South Bellevue Station, used to design A-2 Station |
| City of Bellevue (December 2010). City of Bellevue Utility Data – Sewer, Storm, and Water. Bellevue, WA: City of Bellevue. | City of Bellevue Utility Data | As-built location of sewer, storm, and water utility infrastructure. |
| City of Bellevue (December 2010). *City of Bellevue, Washington Comprehensive Plan*. Bellevue, WA: City of Bellevue | City of Bellevue Comprehensive Plan | Describes land use plans around A-2 Station area |
| City of Bellevue (October 2010). *Bellevue City Code – Chapter 20 Bellevue Land Use Code*. Bellevue, WA: City of Bellevue | Bellevue City Codes | Details height restrictions around A-2 Station |

| Document | Referred to in Technical Memo as: | Relevance to Technical Memo: |
|---|---|---|
| KPFF (July 2010). South Bellevue Station: Alternative Location Analysis. Bellevue, WA: City of Bellevue Transportation Department. | SBSALA | Presents A-2 Station concept to assess and optimize |
| Metro, Municipality of Metropolitan Seattle (March 1991). Metro Transportation Facility Design Guidelines. Seattle, WA: King County Metro | King County Facility Design Guidelines | Establishes design requirements for transit center and ramps |

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 A-2 Station, 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

| A-2 Station (B7-Revised) | B7/C9T | "Apples-to-Apples" | Comment |
|---|---|---|---|
| Independent bus bays: 2 (each 175 feet long and holding two articulated buses at one time) | B7/C9T proposes 118th Station, but no station in vicinity of the A-2 Station (I-90 and Bellevue Way) | Yes | Consistent with design assumptions for the South Bellevue Station from preferred B2M/C9T alternative from SDEIS |
| Layover bays: 5 | | Yes | |
| Access van bay: 1 (55 feet long to hold two vans simultaneously) | | Yes | |
| Access van layover bays: 5 | | Yes | |
| Bike lockers: 45 | | Yes | |
| Light rail station platform length: 380 feet | | Yes | |
| Parking stalls: 1,450 (based on ridership forecasts) | | Yes | Although B2M/C9T's South Bellevue Station is proposed to have 1,400 parking stalls, the methodology applied to both alternatives to estimate parking demand is the same. |
| Year 2030 daily boardings: 4,500 (based on ridership forecasts) | | Yes | B2M/C9T's South Bellevue Station would generate 4,500 daily boardings. |

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

The A-2 Station program for the B7-Revised alternative is largely consistent with that for B2M/C9T's South Bellevue Station as defined in the SDEIS, except as otherwise noted.

## 3.2 Key assumptions

Key operating and design assumptions for A-2 Station are as follows:

| A-2 Station (B7-Revised) | B7/C9T | "Apples-to-Apples" | Comment |
|---|---|---|---|
| The A-2 Station area is zoned as R-3.5 (Residential-3.5) which calls for a maximum height of 30 feet (35 feet to the ridge of a pitched roof) | B7/C9T proposes 118th Station, but no station in vicinity of the A-2 Station (I-90 and Bellevue Way) | Yes | Consistent with design assumptions for the South Bellevue Station from preferred B2M/C9T alternative from SDEIS |
| Bus routes terminating at A-2: 210, 234, 532, 535 | | Yes | |
| Bus routes serving A-2: 111, 114, 222, 240, 560 | | Yes | |
| A center platform configuration was preferred to reduce vertical circulation requirements for the aerial station. | | Yes | |
| Sound Transit station design standards have been applied to design A-2 Station. | | Yes | |
| King County Metro notes that grades over 6-7% impact normal bus operations. A-2 Station bus ramps have been designed to this criterion. | | Yes | |

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

Although an apples-to-apples comparison with B7/C9T is not possible as no A-2 Station is proposed for that alternative, the A-2 Station program for the B7-Revised alternative is consistent with that for the South Bellevue Station of the preferred B2M/9T Alternative as defined in the SDEIS. Note – the center platform configuration proposed for the B7-Revised A-2 Station differs from the side platform station proposed for the SBSALA A-2 Station.

## 3.3 Methodology

| A-2 Station (B7-Revised) | B7/C9T | "Apples-to-Apples" | Comment |
|---|---|---|---|
| Not applicable to this memo. | | | |

Table 5 - Comparison with Sound Transit DEIS and SDEIS methodology

# 4 A-2 Station background

## 4.1 Proposed A-2 Station program

The station program describes the type and size of various components including vertical circulation, platform waiting area, parking capacity, transit center size, transit facilities required, as well as bicycle storage. The proposed B7-Revised A-2 Station program is largely consistent with that of the South Bellevue Station for the B2M/C9T alternative in the SDEIS, except that the number of parking stalls has increased by 50 to 1,450 based on the results of the LRT demand analysis (see Technical Memo 7 or TM07 for additional details). The number of bus bays is based on the scope of transit feeder services to the South Bellevue Station proposed in the Sound Transit East Link Integration Plan.

The proposed A-2 Station program is shown in Table 6 below.

| Proposed A-2 Station Program | | Source |
|---|---|---|
| **Year 2030 Daily Boardings** | 4,500 | Sound Transit Ridership Model Runs for B7-Revised Alternative (see TM07), 2011. |
| **Year 2030 PM Peak Person Trips** | 2,500 | |
| **Parking Spaces** | 1,450 | |
| **Kiss and Ride / Waiting Zones** | Length for 12 vehicles | SBSALA, 2010. |
| **Transit Facilities** | | |
| Arrival/departure bus bays (175 feet each to handle two articulated 60 foot buses simultaneously): | 2 | Sound Transit East Link Integration Plan; SBSALA, 2010. |
| Layover bus bays: | 5 | |
| **Paratransit Facilities** | | |
| Van access bay (55 feet to handle two vans simultaneously): | 1 | SBSALA, 2010. |
| Layover bus bays: | 5 | |
| **Bike Lockers** | 45 | |
| **Staff Restrooms** | 1 | Sound Transit Meeting (3/23/2011) |

Source: (i) Sound Transit Ridership Model, 2011; (ii) SBSALA, 2010; and (iii) Sound Transit Meeting (3/23/2011). Overview of SBSALA A-2 Station Concept

Table 6 – Proposed A-2 Station Program

### 4.1.1 Station elements

SBSALA proposed a number of station concepts in the vicinity of I-90 and Bellevue Way. The preferred station concept defined in the Study was the A-2 Station, which lies at the northwest corner of the I-90 and Bellevue Way interchange. The SBSALA A-2 Station has the following components:

- **Rail platform**
  - An elevated rail platform over the I-90 ramps with a side platform configuration (thus trains unload on the right-hand side)
  - A station concourse underneath the side platforms for ticketing
  - A pedestrian bridge at Level 6 to connect to the west end of the side loading elevated platforms
- **Parking garage and Transit Center**
  - A six-level parking garage holding up to 1,400 vehicles
  - A transit center on Level 1 (the lowest level)
  - Kiss-and-ride curb on Level 1 (the lowest level)
  - Entry and exit ramps on the east side of the facility to keep station traffic off of 113th Ave SE
- **Access facilities to the site**
  - A new roadway bridge over the I-90 on-/off-ramps for direct access from the I-90 off-ramps into A-2 Station (that would eliminate left-turns by northbound traffic from the I-90 ramp coming into the station)
  - A reconfigured SE 30th St. and Bellevue Way SE intersection for right-in/right-out movements from Bellevue Way to/from A-2
  - A new roundabout to distribute traffic to the parking facility (although local and station traffic would mix)

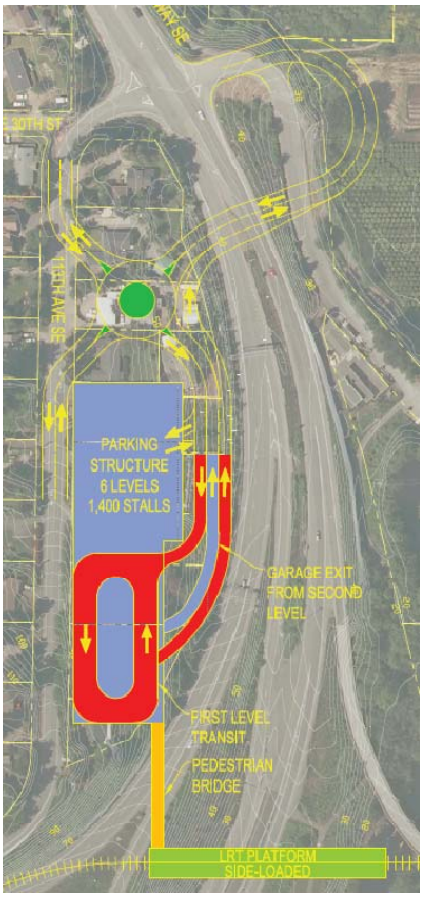
The layout of the SBSALA A-2 Station is shown in Figure 1. Figure 2 and Figure 3 show the proposed massing of the structure.

### 4.1.2 Station cost

The SBSALA A-2 Station would cost about $166m, based on a rough order-of-magnitude cost estimate. Major cost components would include the parking garage, the platform, and the roadway bridge. Direct costs for the SBSALA A-2 Station include:

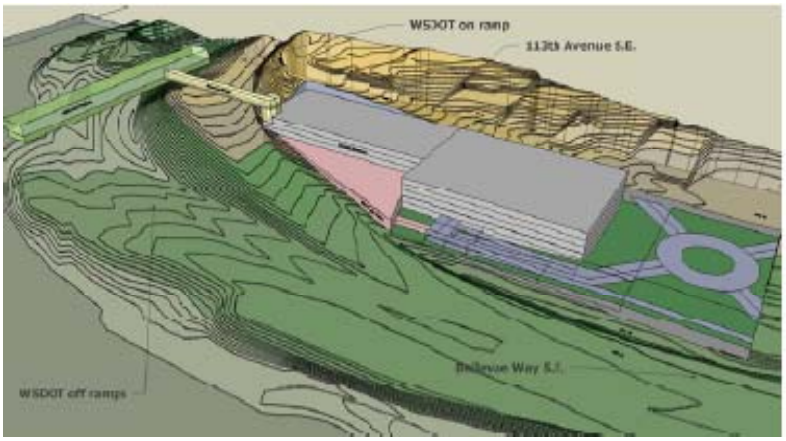
- $37.4m for the parking garage;
- $43.0m for the aerial station; and
- $10.0m add-on for the side platform configuration for additional vertical circulation and structure.

The SBSALA design would require significant excavation to accommodate the parking structure. Potentially, opportunity exists to reduce the number of parking levels as well as the depth of the structure and thus the excavation volumes and costs. In addition, a center platform station could reduce vertical circulation requirements and the cost of the elevated platform.



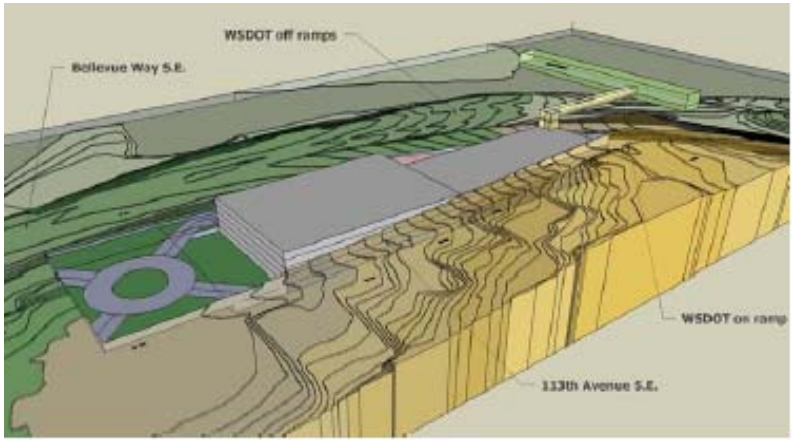

Source: SBSALA, 2010.

Figure 1 – SBSALA A-2 Station concept




Source: SBSALA, 2010.

Figure 2 – SBSALA A-2 Station concept (looking west)




Source: SBSALA, 2010.

Figure 3 – SBSALA A-2 Station concept (looking east)

### 4.1.3 Project team review of SBSALA A-2 Station concept

The project team reviewed the SBSALA A-2 Station concept to identify strategies for optimizing operations and reducing overall costs. Project team comments are noted below:

| Element | Comment |
|---|---|
| LRT Platform Configuration | • Side platforms would be more costly as double the vertical circulation elements would be required (4 stairwells, 2 escalators, and 2 elevators) |
| Transit Center Design | • Transfers to/from the bus plaza and kiss-and-ride curb would be inconvenient, requiring an elevator ride to the top level<br>• A covered transit center would create an unpleasant waiting experience for passengers.<br>• Additional elevators would be needed to accommodate rush hour use (for transit, kiss-and-ride, and park-and-ride users).<br>• The ceiling above the transit center would require additional vertical clearance to allow for removal of disabled buses and accommodate mechanical ventilation – this would remove some portion of parking on Level 2. |
| Pedestrian Bridge from Transit Center to LRT Platform | • The bridge connection to the west end of the rail platform would create long walking distances to the east end of the platform and increase the height of the station platform.<br>• A bridge connecting to the middle of the rail platform would reduce the height of the bridge and the station platform, while decreasing walking distances to either end of the platform. |
| Station Access Road Layout | • The roundabout configuration would reduce the area available for parking. |
| Costs | • A-2 Station (at $166m) would cost significantly more than B7's 118th Station (at $115m) or B2M's South Bellevue Station ($129m).<br>• Cost savings could be realized by reducing the number of parking levels as well as by proposing a center platform instead of a side one. |

Table 7 – Project team assessment of SBSALA A-2 Station concept

# 5 Key design issues and considerations

From the DEIS, SDEIS, and SBSALA studies, as well as meetings with the City of Bellevue and comments arising from the first B7-Revised Open House, several key issues and considerations of the B7-Revised A-2 Station have been identified.

- **Convenient access to/from the light rail platform** – To facilitate transfers to/from Sound Transit and King County Metro buses, the transit center must be quickly and easily accessible to LRT riders. Transfers requiring comparatively long walks or vertical circulation paths discourage use. Similarly, kiss-and-ride users also desire direct access to the platform with minimal level changes or walking distances. ADA access would be provided as required throughout the station.

- **Cost** – The cost of the SBSALA A-2 Station ($166m) is significantly higher than that for B7's 118th Station ($115m) or B2M/C9T's South Bellevue Station ($129m). The optimized design of A-2 Station should consider ways of reducing capital costs in three major areas: (i) platform configuration; (ii) required excavation and thus the number of levels in the facility; and (iii) the roadway bridge.

- **Minimal neighborhood impact west of A-2 Station** – The surrounding neighborhood is predominately single-family residential. It is important to minimize noise and visual impacts to neighbors, particularly those residing along 113th Ave SE. To the extent possible, transit and automobiles heading to A-2 should be kept off of 113th Ave SE. Consideration should be given to reducing the height of the parking facility to below the 30 foot height restrictions in the Bellevue City Codes, and to terracing the facility to reduce visual impacts along 113th Ave SE.

- **Minimal traffic impacts on surrounding area –** Community members have expressed a desire to minimize additional traffic on 113th Ave SE (both transit vehicles and private automobiles) and to prevent potential cut-through traffic into the station via 108th Ave SE and other north-south arterials. To the extent possible, transit and automobiles heading to A-2 should be kept off of 113th Ave SE.

- **Pedestrian and bicycle access** – Pedestrians and bicyclists need to have easy and direct access to the transit center and the elevated station platform. Due to the slope of 113th Ave SE relative to the A-2 Station, elevators and ramps would provide means of access for non-auto/non-transit users from the surrounding community. Safe pathways from both sides of Bellevue Way to the rail platform and transit center are necessary for pedestrians and bicyclists.

- **Pedestrian safety** – Designs with direct and intuitive walking paths and sidewalks would reduce the potential for conflicts between vehicles and pedestrians where they may interface. Dedicated pedestrian paths on the parking levels would also improve safety. Station planning should also

seek to avoid dead-end corridors and unmonitored or visually obstructed areas to enhance safety.

- **Redundant parking access/egress** – To provide adequate capacity for peak loads and to distribute traffic using the facility, particularly during the evening periods, two exits should be provided. A second entry point would also help optimize operations.
- **Safe and efficient I-90 On-/Off-Ramp operations** – The I-90 on-/off-ramps are located due east of the proposed A-2 Station location. Traffic to and from the A-2 Station must be handled in a way to allow for safe and efficient operation of these existing high-speed on- and off-ramps. Based on discussions with WSDOT and considering existing merge distances, a new signalized intersection at SE 30th Street and Bellevue Way SE in the northbound direction would not be recommended for merge and safety reasons. Additionally, while a southbound signal is not optimal from a WSDOT perspective, a new signal would be acceptable if it represents the best solution from a safety, flow, and operations perspective.
- **Transit operations into/out of the Transit Center** – Buses need to enter and exit the facility efficiently, while minimizing impact on the local neighborhoods and operations on 113$^{th}$ Ave SE. Maximum acceptable grades for ramps leading to the facility should meet King County Metro Facility Design Guidelines and applicable Sound Transit standards. In this case, the King County Metro Guidelines specify that grades over 6-7% impose operating restrictions on buses.

# 6 A-2 Station concept development

## 6.1 Background

Several new potential station concepts were proposed to optimize the SBSALA A-2 Station concept and accommodate design considerations identified in Section 5. These refined station concepts were presented to the City of Bellevue on January 13 for the Project Team Workshop and reported in Technical Memo 13.

## 6.2 Potential station alternatives

Alternate station concepts were also considered, which included:

- Relocating the entire A-2 Station to SE 34th Street to reduce potential land takes and reduce walking distances to the platform from the garage;
- Building the 118th Station (B7 Alternative), in addition to the A-2 Station, to provide additional parking capacity to reduce the size of the A-2 Station garage; and
- Preserving the existing South Bellevue Park-and-Ride and connecting it to the A-2 Station with a moving sidewalk.

These alternatives are presented in Technical Memo 13 (TM13), B7-Revised Optimization.

## 6.3 Potential A-2 Station refinements considered

Several refinements to the SBSALA A-2 Station concept were considered. These potential refinements are summarized below (note – some of these concepts are mutually exclusive):

- **Transit Center location**
    - Moving the transit center to the top level to improve connectivity.
    - Moving the kiss-and-ride curb to the top level to improve connectivity.
    - Providing contiguous sidewalks and walking paths on the transit center level to prevent pedestrians from having to cross active bus zones at-grade.
    - Providing pedestrian bridges (at Level 6) over a depressed transit center (at Level 5) to provide a direct walking path from the rail station and pedestrian bridge to the elevators and parking levels beneath.
- **Transit Center access**
    - Permitting access from 113th Ave SE to a transit center on the top level to allow the parking structure to extend further east.

- **Parking garage height, layout, and access**
  - Reducing the number of parking levels to reduce costs and excavation volumes, as well as visual impacts along 113th Avenue SE.
  - Reconfiguring the proposed roundabout to the north of the station to allow for enhanced traffic operations and space for parking.
- **Elevated rail platform configuration**
  - Adopting a center platform for the aerial station to reduce costs associated with vertical circulation.
- **Pedestrian bridge configuration**
  - Angling the pedestrian bridge to connect with the middle of the aerial platform to reduce walking distances and the necessary height of the station and bridge.
- **Pedestrian and bicycle access**
  - Providing a continuous sidewalk on the east side of 113th Ave SE to improve access to the station.

## 6.4 Design consensus from January 13th Project Team Workshop

At the January 13th Project Team Workshop, valuable feedback was provided to the project team based on the initial station concepts introduced in Section 6.3. The following design principles emerged from this workshop:

- A-2 Station should be sited at the SBSALA proposed location, to the northwest of the I-90 ramps, along the east side of 113th Ave SE;
- A transit center at the upper level of the A-2 Station parking garage should be developed to improve transfers and connectivity;
- Visual impacts along 113th Ave SE should be reduced to the extent possible by terracing parking levels;
- King County Metro and Sound Transit bus operations should avoid 113th Ave SE due to noise considerations; and
- Traffic movements along 113th Ave SE to and from the A-2 Station should be minimized to the extent possible.

Additionally under the B7-Revised alternative, the existing South Bellevue Park-and-Ride would be closed. All existing King County Metro and Sound Transit vehicles and paratransit would be re-routed to serve A-2 Station as defined in the SBSALA study and the Sound Transit East Link Integration Plan. This is in contrast to the B7/C9T alternative, which would keep the Park-and-Ride in operation.

# 7 Optimized station concept

Based on feedback from the January 13th Project Team Workshop noted in Section 6.4, as well as additional input, the project team developed the preferred station concept.

## 7.1 Key station components

Key station components of the preferred A-2 Station concept would include the following as shown in Table 8 below:

| Category | Components | Description |
|---|---|---|
| Rail Platform | Platform Configuration | • Center platform configuration proposed to reduce vertical circulation requirements<br>• Stairwells provided at both ends of the platform for life safety requirements<br>• Concourse provided under the platform for ticketing |
| | Pedestrian Bridge from LRT to Transit Center | • Pedestrian bridge angled to meet up with the middle of the platform/ concourse to reduce average walking distance and height of the station platform and the bridge<br>• Pedestrian bridge covered to protect against the elements. |
| Transit Center and Parking Garage | Transit Center | • Transit center placed at top level of facility (Level 5) at south end of facility for efficient transfers to buses/vans<br>• Bus, van, and kiss-and-ride facilities to meet required station program |
| | Parking Garage | • Four levels of parking, accommodating 1,450 spaces<br>• Bank of elevators provided at southwest corner of facility |
| Station Access Facilities | Bridge over I-90 Ramps | • New bridge provided over the I-90 ramps to allow NB traffic from the I-90 off-ramps to access the station without making a left-turn at the SE 30th and Bellevue Way intersection |
| | Intersection with 113th Ave SE | • New access road along the north of the parking facility to link the new bridge over I-90 to 113th Ave SE |
| | Pedestrian/ Bicycle Facilities | • A new 10 foot sidewalk along east side of 113th Ave SE<br>• An elevator at southwest corner of facility to link neighborhood and 113th SE to the transit center |
| | Ramp to Level 5 Transit Center | • Ramp on east side of parking garage provided for entry/exit at Level 4 and access to transit center at Level 5<br>• Ramp has 5.8% grade which is within King County Metro and Sound Transit bus operating standards |

Table 8 – Key A-2 Station Components

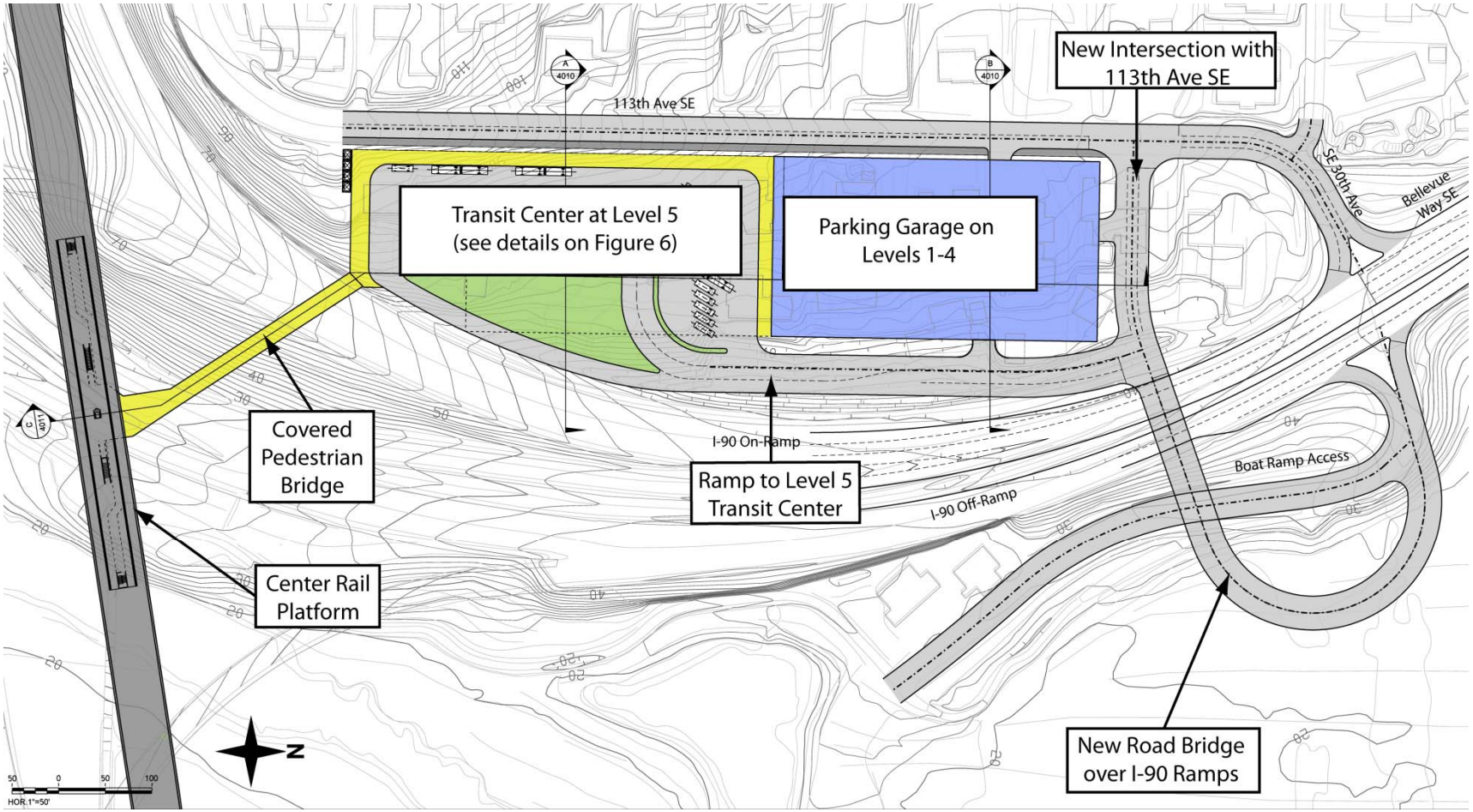



Figure 4 – Preferred A-2 Station: Overall layout and key elements

## 7.2 Station access

### 7.2.1 Vehicular access to the site

External access to the site is depicted in Figure 5. Three ways exist to access the station with an automobile:

- From the south along 113th Ave SE from areas to the west of the station through the Enatai neighborhood
- From the north along southbound Bellevue Way via 113th Ave SE
- From the south along the northbound I-90 off-ramps via the proposed new road bridge over the I-90 ramps

At the intersection of SE 30th Street and Bellevue Way, a right-in and right-out system would be adopted to provide access off of Bellevue Way. Vehicles currently traveling northbound from the I-90 off-ramps can make a left-turn at this intersection – in the future this movement would not be permitted. The left-turn pocket from northbound Bellevue Way into SE 30th would be removed and a solid median would be built through the intersection.

Other key access components are as follows (see Technical Memo 4 (TM04) for further discussion):

- Based on the traffic demand analysis, a double-right turn lane would be required to accommodate PM peak traffic from the station onto the I-90 on-ramps from SE 30th Street.
- A partial signal would be required at the intersection of SE 30th and Bellevue Way. The signal would control the southbound Bellevue Way movement and the SE 30th Street movement from the station onto the I-90 ramps. No signal would be required in the northbound direction. This partial signal is acceptable to WSDOT so long as it improves traffic operations and flow and is the best vehicular access option for the new A-2 Station.
- The southbound portion of Bellevue Way just south of the SE 30th Street intersection would be widened to three lanes prior to the I-90 on-ramps. At present, the I-90 on-ramp already has three lanes with an inside HOV lane and eastbound and westbound lanes, respectively. The existing outside southbound lane would be extended back approximately 200 feet to the Bellevue Way / SE 30th Street intersection.
- Along southbound Bellevue Way north of the SE 30th Street intersection, a right-turn pocket would be added to allow for right-turns as well as through-movements. This pocket would be approximately 200 feet.
- A new right-turn pocket would be provided off of the I-90 off-ramps to the new road bridge and Boat Access ramp. This pocket would be approximately 200 feet long.

- A new acceleration lane would be provided along northbound Bellevue Way to allow vehicles to safely merge from the road bridge and boat ramp onto Bellevue Way. This acceleration lane would be approximately 200 feet long.
- The Boat Access ramp to Mercer Slough on the east side of Bellevue Way would be accessed by northbound Bellevue Way traffic through a right turn from the new ramp from the I-90 off-ramps to the A-2 Station. Southbound Bellevue Way traffic would cross the new road bridge via 113th Avenue SE to read the Boat Access ramp.

Internal intersections around the station and the parking entry and exit points would be controlled with stop signs. Based on the traffic analysis, no new signals would be required in the vicinity of the station besides the partial signal mentioned for the SE 30th and Bellevue Way intersection.

### 7.2.2 Transit Center access for Sound Transit and King County Transit

Sound Transit and King County Metro buses would primarily access A-2 Station and the Level 5 transit center (as described in Section 7.3) in two ways:[2]

- From the north along southbound Bellevue Way via 113th Ave SE
- From the south along the northbound I-90 off-ramps via the proposed new road bridge over the I-90 ramps

A ramp along the east side of the parking garage would provide access to reach the top level of the facility where the transit center is located. Buses heading southbound from Bellevue Way would turn right onto SE 30th/113th Ave SE, left at the new T-junction and then turn right onto the ramp. Buses heading northbound from the I-90 off-ramps would cross the new road bridge, and then turn left onto the ramp.

The ramp grade of approximately 5.8% would meet the 6-7% grades dictated by the King County Metro Transportation Facility Design Guidelines.

### 7.2.3 Vehicular access to parking garage[3]

Access points to the parking garage are described below and shown in Figure 5:

- **Level 3 Entry** – A dedicated entry point would be provided along the north end of the facility at Level 3. This entry point would only allow "right-in" movements to enter the garage. Left turns into the garage at this entry point would be prohibited for traffic flow purposes – traffic coming off the I-90 off-ramps would use the Level 4 entry to reduce conflicts.

[2] Route 222 (to be renumbered as 249 in the future) would likely be the only bus to access the facility from Enatai and the local streets west of the station.
[3] As noted, Section 8 describes an alternate station concept in which the designated entry and exit points are modified from what is defined here.

- **Level 3 Exit** – A dedicated exit point would be provided along 113th Ave SE from Level 3. This exit point would allow left- and right-turn movements out of the garage. This access point would be controlled with a stop sign.
- **Level 4 Entry/Exit** – One entry/exit point would be provided from the ramp on the east side of the facility.

The parking garages would be linked to the transit center on Level 5 and the bridge to the rail platform by a bank of four elevators located at the southwest end of the garage.

### 7.2.4 Kiss-and-Ride access

Kiss-and-ride facilities would be located on the same level as the transit center, at Level 5. Kiss-and-ride users would access A-2 Station in a similar fashion to the King County Metro and Sound Transit vehicles.

### 7.2.5 Pedestrian and bicycle access

From the Enatai neighborhood to the west, pedestrians and bicyclists would use a new 10-foot sidewalk on the east side of 113th Ave SE to access A-2 Station. However, the transit center at Level 5 would be between 15-25 feet below the 113th Ave SE street level (which rises in elevation towards the south), thus, a proposed 113th Ave SE sidewalk (10 feet wide) would link to A-2 Station at two specific locations:

- At the southwest corner of the facility where an elevator would provide access to the Level 5 transit center from the sidewalk;[4] and
- At the Level 3 exit along 113th Ave SE at the northwest corner of the facility.

Bicyclists, pedestrians, as well as park-and-ride users would primarily use the elevator at the southwest corner.[5] Bicyclists and pedestrians could also use the Level 3 exit to access A-2 Station, although internal cycle and pedestrian movements within the garage need to be safely segregated to minimize effect on internal traffic circulation within the garage.

[4] As mentioned, four elevators would be provided in the southwest corner of the facility –the west-most elevator would provide access to the sidewalk along 113th Ave SE.
[5] A sloping ramp could also be provided for ADA and bicycle users. However, since elevator capacity would already be provided to link the transit center level with the underground parking, an additional sloping ramp would require additional expense.

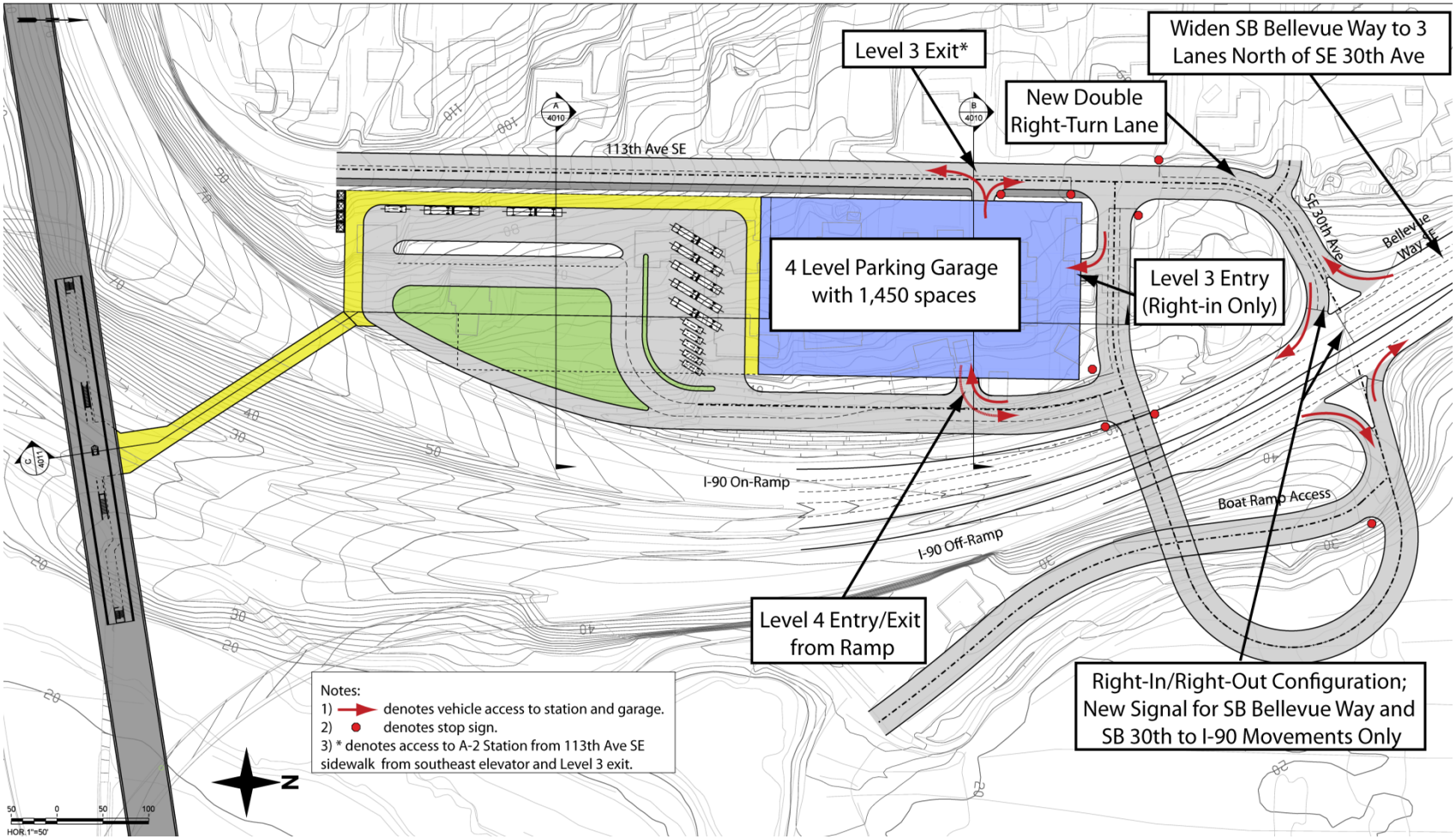



Figure 5 – Preferred A-2 Station: External vehicle access

## 7.3 Facility layout

### 7.3.1 Elevated rail platform and pedestrian bridge

The rail platform would be elevated over the I-90 ramps and have a center platform configuration with boarding and alighting through the left-side doors of the LRT trains. The center platform configuration would reduce direct station costs primarily by reducing the number of vertical circulation elements required. The rail platform would have the following elements:

- The platform would be 380 feet long to accommodate maximum envisioned train consists.
- A concourse would be located under the platform for the station attendant and ticket vending machines.
- Two elevators would be provided for ADA access and redundancy;
- Two escalators and two stairs would be provided;
- One emergency open stairwell would be provided at the east end of the platform to comply with National Fire Protection Association 130 (NFPA 130) - Standard for Fixed Guideway Transit and Passenger Rail Systems;[6] and
- Wind protection as per Sound Transit Design Standards Guidelines (Section 5.5) as appropriate.[7]

The rail platform would be connected to the transit center and parking garage with a covered pedestrian bridge (which would also serve as the primary escape during a fire event). The pedestrian bridge would be approximately 300 feet long and would be angled to meet up with the middle of the platform/ concourse to reduce average walking distance to the ends of the rail platform. The pedestrian bridge would be level – that is there would be no grade change from the platform to the transit center. To shorten the walk access time, a moving sidewalk could be considered as one potential solution.

### 7.3.2 Transit Center (Level 5)

The transit center would occupy all of Level 5, which is about half the area of a typical level of parking. The transit center would be divided into three areas by operation as depicted in Figure 6:

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[6] This stairwell could meet with walk/bike trails on the west side of Mercer Slough to satisfy the NFPA 130 requirements. Additional discussion of fire engineering is included in Section 9.

[7] Additional studies would be required during subsequent design phases to determine the prevailing wind conditions throughout the year at the proposed elevated LRT platform. Results of these studies would inform the selection of appropriate wind protection measures and costs of such measures. Potential buffering strategies could include installing wind barriers on the outside of the LRT platform tracks.

- **Layover** – Layover space for five vans and five buses would be provided at the north end of Level 5. The design of the layover area would permit buses to circulate into and out of the loading areas from the layover area.
- **Bus and van bays** – Boarding areas would be provided along the western edge of the transit center. One van and two bus bays would be provided alongside the curb. The van bay would be 55 feet long to accommodate two vans simultaneously, while the two bus bays would each be 175 feet long to accommodate two articulated 60-foot buses at the same time. Private automobiles would be restricted from entering the bus loading areas – perhaps by colored pavement or bollards.
- **Kiss-and-Ride** – Kiss-and-ride would be provided along a 240 foot curb to the east of the bus and van bays. Assuming 20 feet per vehicle, the curb would accommodate up to 12 vehicles at any given time.

Passenger waiting and transfer areas would be protected from the wind and covered as appropriate pursuant to Sound Transit Design Standards Guidelines (Section 5.5). In addition, a staff restroom would be provided for Sound Transit, King County Metro, and other staff during layovers. The staff restroom would be outfitted and designed according to Sound Transit Design Standard Guidelines (Section 6.1) as well as any applicable King County Metro guidelines.

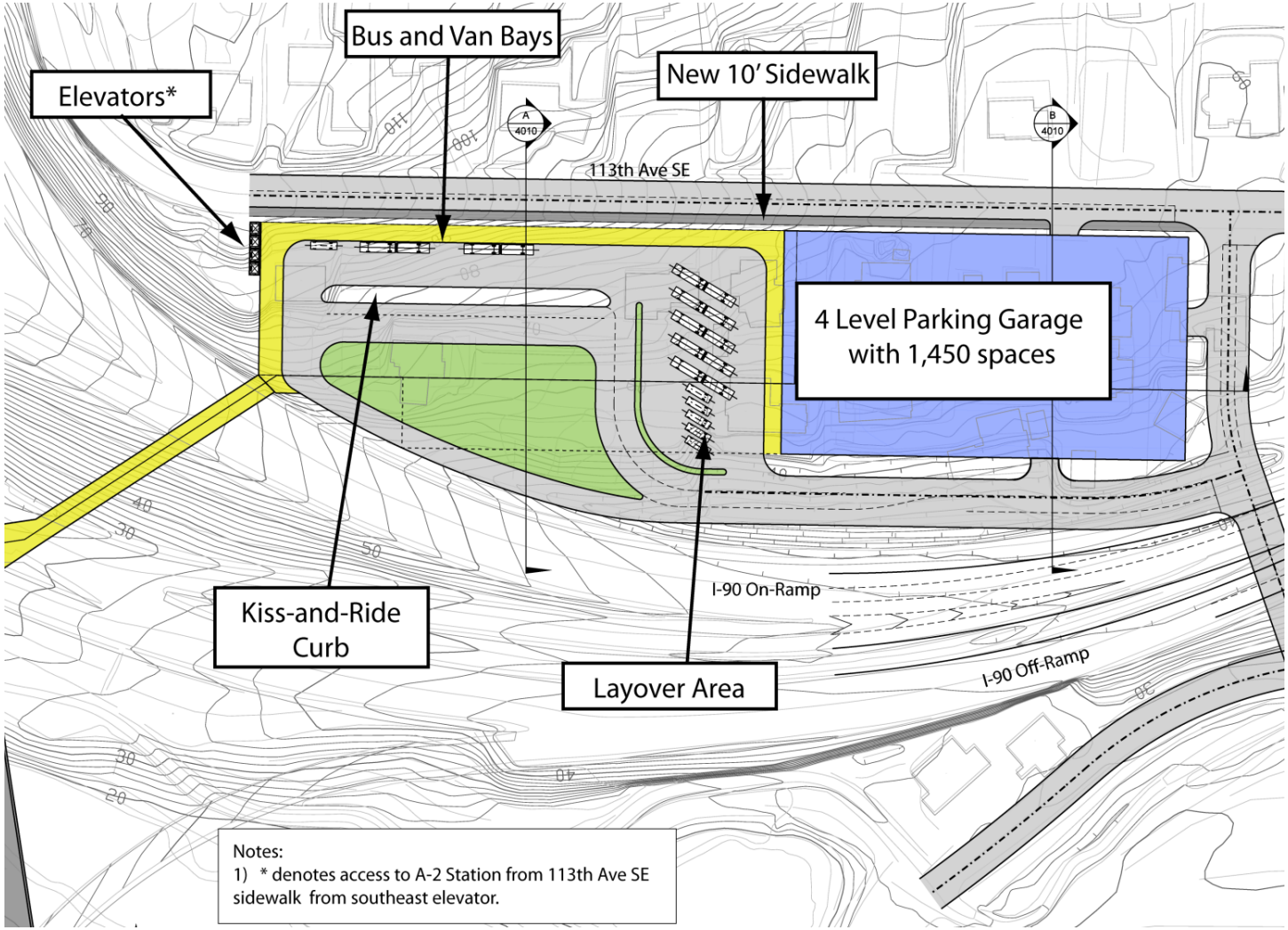



Figure 6 – Optimized A-2 Station: Transit Center configuration

### 7.3.3 Parking Levels (Levels 1-4)

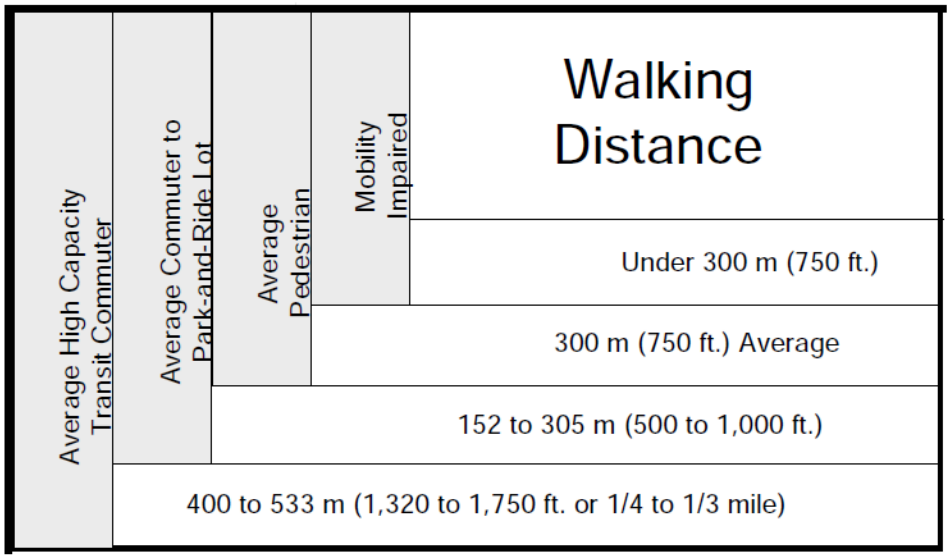
Four levels of parking would be provided, holding upwards of 1,450 spaces. The typical parking level would hold about 400 spaces and measure 190 feet wide (along the east-west axis) and 800 feet long (along the north-south axis). The Level 1 or bottom floor would be a partial floor with about 250 spaces, while Levels 2 through 4 would each hold about 400 spaces. Sloping floors would connect the different levels and also contain parking. Twenty-five (25) ADA spaces would be provided (20 for the first 1,000 spaces and 1 space for each additional 100 spaces).[8]

Levels 1, 2, and 3 would be completely covered and require all-day lighting pursuant to the Sound Transit Design Standard Guidelines (Section 12). The south half of Level 4 would be covered by the Level 5 transit center, while the north half of Level 4 would be uncovered to reduce the effective height and visual impact along 113th Ave SE. At its highest point above 113$^{th}$ Ave SE at the northwest corner of the facility, the parking garage would be approximately 15 feet above the road (Level 4 floor level to 113th Ave SE). This configuration is shown in Figure 10 and Figure 11.

Four elevators at the southwest corner of each parking level would provide access to the upper levels where the transit center and the station platform are located. One elevator would also link to 113th Ave SE. One stairwell would be provided to complement the elevators.

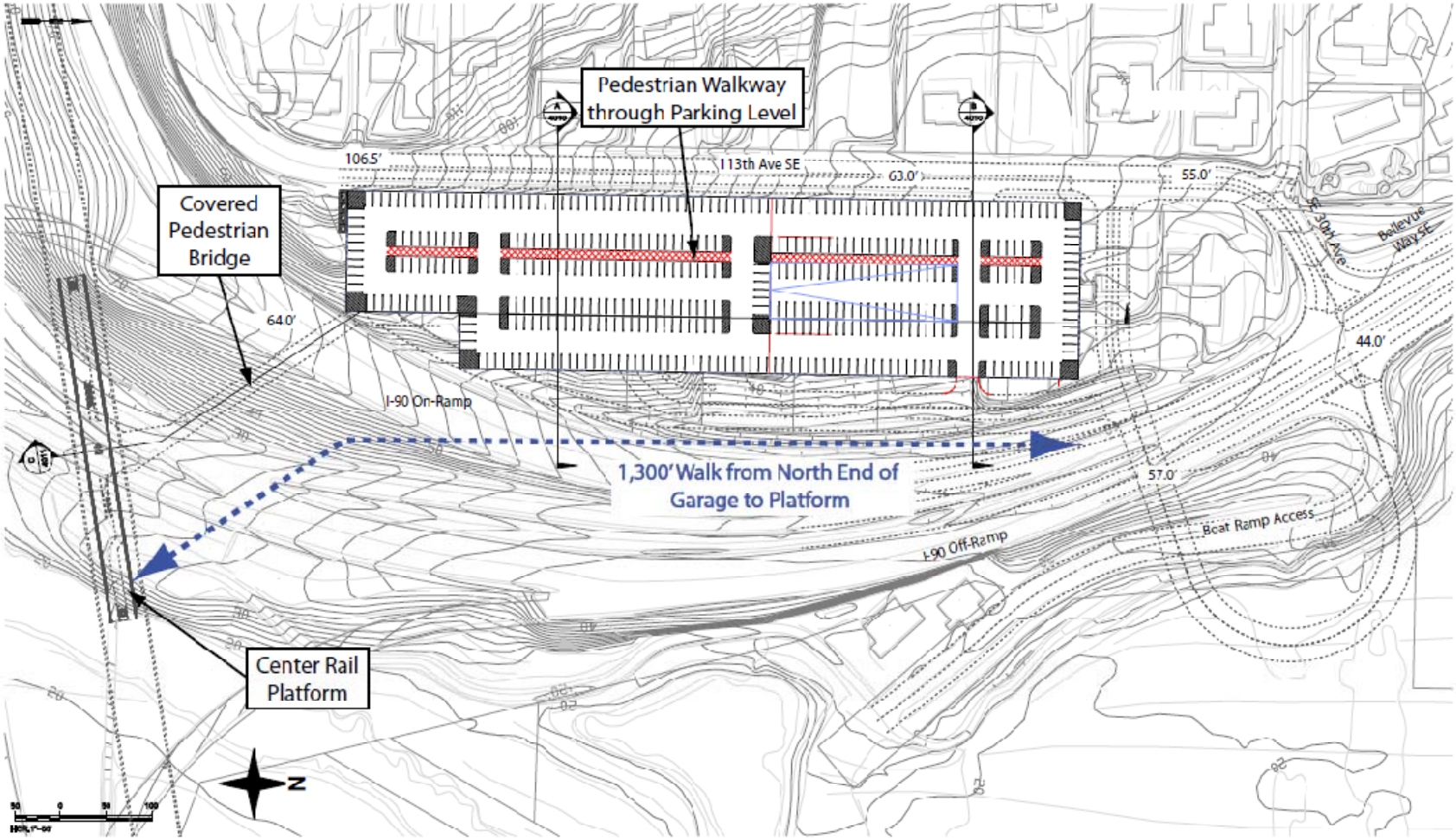
Dedicated pedestrian pathways to the elevators on each floor would be provided along the north-south axis to improve safety as shown in Figure 8. The maximum walking distance from the north end of the parking garage to the rail platform would be 1,300 feet approximately – which is comparable to the longest walking distance from the Eastgate Park-and-Ride to the eastbound I-90 freeway bus station. Also, research has found that this walking distance aligns with average walking distances found for other high capacity transit commuter services such as LRT (see Figure 7).

[8] Americans with Disabilities Act: *ADA Chapter 2: Scoping Requirements, Table 208.2 Parking Spaces.*



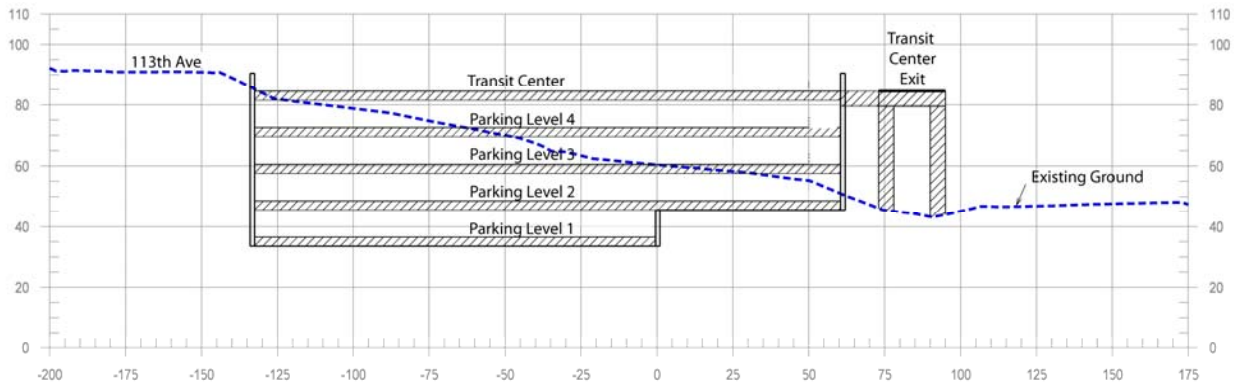

Source: Adapted from A Guide to Land Use and Public Transportation, Sno-Tran, December 1989.

Figure 7 – Average walking distance under normal conditions

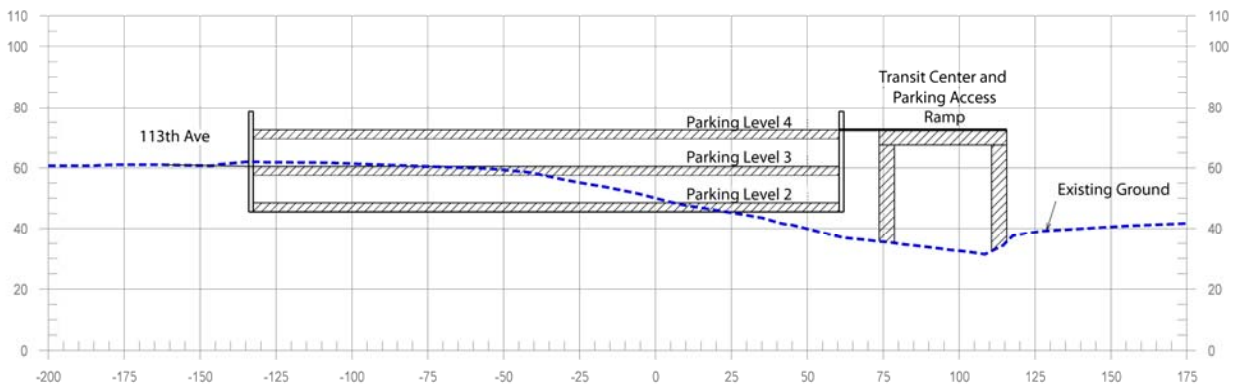



Notes: Level 1 has 250 spaces and is half the size of the typical parking level.

Figure 8 – Optimized A-2 Station: Typical parking level (Levels 2-4)




**SECTION A**




**SECTION B**

Figure 9 – Optimized A-2 Station: Cross-Sections A and B

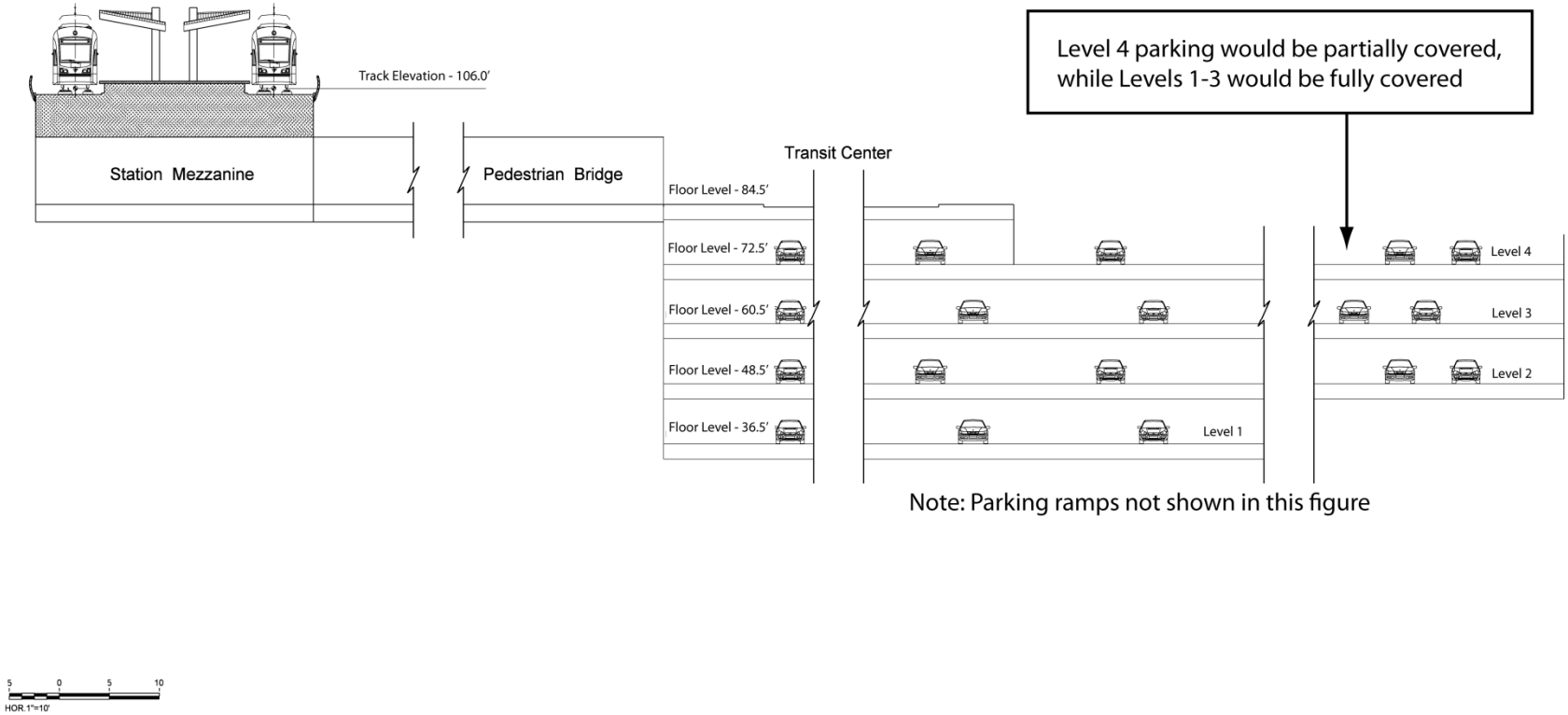



Figure 10 – Optimized A-2 Station: Typical long-Section

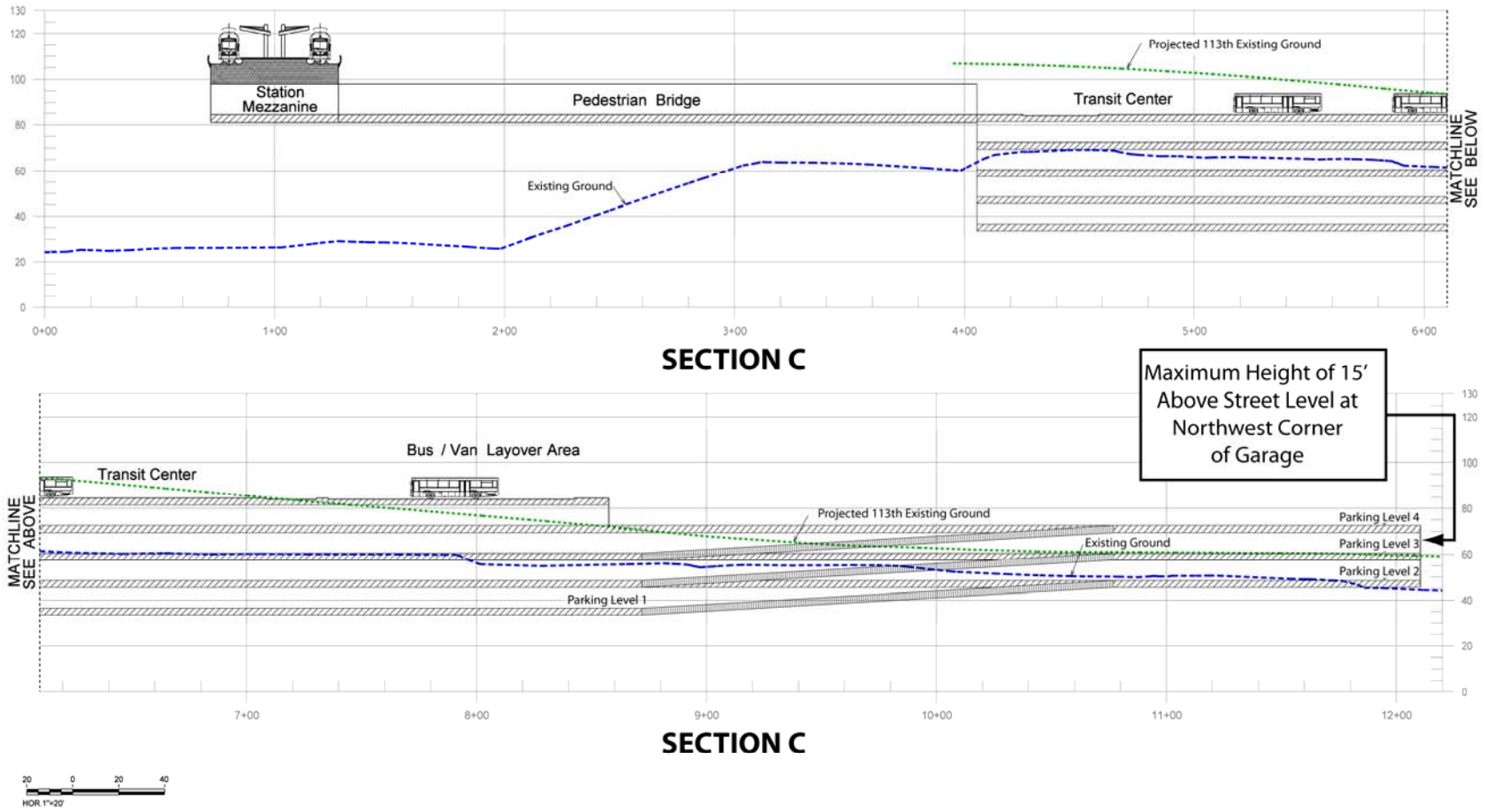



Figure 11 – Optimized A-2 Station - Section C

## 7.4 Summary of A-2 Station concept improvements

Building on the SBSALA A-2 Station concept, the optimized station would include:

- Reduced excavation and costs associated with a five-level, rather than a six-level structure;
- More efficient bus and kiss-and-ride transfers to rail with a transit center at the top level that decreases transfer walking distances and vertical circulation requirements;
- Reduced number of parking levels required by reconfiguring the road network to the station;
- Improved distribution of traffic to the parking garage with a second entry point;
- Lowered platform elevation by linking the pedestrian bridge to the middle of the platform, which also would shorten walking distances to the east end of the platform;
- Reduced visual impacts along 113$^{th}$ SE Avenue by terracing the parking garage and leaving the Level 4 parking lot uncovered; and
- Pedestrian and bicycle access with an elevator and stairwell linking 113$^{th}$ SE Avenue directly with the transit center at Level 5.

Renderings of the preferred A-2 Station concept are shown in Figure 12 and Figure 13. This A-2 Station concept was presented at the March Public Open house.

Note: This visualization was presented at the March Public Workshop.

Figure 12 – Optimized A-2 Station: Rendering view from the southeast

Note: This visualization was presented at the March Public Workshop.

Figure 13 – Optimized A-2 Station: Rendering view from the southeast

# 8 Potential design enhancements

The optimized A-2 Station concept detailed in Section 7 was presented at the March Public Workshop. Subsequently, comments were reviewed from the City of Bellevue, Sound Transit and King County Metro. Although no fatal flaws were identified in the optimized station concept, several enhancements were suggested for safety and operating efficiency as well as pedestrian and bicycle access. These suggestions included:

- Increasing the segregation and separation of transit, Kiss-and-Ride, and Park-and-Ride users;
- Providing a secondary access point to the transit center so bus operations are not disrupted in case of a disabled vehicle or an accident on the ramp;
- Enhancing pedestrian and bicycle access from southbound Bellevue Way as well as from the east side of Bellevue Way and Mercer Slough; and
- Converting the Level 4 entry/exit point along the east ramp into a dedicated entry point, then allowing right-in and right-out movements at the Level 3 access point on the north side of the parking structure.

Potential enhancements to the design were developed to address some of these issues. These include:

- Separating the transit and Kiss-and-Ride facilities and functions by placing the latter in its own dedicated area at the north end of Level 5. With this configuration, transit vehicles re-circulating through the transit center would not cross the path of private automobiles.
- Permitting entry-only at the Level 4 access point from the ramp to reduce the chance of incidents between transit and exiting vehicles on the ramp.
- Permitting right-in and right-out movements at the Level 3 access point on the north side of the parking structure.
- Permitting emergency access from 113th Ave SE to a transit center on the top level to remove disabled buses, to serve the transit center in case of the east access ramp being closed, or to allow emergency vehicles to access the transit center and rail platform.
- Providing an 8-foot walk/cycle path on the road bridge crossing I-90 to link the Mercer Slough trails and the east side of Bellevue Way with the A-2 Station. This path would continue up the east side of the bus ramp to the Level 5 transit center and keep bicycle traffic out of automobile/bus rights-of-way.
- Providing a 6-foot sidewalk along SE 30$^{th}$ Street and 113$^{th}$ Avenue SE to improve access from southbound Bellevue Way.

The figures below show the modifications, which would only affect the Level 5 transit center and access to the station. The configurations for Levels 1 through 4 would remain unchanged (as depicted in Figure 8 through Figure 11). No new visualization was produced for this alternate design.

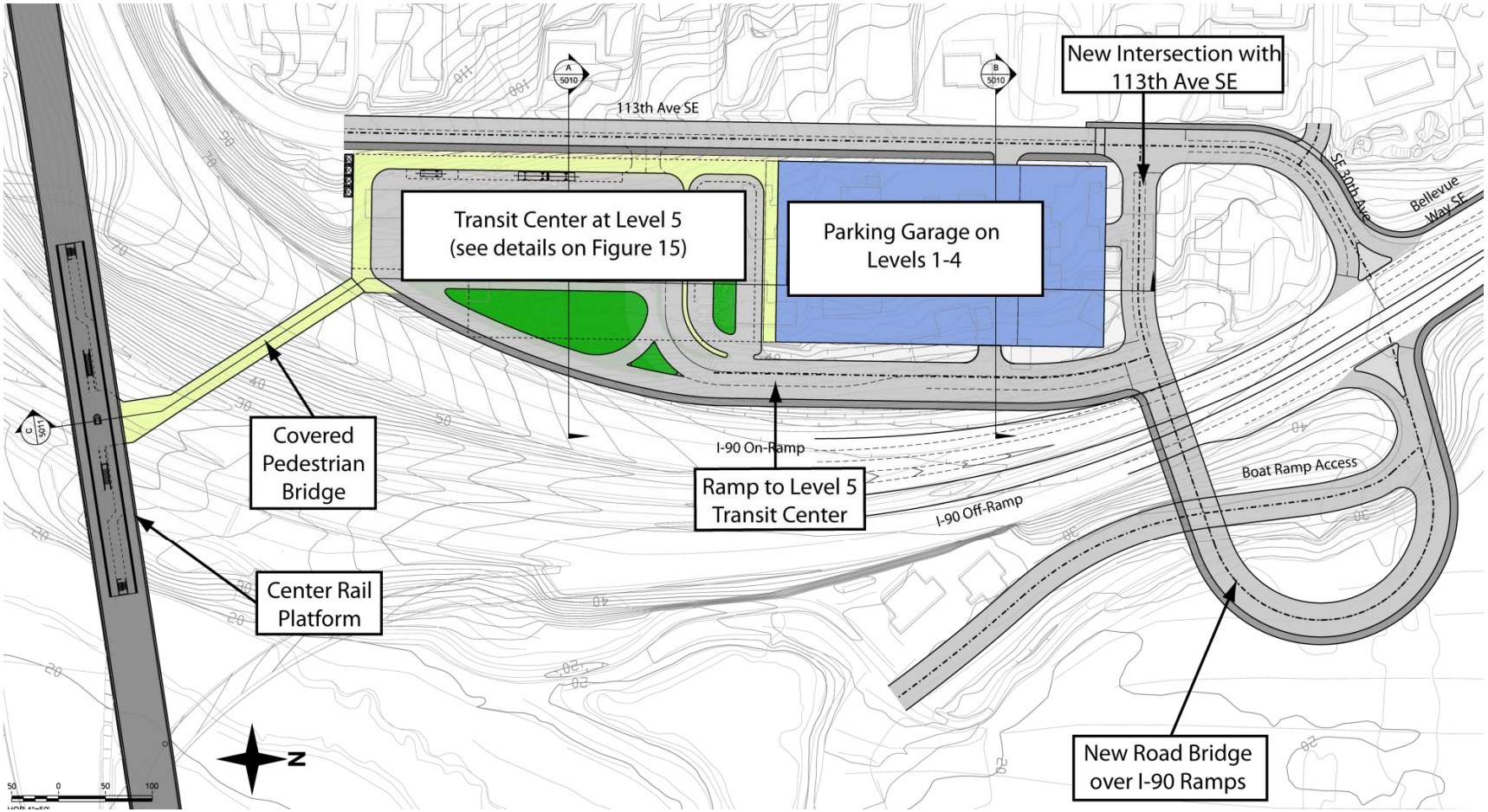



Figure 14 – Potential alternate A-2 Station design: Overall layout and key Elements

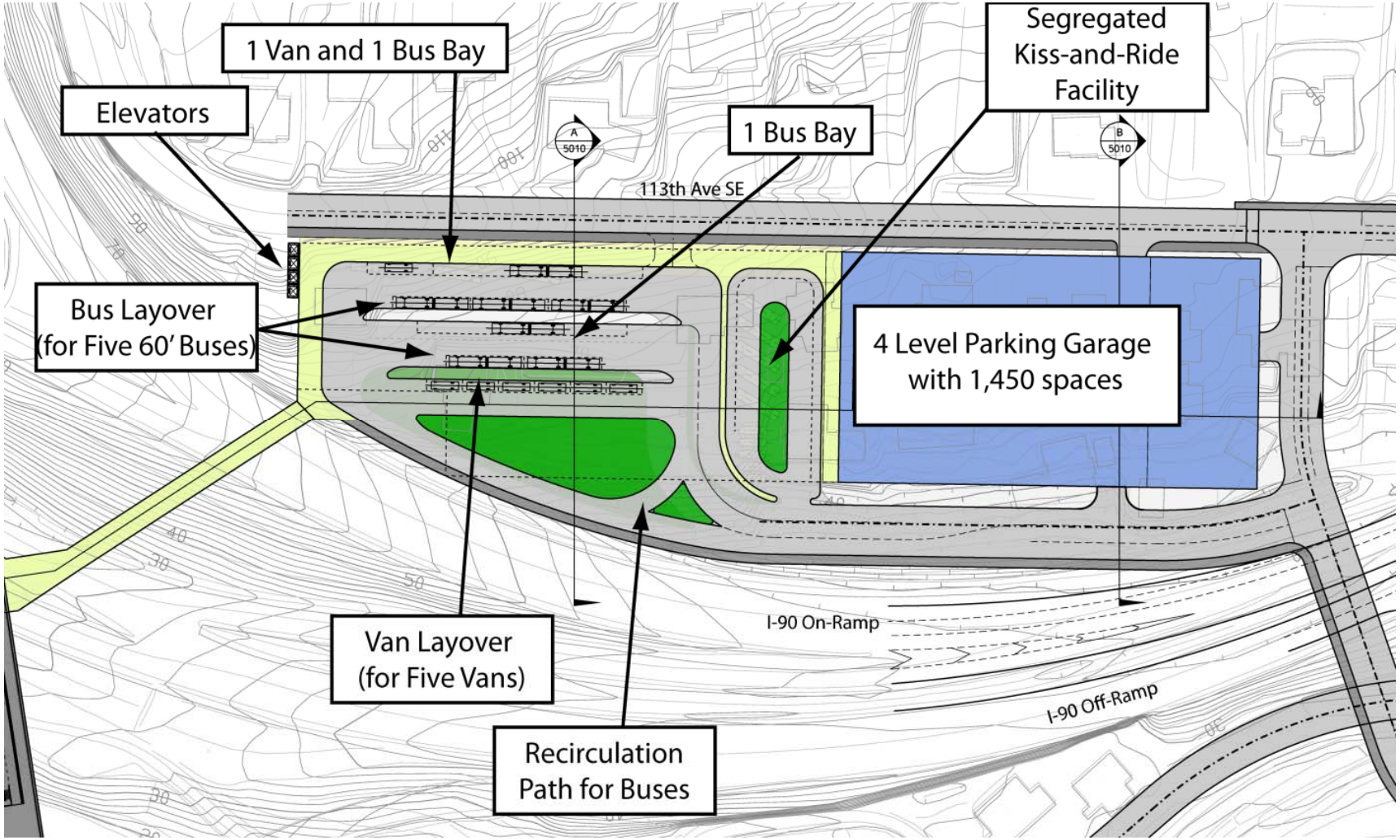



Figure 15 – Potential alternate A-2 Station design: Transit Center configuration

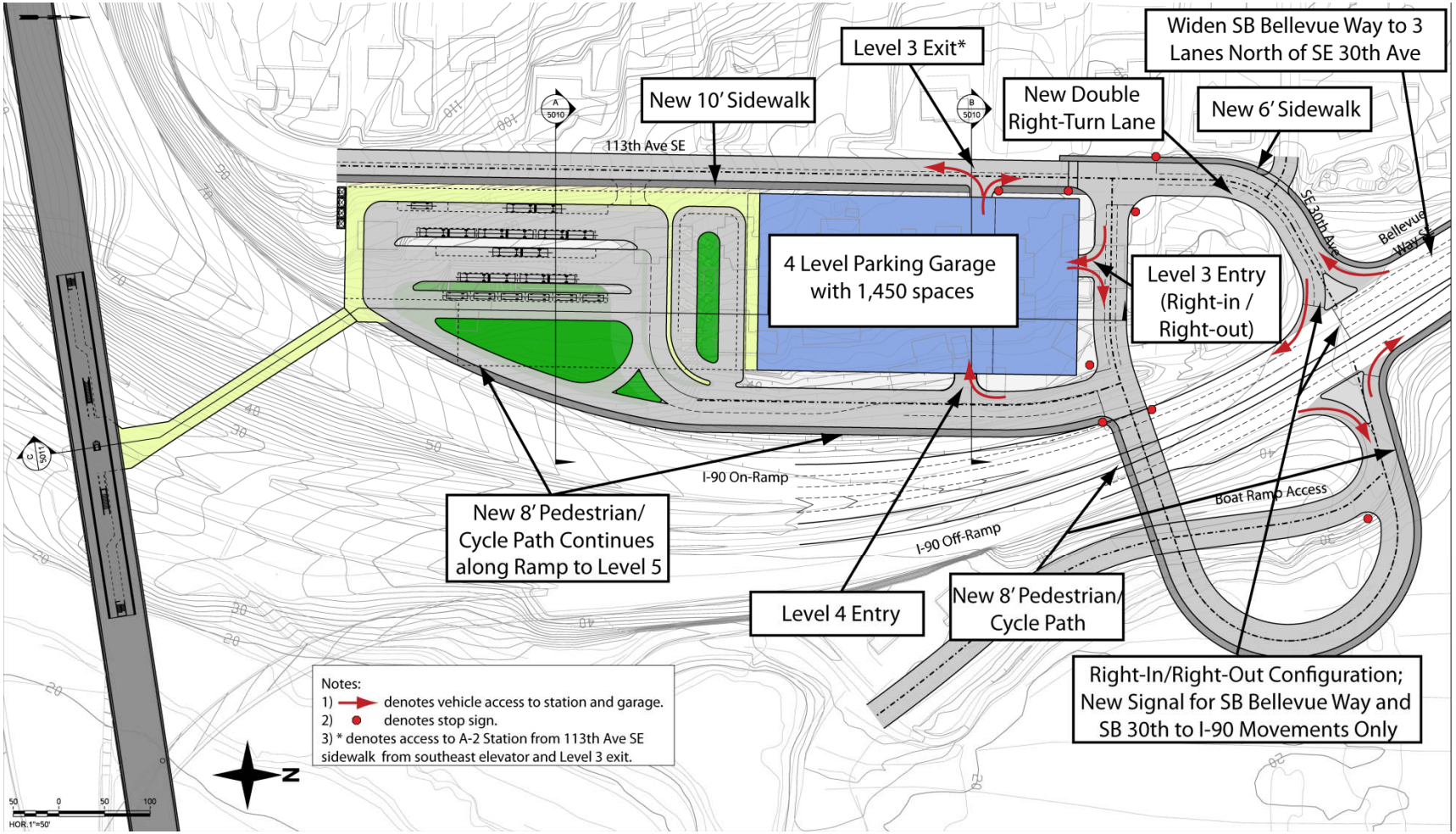



Figure 16 – Potential alternate A-2 Station design: External Access

# 9 Engineering considerations

### 9.1.1 Utilities evaluation

The utilities potentially impacted by this proposal front the site along 113th Ave SE and provide connection to existing residences. Utilities that run parallel to the existing I-90 ramps would likely be unaffected by the future site plan. Preliminary investigation indicates that they are beyond the limit of work. In some instances, the elevation of storm drain and potable water would need to be modified. These, however, would be considered minor impacts.

#### 9.1.1.1 Telecommunications and electrical

The electrical service to the existing properties fronting 113th Ave SE is serviced by an overhead line on the east side of the roadway. It is likely that this service would need to be relocated and/or modified to accommodate the future facility. An existing high voltage transmission line traverses the northern end of the site at the intersection of SE 30th Street and 113th Ave SE and Bellevue Way. It is likely that the future structures traversing the I-90 ramps and future at- grade intersection would not impact this asset as the lines are likely high enough not to be affected.

Telecommunication assets are distributed along the same overhead line as the electrical and would be similarly impacted.

#### 9.1.1.2 Potable water

The potable water supply fronts the eastern side of 113th Ave SE, approximately offset 10 feet from the existing roadway centerline. The service is a 12 inch ductile iron (DI) service at either end of the site frontage and curtailed to a 6 inch asbestos cement (AC). The 6 inch AC line is transitioned by two fire hydrants. Existing potable water service would likely be unaffected by the future A-2 Station. Potable water service for the future facility could be taken from the existing main provided the local water authority consent to the connection. To provide fire service to the facility, the flow, head and hydrant location would be assessed and approved by the local fire marshal prior to implementation.

#### 9.1.1.3 Sanitary sewer

The existing sanitary sewer is located close to the center of 113th Ave SE. It is an 8 inch AC line that flows to the north. The existing line would likely be unaffected by the future development. A 6 inch internal service line would need to be appropriately abandoned and removed for the future facility. This would not impact any service to surrounding areas.

#### 9.1.1.4 Stormwater drainage

The existing stormwater network is a series of 12 inch and 18 inch concrete pipelines fronting the site. The network would remain unaffected by the future development, but connections to these assets would be anticipated due to the future reconfiguration of the surrounding intersections.

The station will increase the impervious area and it is likely that detention structures would be needed to attenuate the outflow.

### 9.1.2 Fire and life safety considerations

#### 9.1.2.1 Minimum station exit requirements

Based on NFPA 130, minimum station exiting requirements would be as follows:

- For an open, exterior station enclosed emergency exits (i.e. fire rated enclosures) are not required. The stair enclosures can be open or the glass enclosures can be used.
- Two independent means of egress need to be provided from the station.
- Open stairs and escalators can be used as a means of egress
- A means of egress has to be provided within 82 feet from the ends of the platform. This can be via an open stair or escalator.

#### 9.1.2.2 General exiting approach

The pedestrian bridge can be considered as the main access to the elevated rail platform. A concourse under the platform would provide access to the stairs and escalators up to the platform. One stairwell would be recommended to have access to the ground, while the pedestrian bridge could be considered the other exit to meet the NFPA standards. If the pedestrian bridge lands at a concourse below the platform a rated opening would not be necessary.

The location of the access stair should be coordinated with the fire department staging area. One option would be to use the east exit stair as the alternative exit, which would have direct access to grade near walk/cycle paths on the west side of Mercer Slough. The concourse could be provided with access to this stair in the event the pedestrian bridge is not usable as an alternate exit from the platform.

Due to the location of the platform (i.e. elevated above a freeway), a risk analysis should be conducted to determine the likelihood of an incident below the bridge and the impact to the station. Findings would guide other life safety and exiting requirements.

### 9.1.3 Grading / roadway cut and fill

The construction of the new parking garage would require cut material to be removed. Approximately 127,000 cubic yards of material would need to be cut to construct the parking garage, transit center, and associated station access roadways (including the new bridge over I-90).

The current roadway designs would also require fill material within the retained structures. The new elevated crossing of Bellevue Way would require about 15,300 cubic yards of fill material and could accommodate a sloped embankment (not shown) which would require an additional 5,800 cubic yards. The segment of roadway alongside the north end of the parking garage would require 4,400 cubic yards of fill material. The construction of the additional I-90 on-ramp lane starting from the Bellevue Way and SE 30$^{th}$ Street intersection would be about 65 cubic yards. While spoil could also be used in some areas for landscaping, the majority will be removed from site.

### 9.1.4 Geotechnical evaluation of A-2 Station site

#### 9.1.4.1 Site conditions and A-2 Station

A-2 Station is currently planned along the eastern slope of a north-south trending ridge located between 113th Ave SE and Bellevue Way SE at the intersection of those roadways with I-90, in Bellevue, Washington. The current plan would provide 4 levels of parking, which would require a cut up to 60 feet deep, depending up on ground level. The elevation of the western property boundary varies from approximately 105 feet at the south end to 60 feet at the north end, the planned base of the structure would be 33 feet.

A pedestrian bridge with one intermediate support would link the parking garage to the elevated rail platform. The foundations for the elevated guideway and station platforms are discussed in Technical Memo 06.

#### 9.1.4.2 Soil and groundwater conditions at the site

In general, a review of the surficial geology maps of the ridge and test borings closest to the site indicate that the stratigraphy of the ridge includes a glacial till cap overlying glacial advanced outwash deposits. The closest borings to the site are 100-200 feet from the east boundary of the project area.

The glacial till consists of a very dense to dense silty gray sand. Advance outwash deposits underlying the till consist of dense to very dense sand with silt and gravel. Underlying the advanced outwash deposits are glacial transitional beds of similar type to the till and outwash with layers of hard silt. The groundwater table is at an elevation of about 50 feet on the west, which drops down to the elevation of Bellevue Way SE and the Mercer Slough ground surface on the east at between 40 and 50 feet.

Based on these site conditions, the planned base of A-2 Station would be in the dense to very dense advance outwash deposits, which in general would provide good ground support for the structure. The base of the structure would be approximately 17 feet below the permanent groundwater table at the deepest section and just above ground water level at the shallowest section.

#### 9.1.4.3 Site seismicity

The A-2 Station site lies in a region of high historical seismicity in terms of earthquake magnitude and frequency of earthquake occurrence. Four earthquake hazards were previously considered; three were determined not to impact the site including surficial ground rupture from the Seattle Fault, seismically induced landslides, and soil liquefaction. However, seismically induced ground motion must be considered in the design – the Sound Transit Link Light Rail Station Design Criteria provides design earthquake parameters.

#### 9.1.4.4 Geotechnical recommendations

As indicated above, no test borings have been conducted within the planned A-2 Station area. From the project team's experience and engineering judgment, no geologic hazard would appear to impact the site as currently planned. Soils anticipated at the foundation level for either of the two concepts being evaluated are dense glacial soils. Therefore, the structure could be supported on shallow spread footings typically ranging from 18-24 inches in depth below the floor slab. Allowable bearing values for the advance outwash could range from 8-10 kips per square foot, which could be used for planning purposes.

Mass excavation would require a temporary ground support system ranging from 75 to 5 feet in height on the southwest and northeast sides of the structure, respectively. The average excavation heights on the north and the south sides of the planned structure would be about 25 feet.

The site appears feasible for a temporary soil nail system or a soldier pile and tieback system. Some areas may allow for temporary cut slopes during the mass excavation. The dense glacial soils overlying the site typically remain stable for temporary cuts no steeper than 1H:1V.

Due to the groundwater table elevation, temporary dewatering would be required during excavation and construction. Shallow sumps and pumps or deep wells would provide a sufficient means of dewatering the site for the structure excavation. Permanent drainage would also be required for the north, south, and west wall, and the base of the structure.

The long-term pumping requirements for the structure could be significant and potentially lower the groundwater table upslope of the structure and down slope of the structure. Lowering of the groundwater table on the upslope side (west) could result in localized settlement.

Permanent sumps and pumps below the base slab in the structure might also be required to collect the groundwater and pump it out to a local storm drain. The

size of these sumps and pumps could be significant and would require pump tests during the detailed design stage to determine the size of these project elements.

A site-specific field investigation of the project area is required to verify and provide final recommendations.

# 10 Summary and preliminary findings

This Technical Memo highlights key design considerations to optimize the SBSALA A-2 Station concept. Input and feedback from the project team and Sound Transit was used to identify key station requirements and design priorities.

Major goals underpinning the design included reducing the overall A-2 Station cost, improving the rail-to-bus interface at the transit center, providing safe pedestrian access to the elevated platforms, and minimizing traffic and noise impacts from station traffic and transit vehicles on nearby residences and particularly along 113$^{th}$ Ave SE.

The optimized station concept would include:

- A five-level structure including a transit center and parking;
- A transit center on the top level (Level 5) with bus/van layover, bus/van bays, and kiss-and-ride facilities.
- Four levels of terraced parking to accommodate up to 1,450 vehicles.
- A terraced parking structure to reduce visual impacts along 113th Ave SE.
- A new road bridge over the I-90 off-ramps to provide access to the station without having to cross Bellevue Way at-grade;
- A ramp on the east side of the facility to link to the Level 5 transit center;
- One dedicated entry/exit point at Level 4 from the east side ramp, one entry point at Level 3 on the north end of the facility allowing “right-in” movements only, and an exit point at Level 3 onto 113th SE Ave; and
- A partially signalized SE 30th Street and Bellevue Way junction would control the southbound Bellevue Way and the southbound SE 30th Street movements onto the I-90 on-ramps – northbound movements would not be impacted by the signal.

Compared to the SBSALA A-2 Station, the optimized A-2 Station would:

- Improve transfers from bus to rail by placing the transit center atop the structure, closer to the rail platform;
- Reduce the average walking distance to the ends of the rail platform by connecting the pedestrian bridge to the middle of the platform;
- Reduce the number of parking levels and excavation required by reconfiguring the station access road at the north end of the facility;
- Improve traffic distribution with three access points; and
- Reduce visual impacts along 113$^{th}$ SE Avenue by terracing the parking garage and leaving the Level 4 parking lot uncovered; and

Based on subsequent feedback from the City of Bellevue, Sound Transit, and King County Metro, potential design enhancements were formulated to improve transit operations and pedestrian/cycle access. Enhancements could include:

- **Transit Center operations**
  - Separating the transit and Kiss-and-Ride facilities and functions by placing the latter in its own dedicated area at the north end of Level 5, thus vehicles laying over would not need to cross the path of automobiles when re-circulating through the transit center.
  - Permitting emergency access from 113th Ave SE to a transit center on the top level to remove disabled buses, to serve the transit center in case of the east access ramp being closed, or to allow emergency vehicles to access the transit center and rail platform.
- **Parking garage access**
  - Permitting entry-only at the Level 4 access point from the ramp to reduce the chance of incidents between transit and exiting vehicles on the ramp.
  - Permitting right-in and right-out movements at the Level 3 access point at the north end of the parking structure.
- **Pedestrian and bicycle Access**
  - Providing an 8-foot walk/cycle path on the road bridge crossing I-90 to link the Mercer Slough trails and the east side of Bellevue Way with the A-2 Station. This path would continue up the east side of the bus ramp to the Level 5 transit center and keep bicycle traffic out of automobile/bus rights-of-way.
  - Providing a 6-foot sidewalk along SE 30$^{th}$ Street and 113$^{th}$ Avenue SE to improve access from southbound Bellevue Way.

Traffic impacts, costs, and ridership comparisons of the B7-Revised alternative and its A-2 Station are discussed in subsequent technical memos (TM04, TM11, and TM07, respectively).