JACOBS ASSOCIATES

MEMORANDUM

DATE: September 23, 2014

TO: Robert Nichols, Acting Corridor Design Manager Northgate Link Extension

FROM: Katherine Casseday, PE, PTOE, Casseday Consulting
Tony Lo, PE, Parsons Brinckerhoff

SUBJECT: Northgate Link Extension Final Design – 2030 Traffic Analysis for Northgate Station and Two Garage Options

COPIES: File
Lauren Swift, Sound Transit
Brian Kemper, Sound Transit
Andrew Engel
Isabelle Lamb

EXECUTIVE SUMMARY

Since the Final Supplemental Environmental Impact Statement (FSEIS) for the former North Link Light Rail project was published in 2006, a number of changes in the roadway network, land use mix, and traffic demand levels near the future Northgate Station have occurred. In addition, assumptions regarding future bus connections and circulation near the proposed station, background growth in traffic demand, mode-of-access ridership, and the park-and-ride supply and allocation for the long-range 2030 horizon year have also been adjusted based on recent design refinements and more current traffic projections and transit ridership data. To support the final design process for the Northgate Link Extension project, an updated traffic analysis specifically focusing on the Northgate Station has been performed to reflect these background changes and adjustments.

This technical memorandum summarizes the findings of the traffic analysis update and highlights the two park-and-ride garage options being considered for the Northgate Station. Relevant mitigation measures to address traffic congestion issues or modal conflicts are also discussed in the context of the recent changes and revised traffic assumptions

The general methods used to evaluate future traffic conditions for this analysis update are similar to those used previously for the FSEIS. However, a more advanced analysis software platform (SimTraffic) has been applied in order to better capture the interactions of vehicles where intersections are closely spaced.

Key changes in the roadway network, traffic levels, and land use mix that have occurred since publication of the 2006 FSEIS include the following:

- 3rd Avenue NE connector between NE 100th Street and NE 103rd Street – Completed in mid-2006 as part of the Thornton Place Development.
- 5th Avenue NE/Northgate Way intersection improvements – completed in 2013 and lengthened the northbound right turn lane and added an additional westbound-to-southbound left turn lane.
- Thornton Place Development – located between 3rd Avenue NE and 5th Avenue NE from NE 100th Street to NE 103rd Street and largely completed in 2008. Includes a multi-screen movie theater (Regal Cinemas), apartments, a variety of restaurants, office/retail space, and a retirement community (Aljoya) bordering NE 100th Street and 5th Avenue NE.
- Existing Traffic Volumes - for the majority of arterials in the study area, traffic volume levels have grown very little or have remained stagnant between 2006 and 2012.

Assumptions for the traffic analysis that have also changed since the 2006 publication include:

- Background traffic growth of 0.50 percent for 2030 volume forecasting purposes in order to more accurately reflect growth trends from 2006 to 2013 (compared to 2.0+ percent used previously).
- SimTraffic software used for analysis purposes. Synchro software used previously.
- Station access volumes and mode split (2030) – updated based on recent mode-of-access study
- Transit center reconfiguration and bus circulation – shifted to 1st Avenue NE (NB buses) and new transit roadway (SB buses) just east of 1st Avenue NE using on-street clockwise-rotation circulation pattern.

The results of the traffic analysis update show that the adjusted traffic demand to/from the Northgate Station during peak weekday boarding and alighting periods and the reconfiguration of the bus transit center will collectively impact local access and circulation compared to a Baseline or No Build scenario. However, these station and transit center effects are not expected to reach far beyond the immediate station area to peripheral arterial segments or intersections (such as Northgate Way).

As described in the traffic operations analysis section for 2030 conditions, the area most impacted by the future roadway changes and traffic volume increases consists of the following trio of intersections:

- NE 100th Street at 1st Avenue NE
- NE 100th Street at the new transit roadway
- NE 100th Street at 3rd Avenue NE

The convergence of background peak period trips into and out of the station area, high on-street bus utilization of 1st Avenue NE and the transit roadway, and concentrated walk/bike activity on 1st Avenue NE and across NE 100th Street will all contribute to creating high peak period delay conditions for these three intersection locations thereby requiring appropriate mitigation to address severe traffic congestion or queuing near the station. Outside if these three intersections, other high delay locations by the 2030 horizon year will include 1st Avenue NE at Northgate Way and the mall driveway on 1st Avenue NE at NE 105th Street. However, high peak period levels of congestion are already expected under Baseline Conditions for these locations, so project-specific mitigation will not be required.

Analysis of the two off-ramp intersections on 1st Avenue NE at NE 103rd Street and NE 107th Street indicates no impacts to I-5 ramp queuing as a result of the Northgate Station and Northgate Link Extension project.

A comparison of the two park-and-ride garage options, based on the Build scenario traffic analysis results, shows similar levels of congestion for the majority of intersections evaluated. However, due to the location differences between the SPG site and Commercial site, circulating volumes and, thus, congestion impacts are expected to be slightly different at affected intersections. For example, for the Commercial site, park-and-ride garage traffic will be more concentrated at the intersection of 1st Avenue NE at NE 100th Street thereby resulting in higher delays (comparatively) at this intersection and adjacent intersections along NE 100th Street.

Mitigation to counteract the peak period delay and queue issues along NE 100th Street regardless of the park-and-ride garage location should include specific turning restrictions and signal phasing adjustments to maximize east-west green time for bus movements and general purpose circulating traffic. With specific measures in place, namely restricting eastbound-to-northbound left turns into the transit roadway and modifying the transit roadway signal phasing pattern, delays along NE 100th Street can potentially be reduced to manageable levels (below critical delay thresholds). No other mitigation measures outside of those identified for NE 100th Street would be required to maintain reasonable levels of congestion in and around the station area.

BACKGROUND AND INTRODUCTION

The Northgate Link Extension project is in the final design stage to extend light rail from the University of Washington to the Northgate area. The terminus station in Northgate will be elevated and located on the east side of First Avenue NE at NE 103rd Street with entry points on both the north and south sides of NE 103rd Street adjacent to Northgate Mall. Station entrances are proposed on the northeast and southeast corners of the First

Avenue NE at NE 103rd Street intersection. The project Final Supplemental Environmental Impact Statement (FSEIS) for the former North Link project was prepared in 2006 and included an assessment of peak period traffic operations for a long range horizon year (2030) upon which the Record of Decision was based along with the project mitigation for the Northgate Station area. Final design work for the Northgate Station is on-going and incorporates changes to both park-and-ride facilities and the future location and configuration of the King County Metro Transit Northgate Transit Center.

The purpose of this technical memorandum is to:

1. Update the analysis of existing traffic conditions and future 2030 No Build (Baseline) conditions to reflect changes in the transportation environment, growth assumptions and analysis tools since the 2006 FSEIS was published.
2. Document the anticipated traffic conditions for year 2030 with Northgate Link Extension in operation along with the planned changes to both the Northgate Transit Center, for two garage options that would change the supply of park and ride spaces near the station, and
3. Identify if any traffic mitigation is required with these changes to the Northgate Link Extension project, when compared with the 2006 FSEIS for the project.

The focus of the analysis update is on intersection traffic operations expected in year 2030 with the Northgate Link Extension project under two scenarios for a park-and-ride garage configuration – a 515-space park-and-ride capacity joint use structure on Northgate Mall (Simon Property Group) property, comparable to the proposed parking garage in the FSEIS, or a 470-space capacity park-and-ride use structure located on a commercial property site in the southeast quadrant of First Avenue NE and NE 100th Street. The study area for this analysis covers NE Northgate Way to NE 92nd Street from First Avenue NE to Fifth Avenue NE and includes signalized intersections, stop-controlled intersections and driveways for vehicle access to the parking garages.

PROJECT DESCRIPTION

The Northgate Station will be elevated over NE 103rd Street just east of First Avenue NE with station entrances on both sides of NE 103rd Street. The station design will incorporate the relocation of the King County Northgate Transit Center from its current location on 2nd Avenue NE between NE 100th Street and NE 103rd Street to an on-street configuration in First Avenue NE (northbound) and in a new transit roadway (southbound) adjacent to the light rail station plaza. Local and connector buses will operate in a clockwise circulation with bus platforms at the station plaza. The Northgate Transit Center along the current 2nd Avenue NE alignment will be decommissioned once the reconfigured transit center is open. The current design for Northgate Station and the relocated Northgate Transit Center is shown in **Figure 1**.

King County Metro plans to relocate bus layover from on-street and within the transit center to the WSDOT park-and-ride lot south of NE 100th Street. Entry to the layover area would be directly off of First Avenue NE with exit via the existing signal at 1st Ave NE and NE 100th Street. Bus circulation and routing to serve the new on-street transit center will change from the existing patterns.

By the time the Northgate Link Station is completed and in service, several changes to the surrounding street network would be incorporated. These changes are described below.

- King County Metro will relocate the Northgate Transit Center to co-locate with the light rail station, providing for northbound bus platform along the eastern curb of 1st Avenue NE and southbound bus platform along a transit roadway connecting NE 100th Street and NE 103rd Street. The south intersection of the transit roadway at NE 100th Street will have signal control.
- 2nd Avenue NE, the alignment of the Northgate Transit Center, will be vacated, available to transition to a local street with later development (potential TOD opportunities).
- Park-and-ride capacity will expand modestly from 1,523 spaces (existing) to either 1,719 spaces (SPG garage) or 1,674 spaces (commercial property garage) by year-of-opening for the Northgate Station. Light Rail station and guideway construction will displace parking spaces at the Northgate Transit Center park-and-ride as well as some commercial parking spaces on Northgate Mall property.

- The NE 103rd Street lane configuration will change with the on-street transit center, with new local bus access points to/from the transit center and a new access driveway for the proposed park-and-ride garage on Simon Property Group property (Northgate Mall).

Daily ridership at the Northgate Station is forecasted to be 15,000 boarding riders by 2030, according to the July 2010 ridership update prepared by Sound Transit. The Final Supplemental EIS (FSEIS) document cited 14,900 daily riders using the Northgate Station. In 2030, an estimated 5,400 riders would alight at Northgate in the 3-hour PM peak period with an estimated 2,160 riders alighting during the single PM peak hour (approximately 5-6 PM). An estimated 3,200 riders would board at Northgate during the 2030 PM peak period, of which 1,280 riders would board in the PM peak hour.

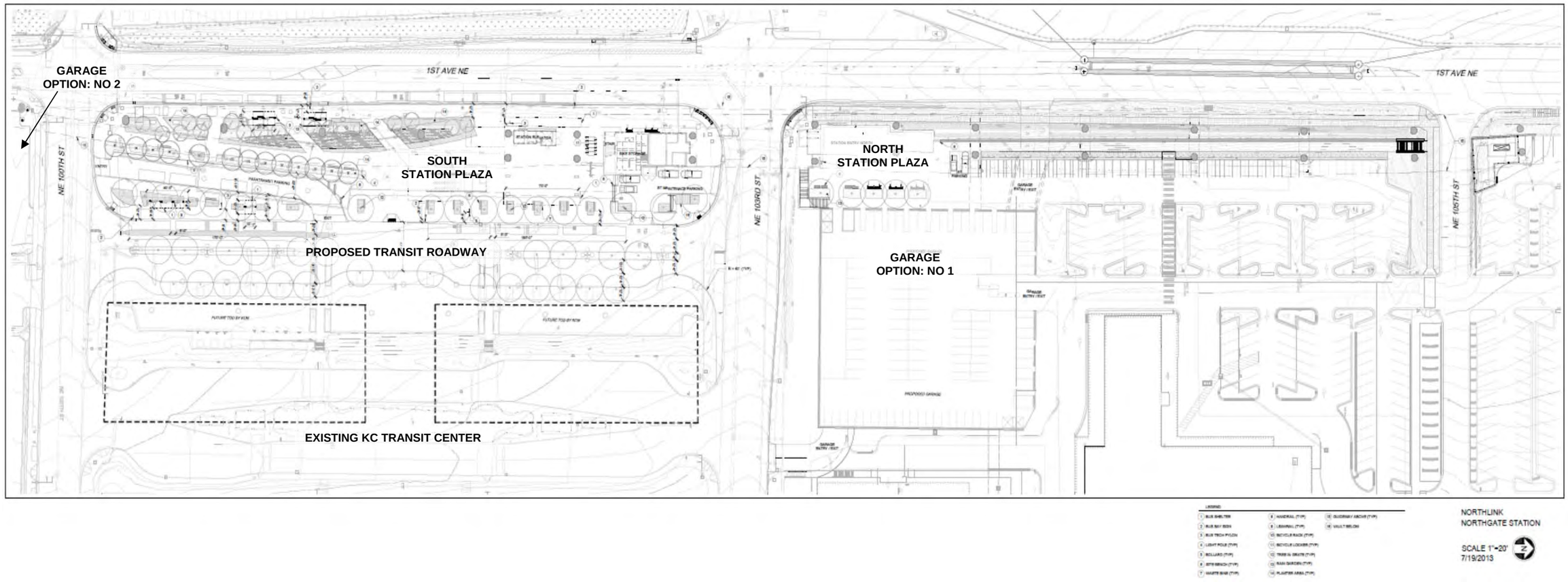
Sound Transit commissioned an analysis of station access mode for the Northgate Station, conducted by Kittelson Associates Inc. and URS. The results of the analysis indicate that 37% of alighting riders (in the PM peak period) would walk, 4% would bike, 28% would connect to local buses and 31% would access by auto (20% park and ride, 11% pick up/drop off). An estimated 57% of boarding riders would walk to the station in the PM peak period (combining the 37% walk mode and the 20% auto arrival mode for the evening peak trip back to the trip origin). See **Table 1** below for details of the ridership forecast and splits among access modes.

Table 1 - Northgate Station 2030 Ridership Forecast and Mode Split (15,000 daily boardings)

Passenger Flow	2030 PM Peak Period (3-hr)	2030 PM Peak Hour	Park and Ride Access	Pick Up Drop Off	Local Bus	Bike	Walk
Alightings	5,400	2,160	432 (20%)	238 (11%)	605 (28%)	86 (4%)	799 (37%)
Boardings	3,200	1,280	N/A	141 (11%)	358 (28%)	51 (4%)	730 (57%)

Sources:
2030 ridership Forecast, Sound Transit, July 2010
2030 Station Access Data Analysis and Application to Northgate Station, Kittelson & Associates, May 2013.

Figure 1 – Northgate Station Elements and Roadway Enhancements



Park-and-ride parking spaces are currently located in a variety of surface lots or structures near and around the Northgate Transit Center as summarized in **Table 2**. In the future, the total number of park-and-ride spaces would effectively limit the number of autos to and from Northgate Station since background demand for parking will likely exceed the given supply. A substantial number of passenger drop-off or pick-up trips are expected as a result of the limited parking supply at Northgate Station.

Table 2 - Park and Ride Supply at Northgate Station

Location	Existing Supply	With Northgate Light Rail Station – Garage Option 1 (SPG)	With Northgate Light Rail Station – Garage Option 2 (Commercial Property)
North Seattle P&R - WSDOT	140 spaces	110 spaces (30 dedicated to bus layover space)	110 spaces (30 dedicated to bus layover space)
Northgate Transit Center West	289 spaces	Displaced by station & TC	Displaced by station & TC
Northgate Transit Center East	464 spaces	464 spaces	464 spaces
Northgate Mall P&R Garage – SPG	280 spaces	280 spaces	280 spaces
Thornton Place Garage	350 spaces	350 spaces	350 spaces
New P&R Garage	N/A	**515 spaces**	**470 spaces**
Parking Supply Totals	1,523 spaces	1,719 spaces	1,674 spaces

Source: Sound Transit

The Northgate Station will displace park and ride spaces in the Northgate Transit Center West lot (289 spaces) and will displace an estimated 155 commercial parking spaces on Simon Property Group property (Northgate Mall).

Sound Transit plans to design and construct a parking garage to provide replacement park-and-ride spaces, as directed through the Record of Decision to replace off-street parking impacted by the project on a one-for-one basis. Two garage locations are under consideration: Northgate Mall (Simon Property Group) property west of the existing JC Penney garage with 515 dedicated park-and-ride spaces (plus additional spaces to replace displaced commercial surface parking) and a location south of NE 100th Street and east of First Avenue NE (commercial property) with 470 park-and-ride spaces. **Figure 2** shows the layout and access for Garage Option 1 on SPG property and **Figure 3** shows the layout and access for Garage Option 2 south of NE 100th Street.

The analysis of peak hour traffic operations for year 2030 reflects Link service terminating at Northgate Station with a parking supply of 1,719 spaces with Option 1 and 1,674 spaces with Option 2 for park-and-ride use. A summary of the expected park-and-ride supply allocation is shown in Table 2.

Future transit oriented development (TOD) land use on King County property is not reflected in either the 2030 forecasts or the park-and-ride supply. The potential for future King County TOD has been discussed that would replace park-and-ride spaces east of the existing and planned Northgate Transit Center. However, the specific TOD land use components and parking configurations have yet to be defined or programmed. Background growth from future development in the area outside of future King County TOD is reflected in the traffic volume projections as discussed in the key analysis assumptions section.

Figure 2 - Preliminary Park-and-Ride Garage Concept on SPG property (Option 1)

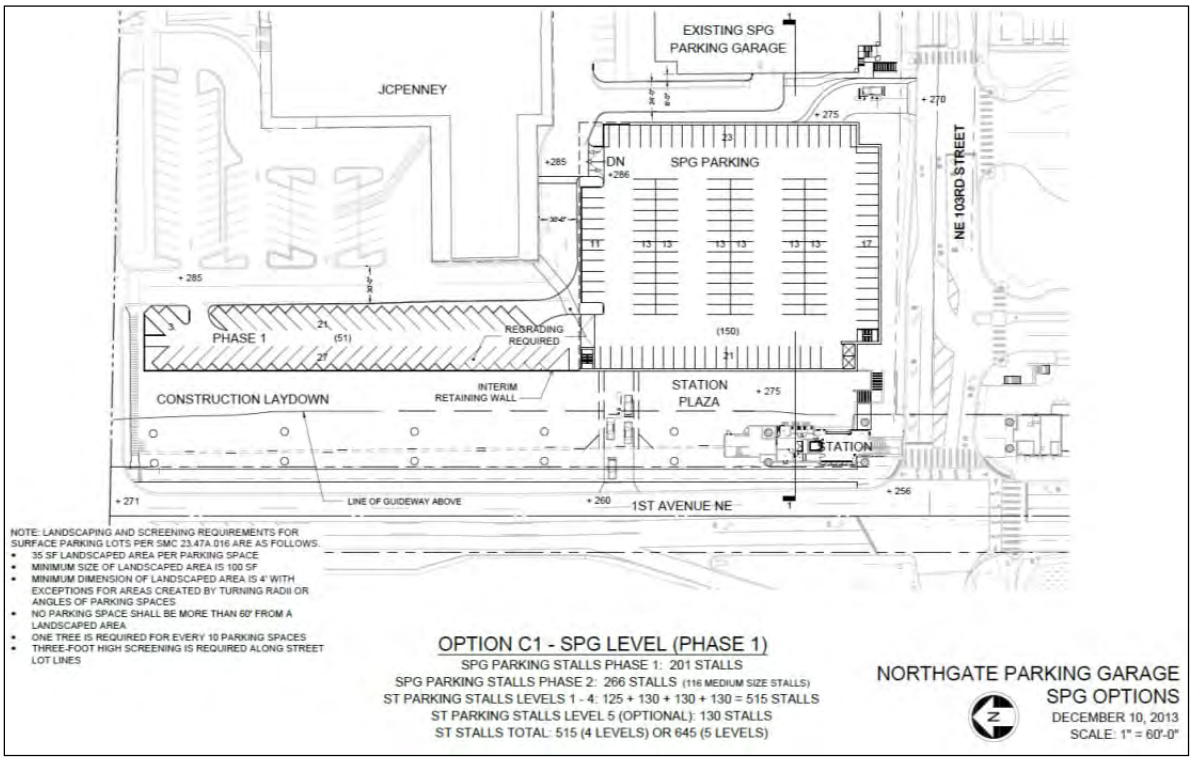
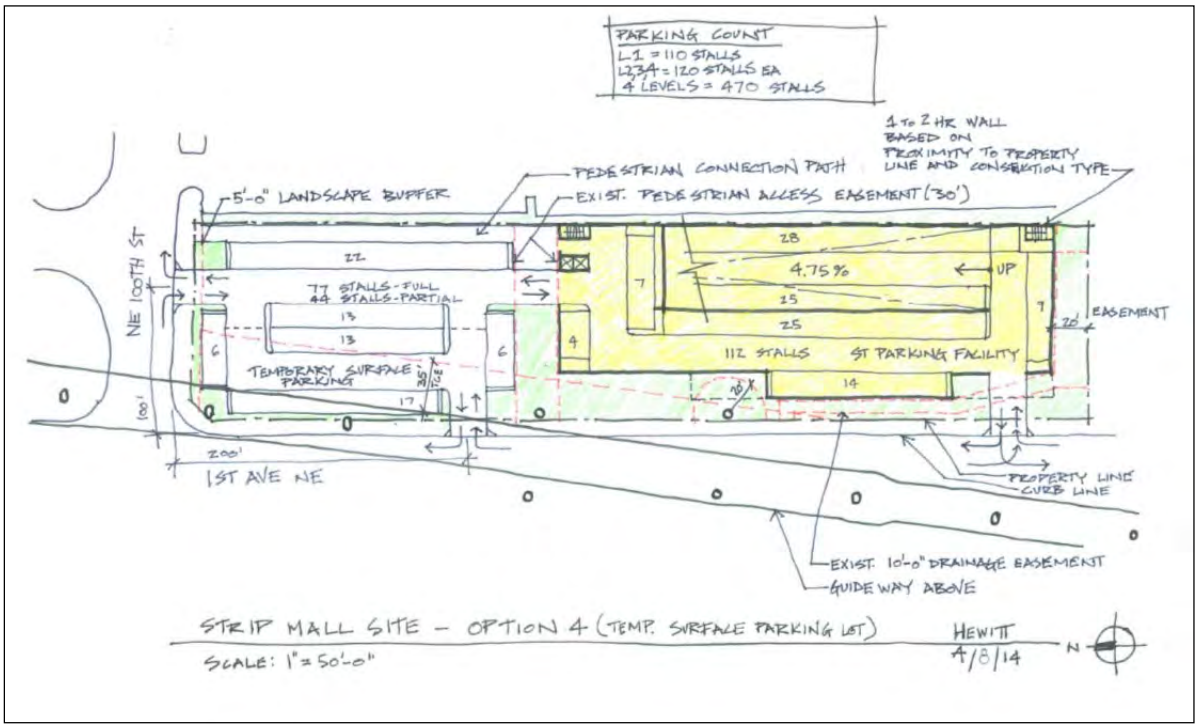


Figure 3 - Preliminary Park-and-Ride Garage Concept on Commercial Property (Option 2)



KEY ANALYSIS ASSUMPTIONS

The analysis of traffic operations for the two candidate park-and-ride garage sites was based on several inputs related to the target study area: roadway network, background traffic data and future growth projections, analysis software, and design elements. Each of these elements was directly incorporated into the analysis model to produce estimates of future intersection delays and level of service. Below is a brief summary of the key inputs and assumptions.

Study Area

The study area for the 2030 analysis of the Northgate Station extends from NE Northgate Way on the north to NE 92nd Street on the south, and extends from 1st Avenue NE and Interstate 5 (I-5) on the west to 5th Avenue NE on the east. Approximately 15 intersections within the study area are included for the analysis, with signal- and stop-control intersections plus driveways.

Time Period and Horizon Year

The targeted time period for the traffic analysis is the PM peak hour for the arterial network in the Northgate area which is approximately 4:30-5:30 PM. Development near the future the Northgate Station area is largely comprised of retail development which, combined with commute trip activity, results in greater traffic volumes and congestion during the afternoon peak compared to the morning peak. The focus of the traffic operations analysis is on PM peak conditions since this represents a worst case scenario and thus provides a conservative estimate of traffic congestion effects. Analysis was conducted for current conditions (2012 traffic volumes) and for the targeted horizon year (2030) which is consistent with the 2006 FSEIS analysis for the former North Link project.

Analysis Software

The traffic analysis was conducted using Synchro v7 and SimTraffic v7 (Build 773 rev. 8) software. Analysis results are reported from the SimTraffic simulation of traffic volumes and movements on the street network for the various scenarios evaluated.

The 2006 FSEIS analysis used Synchro to report intersection results. Synchro is a static evaluation software tool that analyzes traffic movements and delays at intersections in isolation, only accounting for minimal influences between adjacent intersections. For this study, SimTraffic, the simulation component of the larger Synchro/SimTraffic software suite, was utilized to better capture the interactions between closely spaced signalized intersections such as those represented throughout the Northgate Station study area. Use of a simulation model is consistent with methods employed for a previous multi-agency workshop series to help to identify potential changes to the Northgate Transit Center configuration.

Compared to Synchro, the delay calculation algorithms reflected in SimTraffic more effectively account for spill-back effects and the upstream impacts of these effects. This is particularly important since the updated transit center design introduces the reconfigured transit center roadway that is separated from 1st Avenue NE by less than 150 feet. In addition, Northgate Way is already congested and operates as an inter-related network of signalized intersections. Using SimTraffic as opposed to Synchro, more accurately reflects higher delays being reported for intersections along Northgate Way, particularly the high-volume 1st Avenue NE and Northgate Way intersection. The average vehicle delay is reported for each intersection, in seconds per vehicle, with intersection level of service (LOS) ranging from A (low delay) to F (high delay and congested conditions).

Traffic Volume Data

The current peak period turning movement volume count data (2011-2013 counts) provides the basis for future volumes. Year 2030 estimated traffic volumes were developed by applying a growth factor to the current (nominally 2012) turning movement volumes for the PM peak hour. A growth rate of 0.5% (annually) was applied, resulting in total growth of approximately 9.5% (2012-2030). This level of growth was estimated based on historical trends in peak hour arterial volumes and was agreed upon by partner agencies (SDOT, King County Metro, WSDOT and Sound Transit) during a multi-agency workshop series conducted in early- to mid-2013. The analysis was conducted for a peak one hour volume within the AM and PM peak periods.

The existing conditions and future year traffic volumes for this analysis vary from what was assumed during the FSEIS. The 2006 FSEIS work utilized 2002 counts and assumed an approximate growth in traffic of 20%

between 2002 and 2015 and an additional 20% from 2015 to 2030. The updated 2012 counts showed that traffic volumes have actually reduced at key intersections by roughly 7-21% between 2002 and 2012. As a result of recent trends and the assumed 0.5% growth per year between existing conditions and 2030, the recent peak hour traffic projections are lower than what was assumed in the FSEIS work.

On-street and ingress/egress bus volumes were identified from current King County Metro schedules for Northgate Transit Center (all 6 bus bays reflected). Future bus volumes were provided by King County Metro service planners.

Existing pedestrian volumes were identified from peak period turning movement volume count data. Future pedestrian demand reflects the Sound Transit Link ridership model projections and 2012 Access-by-Mode Analysis (Kittelson/URS).

Roadway/Street Network

The network for baseline 2030 conditions generally reflects existing roadway geometry and intersection configurations.

For the future network in year 2030, one SB through lane would be removed on 1st Ave NE north of NE 103rd Street to accommodate improvements along 1st Ave NE including proposed SDOT cycle track extending from NE 92nd Street to NE Northgate Way. This would shift the existing merge point from south of NE 103rd to south of NE 107th Street intersections. Improvements to 5th Ave NE/Northgate Way (constructed recently) are assumed to be in place for existing conditions and future year scenarios.

Future Build scenario analysis networks all assume relocation of King County Metro transit center function to an on-street operation at the Northgate light rail station plaza. The station plaza is 105' wide and separates the local bus platforms: Southbound buses would operate along a transit roadway from NE 103rd Street to NE 100th Street and northbound buses would operate on-street in 1st Ave NE, with bus platform along the east curb. Station pick-up and drop-off activity will operate northbound along the transit roadway.

For the Simon Property Group (SPG) parking garage option on the Northgate Mall property, a signalized garage access driveway to/from NE 103rd Street would align with the current King County Metro transit center (approximately 2nd Avenue NE alignment). Garage access at 1st Ave NE would be via a new driveway with 3/4 access (right turns into and out from the driveway plus entering left turns). For the Commercial garage site option located east of 1st Avenue NE and south of NE 100th Street, ingress and egress for the garage will be via two driveways on 1st Ave NE and one driveway (right in/right out only) on NE 103rd Street.

Signal Timing/Phasing

Signal timing and phasing for all targeted signalized intersections reflect current operations based on previous and on-going analysis for the Northgate Link Extension Final Design project. Signal timing data was confirmed and verified through field observations (early-2012 and late-2013). Signal timings for future scenarios assume split optimization but no phase reconfiguration unless signal is considered new. Where new signalized intersections are assumed (future transit roadway intersection at NE 100thStreet), phasing plans were developed by SDOT signal operations staff.

Parking Garage Trip Generation & Distribution

Trip distribution patterns are largely based on assumed park & ride capacity (supply) and license plate survey data (as provided by King County Metro). Park-and-ride trip generation is primarily based on a 2013 Sound Transit ridership/parking demand study and park & ride supply constraints for Northgate Station (Kittelson/URS). Park-and-ride traffic would shift within the station vicinity as parking space access and locations are relocated at project completion. A garage capacity of 515 park and ride stalls is assumed for SPG garage site (contained below ground level) while a capacity of 470 stalls is assumed for Commercial property garage site.

The total park-and-ride supply increases slightly with Northgate Station and either parking garage in place. Park-and-ride trips associated with west transit center surface lot (between 1st Ave NE and existing TC) were eliminated due to Link station footprint and reconfigured transit center. These park and ride vehicle trips would be replaced by the vehicle trips associated with the proposed park and ride garage.

Performance Measures

The traffic analysis results are reported in terms of average vehicle delay (seconds per vehicle) at study intersections based on PM peak hour analysis (SimTraffic results). The Level of service thresholds (A through F) based on 2010 High Capacity Manual reflecting SimTraffic analysis results.

EXISTING CONDITIONS

Roadway Network

Since the 2006 North Link FSEIS was prepared, changes in the Northgate Station area roadway network have occurred mainly at the intersection of 5th Ave NE/Northgate Way and near the Thornton Place mixed-use development south and west of the 5th Ave NE/NE 103rd Street intersection (completed in 2009). Key network changes are briefly highlighted and described below.

5th Ave NE/Northgate Way (completed 2013)

- Additional WB left turn lane constructed resulting in dual left turn lanes.
- NB right turn lane extended from 100 feet to approximately 200 feet.
- NB right turn overlap phase added to signal phasing structure.

3rd Ave NE Connector (completed 2009)

- New 3rd Ave NE collector arterial constructed between NE 100th Street and NE 103rd Street.
- New arterial provides access to Thornton Place development (to the east) and King County Metro surface park-and-ride lot (to the west) as well as secondary access pathway to Northgate Mall.
- Aligned with existing south access Northgate Mall driveway.
- Signal installed at NE 103rd Street intersection. No signal at NE 100th Street intersection (north and south legs are stop controlled).

Park and Ride Supply

The current park-and-ride supply in the study area amounts to 1,523 parking spaces spread over several parking lots and garages. A summary table of the current park-and-ride supply was shown previously in Table 2.

Peak Hour Volumes

Existing PM peak hour volumes were updated for analysis purposes based on more current 2012/2013 peak hour traffic counts. Previous work associated with the 2006 FSEIS reflected 2000-2002 counts or volume estimates. A traffic volume comparison between the PM peak hour 2002 counts and the more current 2012/2013 counts show that the study area intersection volumes have reduced by 7-21% over time at the high volume intersections (intersections along 1st Ave NE and NE Northgate Way). Counts at two intersections along 5th Ave NE were approximately the same. **Figure 4** on the following page summarizes PM peak hour intersection turning movement volume counts taken during the final design project (2011 through 2013). Pedestrian volumes were updated commensurately based on intersection counts from late 2012.

Signal Timing and Phasing

Signal timing and phasing was updated for all intersections based on data provided by SDOT. The intersection parameters for modeling were confirmed and verified through field observations in early-2012 and late-2013.

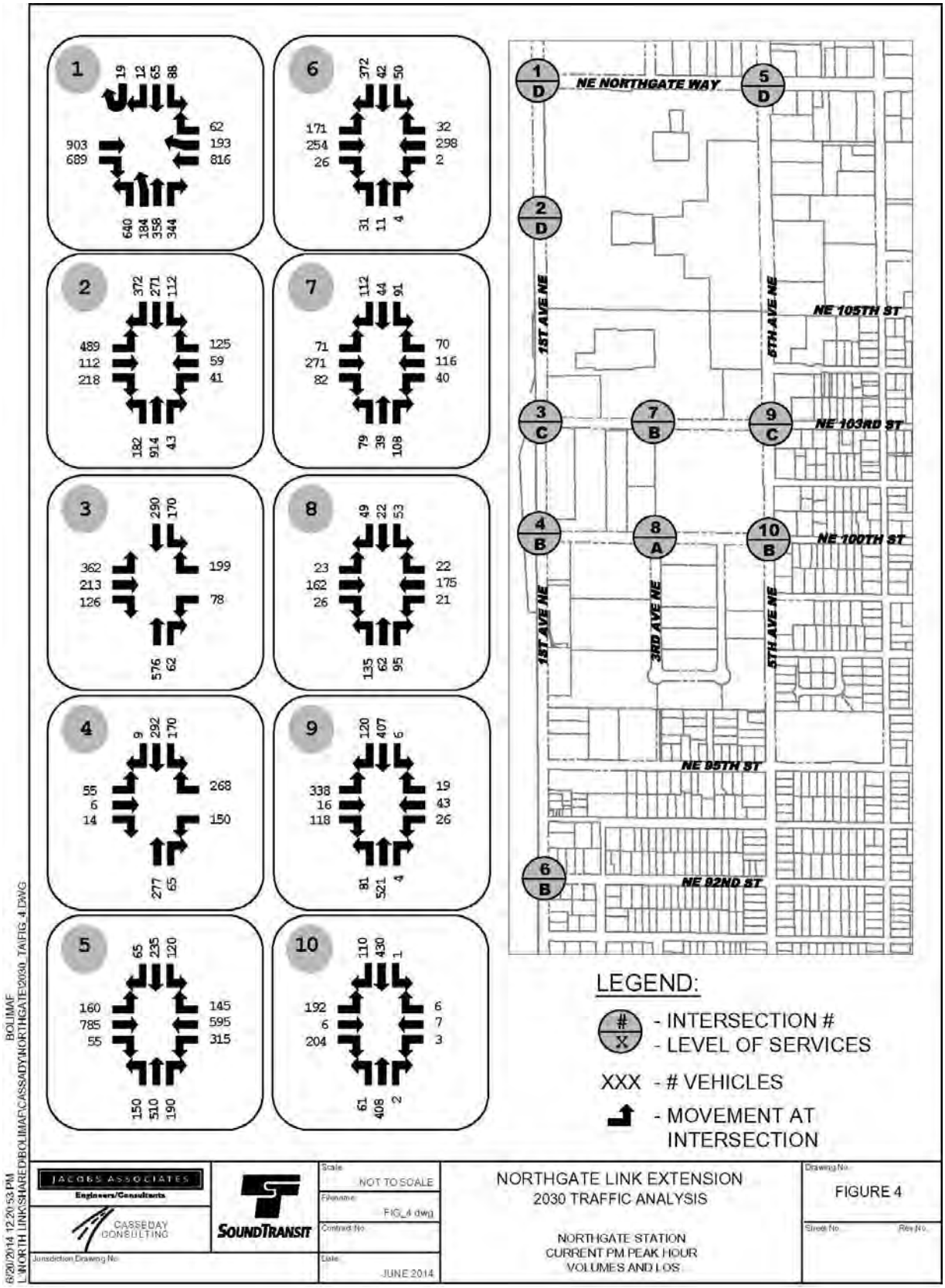
Bus Routes and Volumes

Bus volumes assumed for the PM peak hour existing conditions analysis were updated to reflect recent King County Metro schedule changes (as of 2013). Inbound and outbound circulation patterns for each relevant Northgate Transit Center route were also updated as needed based on current route data.

Non-Motorized Volumes

Pedestrian and bicycle volumes for the PM peak hour existing conditions analysis were also updated to reflect counts taken in late-2012.

Figure 4 - Current PM Peak Hour Traffic Volumes and LOS



Peak Hour Delays and Level of Service (LOS)

An updated traffic analysis of existing conditions was performed to document changes in existing PM peak hour average delays and LOS based on more recent intersection volume counts and modifications in the roadway network. Refer to **Table 3** below for an updated summary of existing intersection average delays/LOS.

Table 3 – Existing Conditions PM Peak Hour Delays and LOS

Intersection	Intersection Control	2012 Existing Conditions PM Peak Hour	
		Avg Delay (sec/veh.)	**LOS[1]**
1st Ave NE & Northgate Way	Signalized	48.8	**D**
1st Ave NE & NE 107th Street	Signalized	44.6	**D**
1st Ave NE & NE 103rd Street	Signalized	23.9	**C**
2nd Ave NE & NE 103rd Street (existing TC roadway)	Signalized	10.9	**B**
3rd Ave NE & NE 103rd Street	Signalized	11.1	**B**
5th Ave NE & NE 103rd Street	Signalized	21.6	**C**
1st Ave NE & NE 100th Street	Signalized	10.0	**B**
2nd Ave NE & NE 100th Street (existing TC roadway)	Signalized	2.2	**A**
5th Ave NE & Northgate Way	Signalized	36.7	**D**
1st Ave NE & NE 92nd Street	Stop-controlled	14.3	**B**
3rd Ave NE & NE 100th Street[2]	Stop-controlled	8.5	**A**
5th Ave NE & NE 100th Street	Signalized	12.7	**B**
Mall Driveway at 1st Ave NE & NE 105th Street [2]	Stop-controlled	90.4	**F**

[1] *LOS based on HCM 2010 delay thresholds*
[2] *Based on stop-controlled approach only*

PM peak hour intersection average delays were estimated from SimTraffic analysis software whereas previous results from the 2006 FSEIS were taken from Synchro analysis output for isolated intersections. SimTraffic modeling results revealed congested operation during the PM peak hour for several intersections including 1st Ave NE/Northgate Way (LOS D), 1st Ave NE/NE 107th Street (LOS D) and 5th Ave NE/Northgate Way (LOS D), a change from the FSEIS results. However, LOS D is considered an acceptable level of service for overall intersection operations.

Peak hour delays at the southwest Northgate Mall driveway intersection at 1st Ave NE/NE 105th Street are noticeable (LOS F for the critical, stop-controlled movement) based on the stop-control analysis results. These delays are specific to the exiting driveway movements (on private property) onto 1st Ave NE which do not significantly affect northbound or southbound traffic flow along 1st Ave NE.

I-5 Off-ramp Queues

Existing queues on the I-5 off-ramps during the PM peak hour were estimated from the SimTraffic analysis and reported in Table 4. The average queues at the I-5 northbound off-ramp to the intersection of 1st Ave NE/NE 107th St do not spill back beyond the ramp onto I-5. However, the 95th percentile queue does extend slightly beyond the available storage. The average and 95th percentile queues at the I-5 northbound express lane off-ramp to the intersection of 1st Ave NE/NE 103rd St do not spill back beyond the ramp onto the I-5 express lanes.

Table 4 – Existing Conditions PM Peak Hour I-5 Ramp queues

Approach/Intersection/Lane Group	2012 Existing Conditions PM Peak Hour Average Queue (feet)	2012 Existing Conditions PM Peak Hour 95th percentile Queue (feet)
I-5 northbound off-ramp at 1st Ave NE & NE 107th Street		
left	520	1245
left/through	505	1265
right	115	375
I-5 NB express lane off-ramp at 1st Ave NE & NE 103rd Street		
left	235	370
through/right	250	625

YEAR 2030 FUTURE CONDITIONS

NO BUILD (BASELINE) SCENARIO

Roadway Network

The roadway network for 2030 Baseline conditions is assumed to be similar to existing conditions. This includes improvements at the 5th Ave NE/Northgate Way intersection as of mid-2013 and new roadway elements near the Thornton Place mixed-use development south and west of the 5th Ave NE/NE 103rd Street intersection (completed in 2009). A cycle track (separated bicycle facility) is also assumed to be in place along 1st Ave NE between Northgate Way and NE 92nd Street varying in alignment within this segment.

In terms of arterial revisions near the future station, one southbound travel lane would be removed on 1st Ave NE north of NE 103rd Street (relocating the merge point to the north) to accommodate changes along 1st Ave NE for the proposed SDOT cycle track.

Park and Ride Supply

The current park-and-ride supply in the study area of 1,523 parking spaces is assumed to be carried over to 2030 Baseline conditions. Refer to Table 2 shown previously for a summary of the parking supply allocation by lot/structure and capacity.

Intersection Volumes

Intersection turning movement volumes for 2030 Baseline conditions reflect background annual growth of 0.5% applied to existing (2012) PM peak period volume counts. **Figure 6** provides a summary of the 2030 Baseline peak hour intersection volume projections.

Signal Timing and Phasing

No changes in signal phasing were modeled, but timing (split) optimization was incorporated.

Bus Routes and Volumes

Same bus routes and volumes assumed for existing conditions were incorporated into the 2030 Baseline analysis (reflects King County Metro schedule changes as of late-2013).

Non-Motorized Volumes and Access

Pedestrian and bicycle volumes for the Baseline analysis were assumed to be similar to those reflected in existing conditions. Seattle Department of Transportation (SDOT) has developed a list of pedestrian and bicycle projects to improve non-motorized access to the Northgate Station and Transit Center, as shown in **Figure 5**.

Figure 5 – SDOT non-motorized project lists

Peak Hour Delays and Level of Service (LOS)

Similar to existing conditions, an updated 2030 Baseline traffic analysis was performed to document changes in future PM peak hour average delays and LOS (without the Northgate Link Extension project in place) as they compare to previous work related to the 2006 FSEIS. Refer to **Table 5** for an updated summary of 2030 Baseline intersection average delays/LOS. PM peak hour intersection average delays were estimated from SimTraffic analysis software for the network whereas previous results from the 2006 FSEIS were taken from Synchro analysis output for isolated intersections.

One intersection and one driveway would operate below City standard, under the 2030 Baseline analysis: 1st Ave NE/Northgate Way (LOS F) and the 1st Ave NE/NE 105th Street exit driveway at Northgate Mall (LOS F). No plans are identified to modify the 1st Ave NE at Northgate Way intersection to improve vehicle level of service – it is effectively built-out with very high traffic volumes passing through the intersection.

The stop-controlled driveway approach at 1st Ave NE at NE 105th Street is a private access to the Northgate Mall. LOS F is an acceptable operation for a private driveway egress with options for travelers to exit via another driveway, including an option with signal control (NE 107th Street at 1st Ave NE).

Similar to existing conditions, elevated levels of PM peak hour congestion are also projected for 1st Ave NE/NE 107th Street (LOS D) and 5th Ave NE/Northgate Way (LOS D) but remain within an acceptable congestion threshold of LOS E.

Figure 6 - Year 2030 No Build (Baseline) PM Peak Hour Traffic Volumes and LOS

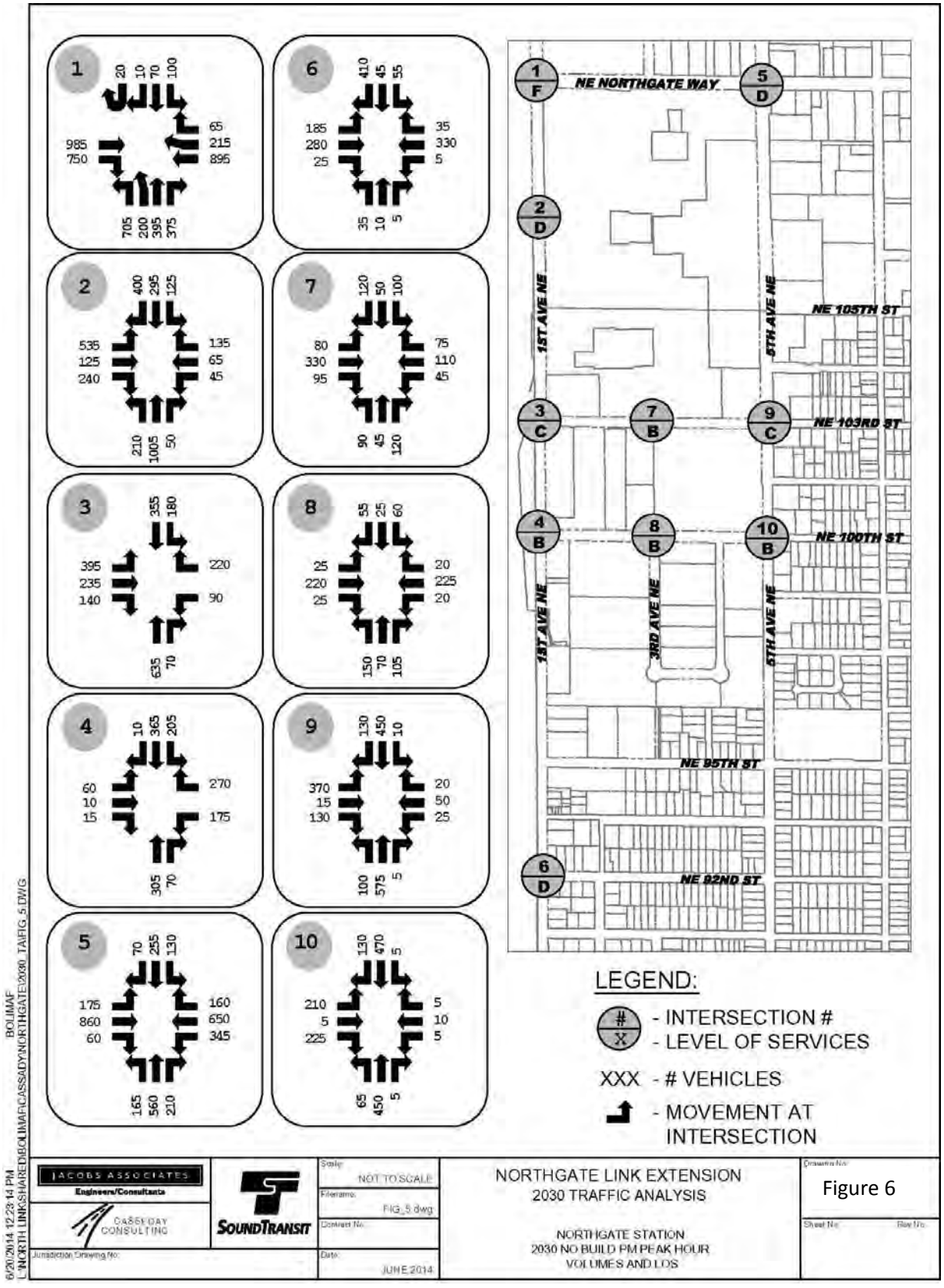


Table 5 – 2030 No Build (Baseline) PM Peak Hour Delays and LOS

Intersection	Intersection Control	2012 Existing Conditions PM Peak Hour Avg Delay (sec/veh.)	2012 Existing Conditions PM Peak Hour LOS[1]	2030 Baseline Conditions[3] PM Peak Hour Avg Delay (sec/veh.)	2030 Baseline Conditions[3] PM Peak Hour **LOS[1]**
1st Ave NE & Northgate Way	Signalized	48.8	D	156.6	**F**
1st Ave NE & NE 107th Street	Signalized	44.6	D	50.0	**D**
1st Ave NE & NE 103rd Street	Signalized	23.9	C	27.1	**C**
2nd Ave NE & NE 103rd Street (existing TC roadway)	Signalized	10.9	B	11.4	**B**
3rd Ave NE & NE 103rd Street	Signalized	11.1	B	14.9	**B**
5th Ave NE & NE 103rd Street	Signalized	21.6	C	29.7	**C**
1st Ave NE & NE 100th Street	Signalized	10.0	B	11.3	**B**
2nd Ave NE & NE 100th Street (existing TC roadway)	Signalized	2.2	A	2.8	**A**
5th Ave NE & Northgate Way	Signalized	36.7	D	43.2	**D**
1st Ave NE & NE 92nd Street	Stop-controlled	14.3	B	26.6	**D**
3rd Ave NE & NE 100th Street[2]	Stop-controlled	8.5	A	10.6	**B**
5th Ave NE & NE 100th Street	Signalized	12.7	B	13.2	**B**
Mall Driveway at 1st Ave NE & NE 105th Street[2]	Stop-controlled	90.4	F	>200	**F**

[1]LOS based on HCM 2010 delay thresholds
[2]Based on stop-controlled approach only
[3]Signal timings optimized

I-5 Off-ramp Queues

The PM peak hour 2030 Baseline queues on the I-5 off-ramps were estimated from the SimTraffic analysis and reported in Table 6. Similar to existing conditions, the average queues at the I-5 northbound off-ramp to the intersection of 1st Ave NE/NE 107th St do not spill back beyond the ramp onto I-5. However, the 95th percentile queue is anticipated to extend beyond the available ramp storage. The average and 95th percentile queues at the I-5 northbound express lane off-ramp to the intersection of 1st Ave NE/NE 103rd St do not spill back beyond the ramp onto the I-5 express lanes.

Table 6 – 2030 No Build (Baseline) PM Peak Hour I-5 Ramp queues

Approach/Intersection/Lane Group	2012 Existing Conditions PM Peak Hour Average Queue (feet)	2012 Existing Conditions PM Peak Hour 95th percentile Queue (feet)	2030 Baseline Conditions[1] PM Peak Hour Average Queue (feet)	2030 Baseline Conditions[1] PM Peak Hour 95th percentile Queue (feet)
I-5 northbound off-ramp at 1st Ave NE & NE 107th Street				
left	520	1245	455	1690
left/through	505	1265	425	1700
right	115	375	160	455
I-5 NB express lane off-ramp at 1st Ave NE & NE 103rd Street				
left	235	370	345	555
through/right	250	625	310	525

[1]Signal timings optimized

BUILD SCENARIO (SPG & COMMERCIAL PARK-AND-RIDE GARAGE SITES)

Roadway Network

The roadway network for 2030 Build conditions is similar for the two park-and-ride garage scenarios which includes a number of major changes to the street system. As with Baseline conditions, improvements at the 5th Ave NE/Northgate Way intersection as of mid-2013 and new roadway elements near Thornton Place are assumed. The 1st Ave NE cycle track (separated bicycle facility) is also assumed to be in place between NE 92nd Street and NE Northgate Way varying in alignment within this segment. In addition, one southbound travel lane is removed on 1st Ave NE north of NE 103rd Street to accommodate the proposed cycle track.

Future Build scenarios assume reconfiguration and relocation of the King County Metro transit center function with southbound buses utilizing a new transit roadway (just east of the station plaza) and northbound buses using curb space along 1st Ave NE. The northbound direction of the new transit roadway will be open to general purpose circulation but is expected to be used primarily for station-related pick-up and drop-off (kiss-and-ride) activity.

For the SPG parking garage site option, a signalized garage access driveway to/from NE 103rd Street is assumed which aligns with the current King County Metro transit center (approximately 2nd Avenue NE). Garage access to/from 1st Ave NE would be provided via a new stop-controlled driveway allowing 3/4 access at the driveway (right turns into and out from plus entering left turns). For the Commercial garage site option, ingress and egress for the garage will be via two designated garage driveways on 1st Ave NE and one driveway (right in/right out only) on NE 103rd Street just east of 1st Ave NE.

Refer to Figure 1 for an overview and layout of the Northgate Station project elements and associated roadway network and transit center revisions.

Park and Ride Supply

The *overall* park-and-ride supply in the Northgate area under the Build scenarios will be fairly similar to what is assumed for Baseline conditions but with the allocation of parking shifted to new parking areas and garage structures. The current 1,523 parking space supply would be expanded slightly under Build conditions to 1,674 or 1,719 spaces depending on the park-and-ride garage location. Refer to Table 2, shown previously, for a summary of the estimated park-and-ride supply by lot/structure and capacity for the two Build scenarios.

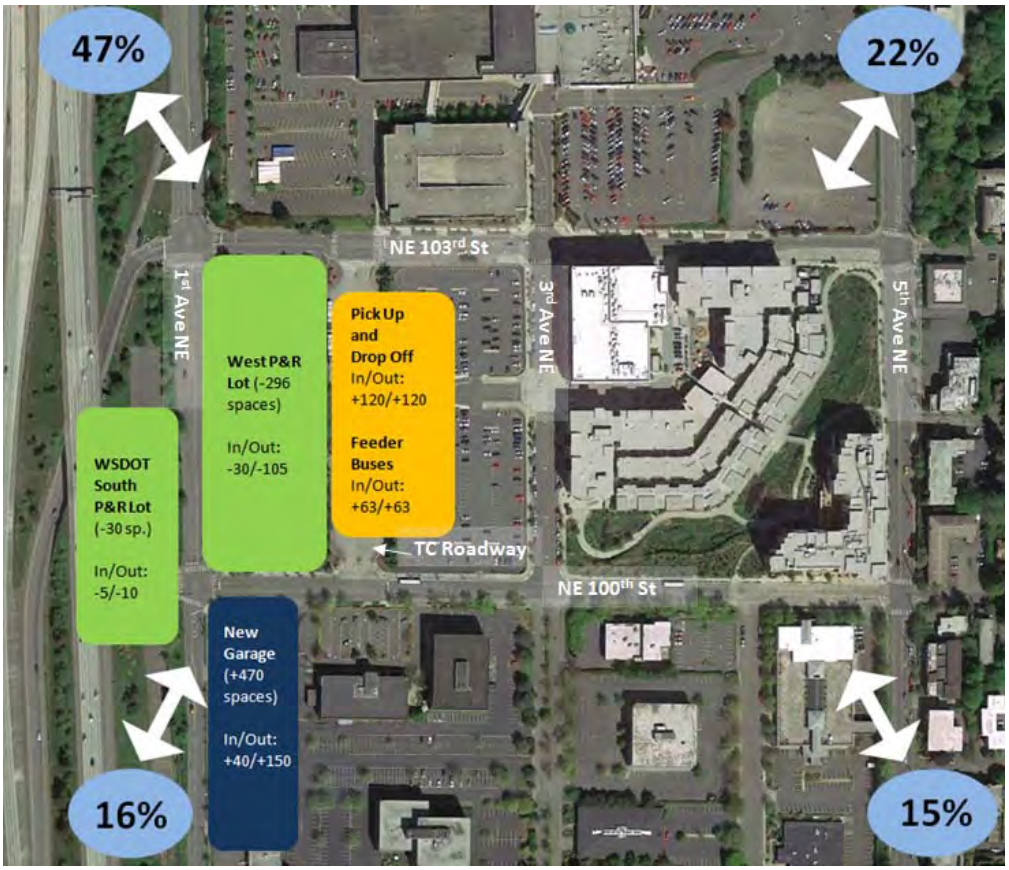
Northgate Station Trip Generation & Distribution

Vehicular trip generation associated with the future Northgate Link Station is constrained by the parking supply dedicated to park-and-ride use. For the purposes of the updated traffic analysis, trip generation is based on future 2030 levels of demand expected to and from the station during the *PM peak hour*.

Future station demand will be mainly be comprised of park and ride trips but will also include kiss-and-ride trips (pick-up and drop-off), paratransit activity and the bus movements through the relocated Northgate Transit Center. All components of this site traffic were incorporated into the traffic analysis. The distribution of inbound and outbound station related park-and-ride trips is based on license plate survey data collected in 2012 while the proportion of park-and-ride trips concentrated in the PM peak hour is based on Northgate Transit Center user survey data (2012). Refer to **Figures 7** and **8** for summaries of the park-and-ride trips for each of the proposed garage sites including pick up and drop off passenger trips in the northbound section of the transit roadway.

Figure 7 - Trip Generation/Distribution for SPG Garage

Figure 8 - Trip Generation/Distribution for Commercial Garage



Intersection Volumes

Intersection turning movement volumes for the 2030 Build scenarios reflect a combination of the 2030 Baseline volumes with the revised bus volumes, redistributed park-and-ride trips (specific to each garage site), and new kiss-and-ride trips. Figures 8 and 9 represent the combined 2030 Build scenario PM peak hour intersection volume projections for each of the garage sites.

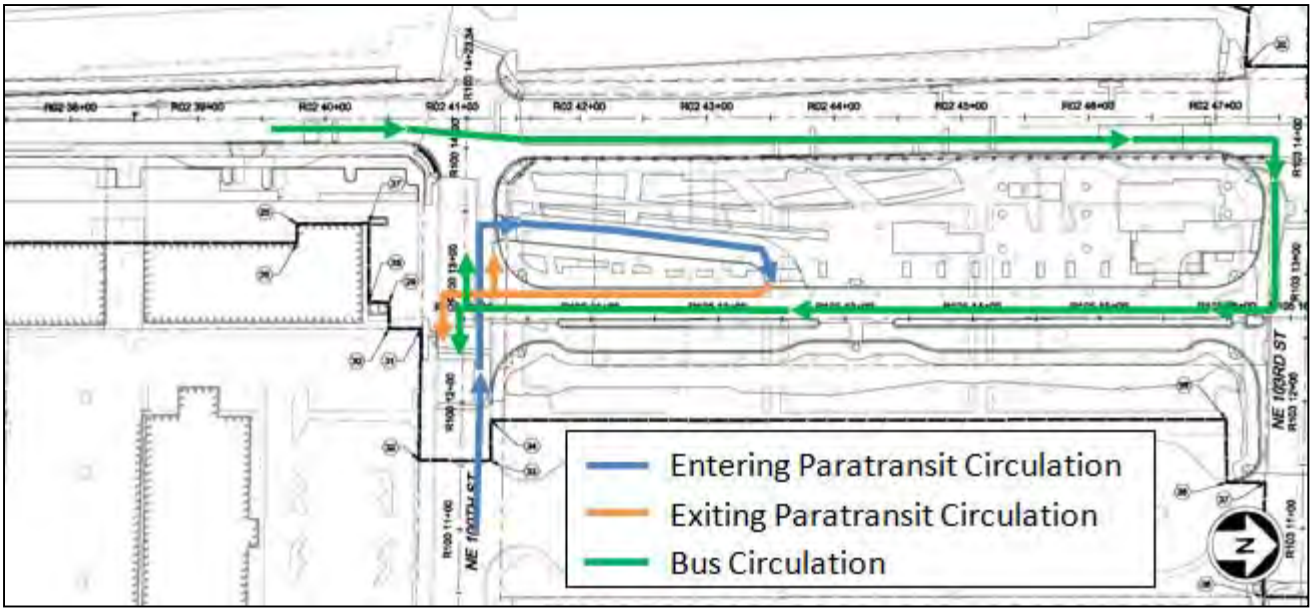
Signal Timing and Phasing

Due to the reconfiguration of the King County Metro transit center, changes in signal phasing and timing will be needed to accommodate more concentrated interactions between buses, general purpose traffic, and non-motorized activity. Signal timing and phasing data were provided by SDOT signal operation staff for the new transit roadway signal at NE 100th Street as well as the I-5 express lanes off-ramp intersection at 1st Ave NE/NE 103rd Street. Timing optimization was performed for all intersections to reflect projected changes in approach-level demand at each of the targeted study intersections.

Bus Routes and Volumes

Bus routes and volumes for Build conditions are assumed to be modified as a result of the relocated and reconfigured transit center function. Projected bus routing, peak hour volumes, and layover pathways were provided by King County Metro service planning staff during the concept development and design process. The proposed bus and paratransit routing is shown in **Figure 9**.

Figure 9 – Projected Bus and Paratransit Routing



Non-Motorized Volumes

Pedestrian volumes in and around the Northgate Station are expected increase dramatically compared to existing or Baseline conditions. Future pedestrian volumes in the Build analysis were assumed to reflect Sound Transit ridership estimates for the future Northgate Link Station. Peak hour pedestrian trips were developed based on walk-shed analysis and access-by-mode evaluation performed by Kittelson/URS for Sound Transit (2012). Cycle track demand was broadly estimated based on SDOT bicycle-use projections.

Peak Hour Delays and Level of Service (LOS)

Aggregate traffic volumes for the 2030 Build Park-and-Ride Options 1 and 2 are shown in **Figures 10** and **11**, respectively. Analysis results for the two 2030 Build (parking garage) scenarios in terms of intersection LOS are summarized in Figures 10 and 11. As with the existing conditions and 2030 Baseline analyses, PM peak hour

intersection average delays were estimated from SimTraffic analysis software whereas previous results described in the 2006 FSEIS were taken from Synchro analysis output. **Table 7** provides a summary of the analysis results, including intersection delays and LOS.

Locations identified with high levels of congestion based on the 2030 Build analyses include 1st Ave NE/Northgate Way (LOS F), the 1st Ave NE/NE 105th Street exit driveway at Northgate Mall (LOS F), 3rd Ave NE/NE 100th Street (LOS F), and Transit Center Roadway/NE 100th Street (LOS E). While the high levels of delay at 3rd Ave NE/NE 100th Street and the Transit Center Roadway/Ne 100th Street are largely due to the Northgate Station configuration and transit center relocation, the intersections of 1st Ave NE/Northgate Way and 1st Ave NE/NE 105th Street are already expected to operate at LOS F under Baseline conditions.

Based on a detailed examination of the traffic simulation/animation, the future westbound approach queue on NE 100th Street is shown to consistently extend past 3rd Ave NE (and farther to the east) from 1st Ave NE. The 95th percentile westbound queue along NE 100th Street extends roughly 225 feet beyond 3rd Ave NE with the SPG site garage and 500 feet with the Commercial garage site. This queue is a result of signal operations at NE 100th Street at 1st Ave NE and the Transit Roadway. However, spill back delays from the signalized intersections are also reported for 3rd Ave NE/NE 100th Street although the delay is not caused by operations at 3rd Ave NE/NE 100th Street..

Elevated levels of PM peak hour congestion are also projected for 1st Ave NE/NE 107th Street (LOS D) and 5th Ave NE/Northgate Way (LOS D) but will remain within acceptable thresholds.

Figure 10 - 2030 Build Traffic Volumes and Level of Service for SPG Site Garage (Option 1)

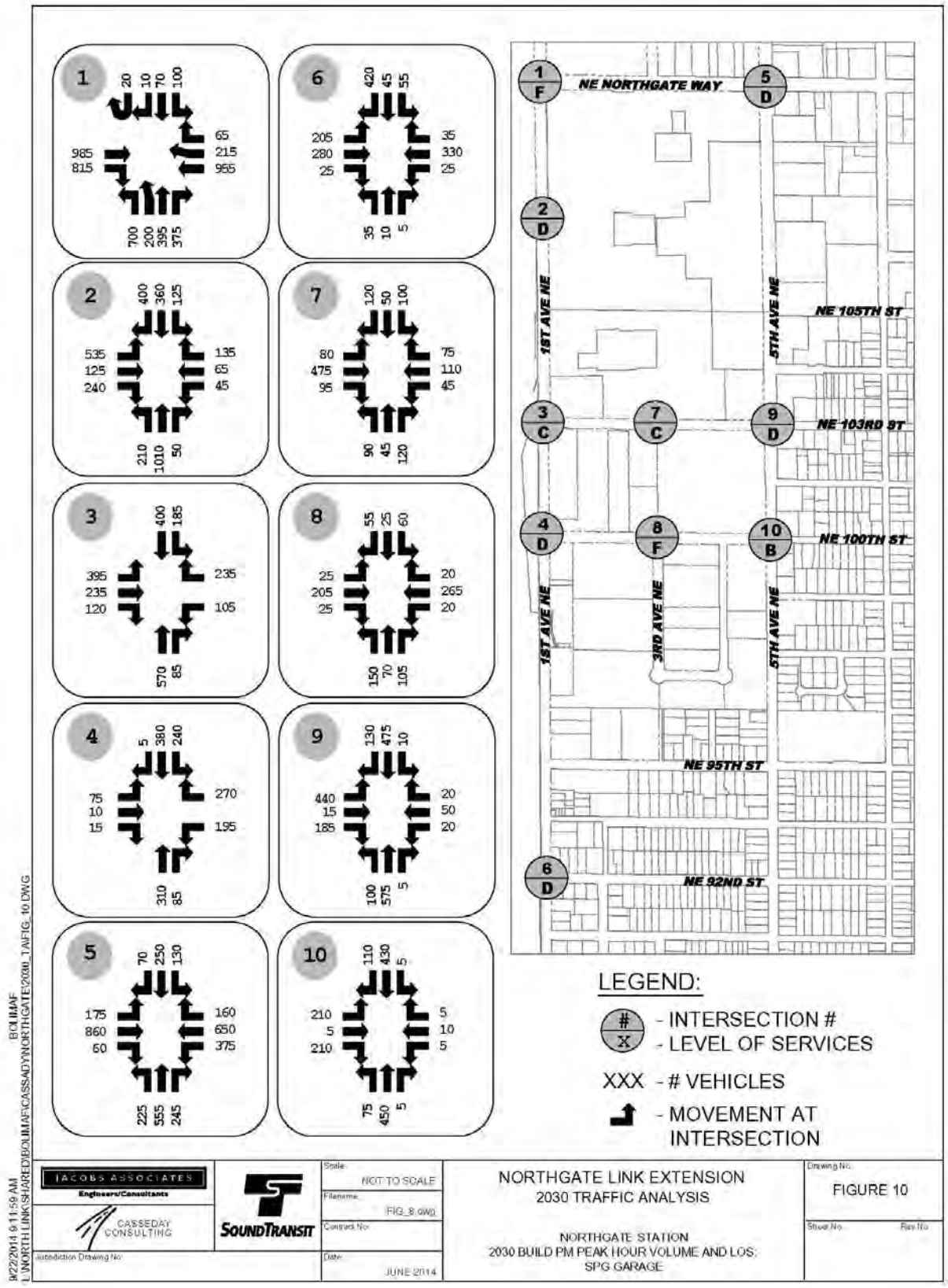


Figure 11 - 2030 Build Traffic Volumes and Level of Service for Commercial Site Garage (Option 2)

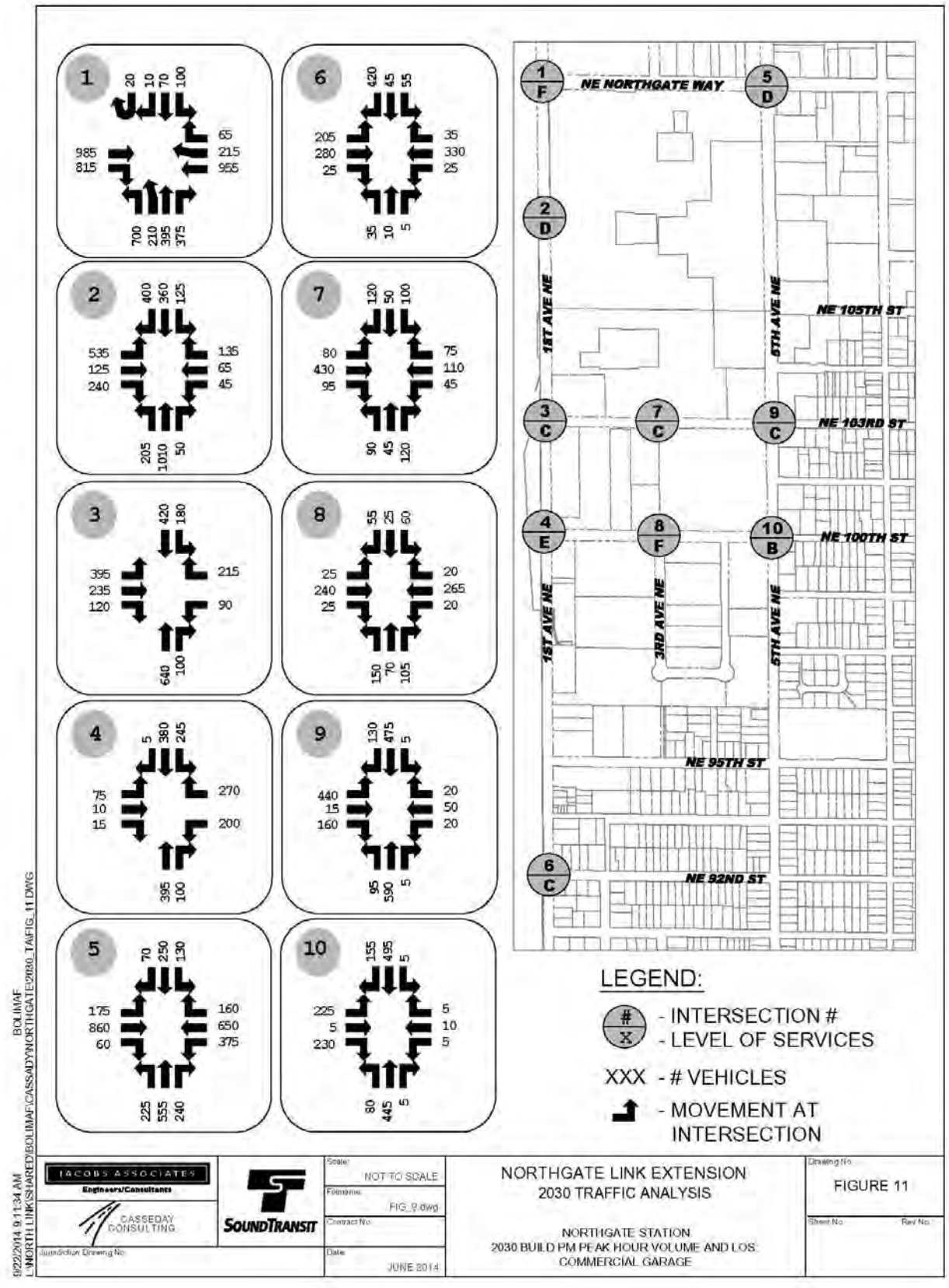


Table 7 - 2030 Build Level of Service Results for Park-and-Ride Garage Options

Intersection	Intersection Control	2012 Existing Conditions PM Peak Hour Avg Delay (sec/veh)	2012 Existing Conditions PM Peak Hour LOS[1]	2030 Baseline Conditions[3] PM Peak Hour Avg Delay (sec/veh)	2030 Baseline Conditions[3] PM Peak Hour LOS[1]	2030 Build with SPG Site Garage[3] PM Peak Hour Avg Delay (sec/veh)	2030 Build with SPG Site Garage[3] PM Peak Hour LOS[1]	2030 Build with Commercial Site Garage[3] PM Peak Hour Avg Delay (sec/veh)	2030 Build with Commercial Site Garage[3] PM Peak Hour LOS[1]
1st Ave NE & Northgate Way	Signalized	48.8	D	156.6	F	164.6	F	149.9	F
1st Ave NE & NE 107th Street	Signalized	44.6	D	50.0	D	51.7	D	54.3	D
1st Ave NE & NE 103rd Street	Signalized	23.9	C	27.1	C	25.8	C	29.0	C
2nd Ave NE & NE 103rd St (existing TC roadway)	Signalized	10.9	B	11.4	B				
Relocated Transit Center & NE 103rd Street[2]	Stop-controlled					20.3	C	4.2	A
3rd Ave NE & NE 103rd Street	Signalized	11.1	B	14.9	B	28.9	C	23.9	C
5th Ave NE & NE 103rd Street	Signalized	21.6	C	29.7	C	50.0	D	26.9	C
1st Ave NE & NE 100th Street[4]	Signalized	10.0	B	11.3	B	53.4	D	72.0	E
Relocated Transit Center & NE 100th Street[4]	Signalized					51.3	D	73.0	E
2nd Ave NE & NE 100th St (existing TC roadway)	Signalized	2.2	A	2.8	A				
5th Ave NE & Northgate Way	Signalized	36.7	D	43.2	D	43.1	D	42.1	D
1st Ave NE & NE 92nd Street	Stop-controlled	14.3	B	26.6	D	29.7	D	21.7	C
3rd Ave NE & NE 100th Street[2,4]	Stop-controlled	8.5	A	10.6	B	72.2	F	>200	F
5th Ave NE & NE 100th Street	Signalized	12.7	B	13.2	B	18.2	B	17.4	B
Northern park-and-ride driveway & 1st Ave NE[2]	Stop-controlled							17.8	**C**
Southern park-and-ride driveway & 1st Ave NE[2]	Stop-controlled							20.3	**C**
Park-and-ride driveway & NE 103rd Street	Signalized					8.9	A		
Park-and-ride driveway & 1st Ave NE[2]	Stop-controlled					15.6	C		
Mall Driveway at 1st Ave NE & NE 105th Street[2]	Stop-controlled	90.4	F	>200	F	>200	F	>200	F

[1]LOS based on HCM 2010 delay thresholds

[2]Based on stop-controlled approach only

[3]Signal timings optimized

[4]Reported delays along NE 100th Street at 1st Ave NE and the Transit Roadway includes westbound delay along 100th Ave NE that spills back past the intersection of NE 100th Street at 3rd Ave NE. High delays at 3rd Ave NE at NE 100th Street are a result of spill back from 1st Ave NE, not poor operations at 3rd Ave NE.

I-5 Off-ramp Queues

The PM peak hour 2030 Build queues on the I-5 off-ramps are shown in **Table 8** and are anticipated to be similar to 2030 No Build conditions. Some minor differences in the reported queue lengths between the 2030 scenarios is a result of slightly different signal timings as well as model randomness not due to different operations.

Table 8 – 2030 Build I-5 Ramp Queues for Park-and-Ride Garage Options

Approach/Intersection/Lane Group	2012 Existing Conditions		2030 Baseline Conditions[1]		2030 Build Conditions with SPG Site Garage[1]		2030 Build Conditions with Commercial Site Garage[1]	
	PM Peak Hour		PM Peak Hour		PM Peak Hour		PM Peak Hour	
	Average Queue (feet)	95th percentile Queue (feet)	Average Queue (feet)	95th percentile Queue (feet)	Average Queue (feet)	95th percentile Queue (feet)	Average Queue (feet)	95th percentile Queue (feet)
I-5 northbound off-ramp at 1st Ave NE & NE 107th Street								
left	520	1245	455	1690	415	1505	430	1500
left/through	505	1265	425	1700	405	1520	435	1510
right	115	375	160	455	160	455	170	475
I-5 NB express lane off-ramp at 1st Ave NE & NE 103rd Street								
left	235	370	345	555	260	410	275	470
through/right	250	625	310	525	250	435	260	455

[1]*Signal timings optimized*

POTENTIAL MITIGATION

In 2030 under Baseline conditions the intersection at 1st Ave NE at NE Northgate Way is expected to operate at LOS F indicating long delays and pronounced levels of congestion during the PM peak hour. For 2030 *Build* conditions with the Northgate Link Extension project in place, this intersection would continue to operate at LOS F. Based on a review of the current SDOT transportation capital improvement program and the WSDOT project funding program, there are no plans for modifying or improving this intersection for vehicle traffic in the foreseeable future. As noted previously, SDOT has developed an extensive set of projects to improve non-motorized travel access in the Northgate area, including through this intersection. Nonetheless, given the critical function of this intersection with respect to interstate access, sub-area mobility, and connection to a regional transit hub, potential vehicle capacity enhancements could be pursued in the longer term future.

In addition to the 1st Ave NE/Northgate Way intersection, the Northgate Mall driveway to 1st Avenue NE at NE 105th Street would likely operate at LOS F under both Baseline and Build conditions specifically for exiting left turn traffic onto 1st Ave NE. Similar to the 1st Ave NE/Northgate Way intersection, no explicit mitigation has been identified or is proposed at this intersection since the high level of congestion at this location is not directly the result of Northgate Link Extension project impacts.

With Northgate Station in operation and with the relocated Northgate Transit Center, westbound traffic on NE 100th Street would experience long delays and queues Street approaching 1st Avenue NE, extending through the transit roadway and 3rd Avenue NE intersections. Possible mitigation for this queuing and congested condition is to eliminate the eastbound left-turning traffic movement from NE 100th Street to the transit roadway (kiss-and-ride pick-up and drop-off traffic) and shift the kiss-and-ride access to right-turns only from the westbound approach. This change to the transit roadway signal would simplify the signal operation and alleviate the westbound queuing, and thus improve operations along NE 100th Street, between 1st and 3rd Ave NE as shown in **Table 9**. We recommend that this change be implemented with the relocated transit center, the transit roadway and the overall circulation near the Northgate Station.

Table 9 - 2030 Build Level of Service Result with Mitigation

Intersection	Intersection Control	2030 Build with Mitigation for SPG Site Garage[3] PM Peak Hour Avg Delay (sec/veh)	LOS[1]	2030 Build with Mitigation for Commercial Site Garage[3] PM Peak Hour Avg Delay (sec/veh)	LOS[1]
1st Ave NE & Northgate Way	Signalized	163.9	**F**	165.0	**F**
1st Ave NE & NE 107th Street	Signalized	53.1	**D**	49.0	**D**
1st Ave NE & NE 103rd Street	Signalized	29.4	**C**	28.5	**C**
Relocated Transit Center & NE 103rd Street[2]	Stop-controlled	23.5	**C**	4.4	**A**
3rd Ave NE & NE 103rd Street	Signalized	24.6	**C**	21.5	**C**
5th Ave NE & NE 103rd Street	Signalized	52.4	**D**	45.9	**D**
1st Ave NE & NE 100th Street	Signalized	28.2	**C**	37.3	**D**
Relocated Transit Center & NE 100th Street	Signalized	13.1	**B**	12.8	**B**
5th Ave NE & Northgate Way	Signalized	43.8	**D**	42.8	**D**
1st Ave NE & NE 92nd Street	Stop-controlled	31.0	**D**	24.5	**C**
3rd Ave NE & NE 100th Street[2]	Stop-controlled	11.3	**B**	12.3	**B**
5th Ave NE & NE 100th Street	Signalized	17.6	**B**	18.5	**B**
Northern park-and-ride driveway & 1st Ave NE[2]	Stop-controlled			18.2	**C**
Southern park-and-ride driveway & 1st Ave NE[2]	Stop-controlled			25.3	**D**
Park-and-ride driveway & NE 103rd Street	Signalized	8.8	**A**		
Park-and-ride driveway & 1st Ave NE[2]	Stop-controlled	18.2	**C**		
Mall Driveway at 1st Ave NE & NE 105th Street [2]	Stop-controlled	>200	**F**	>200	**F**

[1]LOS based on HCM 2010 delay thresholds
[2]Based on stop-controlled approach only
[3]Signal timings optimized

COMPARISON WITH 2006 FSEIS

The Final SEIS for North Link was published in 2006 and reflects expected conditions in 2030 based on traffic counts from 2000 and 2002 for the Northgate station area.

The preferred alternative is consistent with the current design for the Northgate Station, with a station that straddles NE 103rd Street with entrance from the Northgate Mall and from the area south of NE 103rd Street. The background roadway network is much the same as identified in the FSEIS except for the following items (as summarized earlier in this technical memorandum):

- Thornton Place development was completed in 2009 and includes 350 leased park-and-ride spaces
- Northgate Mall parking garage includes 280 leased park-and-ride spaces
- 3rd Ave NE was constructed to connect NE 100th Street and NE 103rd Street
- Intersection improvements were completed in 2013 at NE Northgate Way at 5th Ave NE
- A cycle track is planned and programmed by SDOT for 1st Ave NE which will remove one southbound travel lane between NE 107th Street and NE 103rd Street (relocating the merge to north of NE 103rd)

The 2030 traffic analysis with the Northgate Station and parking garage (either 515 or 470 spaces) would operate much the same as what was presented in the FSEIS document. Three intersection locations would not meet LOS E standard: 1st Ave NE at Northgate Way, 1st Ave NE at NE 105th Street driveway and 3rd Ave NE at NE 100th Street. Mitigation is proposed at the transit roadway and NE 100th Street intersection to improve the operation at 3rd Ave NE at NE 100th Street.

Traffic analysis results for the North Link FSEIS (2006) were summarized in Table 5.3-5c of the Transportation Technical Report for the project, included below. One intersection was identified with operational issues for the 2030 traffic conditions: NE Northgate Way at 5th Avenue NE. The FSEIS identified mitigation for the project for Sound Transit to contribute a proportionate share toward the future improvement for the intersection.

Table 5.3-5c
Northgate Station Options: Year 2015 and 2030 PM Peak Hour Level of Service Comparison

Intersection	Year 2015					Year 2030				
	No-Build	*Preferred Alternatives*	*Options C4/E1*	Option C2	Option C3	No-Build	*Preferred Alternatives*	Options C4/E1	Option C2	Option C3
NE Northgate Way/ 1st Avenue NE	C (22.5)	*C (22.7)*	C (22.7)	C (22.7)	C (22.7)	D (37.5)	*D (38.1)*	D (37.8)	D (38.1)	D (40.4)
NE 107th Street/I-5 Northbound Ramps/1st Avenue NE	D (43.8)	*D (44.5)*	D (45.1)	D (44.5)	D (47.1)	E (66.1)	*E (67.0)*	E (67.3)	E (67.0)	E (70.2)
NE 103rd Street/ 1st Avenue NE	D (36.5)	*D (39.0)*	D (37.0)	D (39.0)	D (40.3)	E (68.5)	*E (76.3)*	E (70.3)	E (76.3)	E (77.2)
NE 103rd Street/ 2nd Avenue NE	B (14.0)	*B (16.5)*	B (14.9)	B (16.5)	B (15.7)	B (19.8)	*C (31.4)*	C (23.3)	C (31.4)	C (24.7)
NE 100th Street/ 1st Avenue NE	B (12.9)	*B (13.5)*	B (13.6)	B (13.5)	B (13.5)	D (41.0)	*D (42.0)*	D (41.8)	D (42.0)	D (42.0)
NE Northgate Way/ 5th Avenue NE	E (55.4)	*E (56.9)*	E (56.7)	E (56.9)	E (58.6)	F (100.0)	*F (103.9)*	F (103.5)	F (103.9)	F (109.9)
NE 103rd Street/ 5th Avenue NE	C (24.8)	*C (29.9)*	C (30.6)	C (29.9)	C (26.4)	D (41.9)	*D (50.5)*	D (46.9)	D (50.5)	D (45.3)
NE 100th Street/ 5th Avenue NE	B (12.0)	*B (12.5)*	B (12.5)	B (12.5)	B (12.3)	C (32.4)	*C (34.3)*	C (33.4)	C (34.3)	C (34.3)

Notes: Analysis was conducted using Synchro 5.0 software and 2000 Highway Capacity Manual. All results shown are with the highest-ridership alternative.

Values in parentheses indicate average intersection delay, in seconds per vehicle. In some cases, average delays decrease with the Build Alternatives, despite overall increase in traffic volumes. This occasionally occurs when increases in traffic volume are made to movements with unused green-time available to accommodate additional demand.

Based on the 2030 analysis results in Table 7, the intersection of NE Northgate Way at 5th Ave NE would operate at LOS D for 2030 Baseline and Build conditions and would no longer require mitigation.

Three locations would operate at LOS F under the 2030 Build conditions for the project.

1. 1st Ave NE at Northgate Way
2. 1st Ave NE at NE 105th Street driveway
3. 3rd Ave NE at NE 100th Street

The two intersection locations on 1st Ave NE are expected to operate below acceptable standard (below LOS E) in 2030 under both the Baseline and the Build conditions. Further discussion for each intersection follows.

- First Ave NE at Northgate Way would operate poorly at LOS F under 2030 Baseline and Build conditions, based on the traffic simulation results reported in Table 7. The average delay for motorists through the intersection would increase less than 10 seconds for the Build condition (SPG garage), for an estimated 5% increase in the delay. The intersection lies along Northgate Way, a major east-west corridor with high volumes and constrained right of way. The intersection is fully built out and left-turns are already restricted at the intersection. Changes to signal timing can help to manage and reduce the delays at this intersection; however operation would continue to be LOS F.
- The stop-controlled driveway from Northgate Mall to 1st Ave NE at NE 105th Street would operate poorly at LOS F for the exiting traffic in the single approach lane. This is a private driveway approach to 1st Ave NE with on-site circulation connections to a signal-controlled access to 1st Ave NE at NE 107th Street. Most delay for this driveway is based on congestion on 1st Ave NE and limited opportunity for left-turns. It is possible to improve driveway level of service by adding an approach lane or by restricting the exit to right turns only. No mitigation is proposed for this location.

Under the 2030 Build conditions, Northgate Link Extension includes construction of the Northgate Station and includes the relocated Northgate Transit Center adjacent to the light rail station. The intersection of 3rd Ave NE at NE 100th Street is reported to operate at LOS F in 2030 Build due to backed up traffic extending from the signal at NE 100th Street at the transit roadway, a new feature with the planned on-street transit center. Given the closely spaced signals along NE 100th Street, allowing for eastbound left-turning traffic to the transit roadway requires a separate signal phase and results in westbound delays and queues that would extend through the intersection at 3rd Ave NE. Proposed mitigation for this intersection would be to restrict eastbound left-turns from NE 100th Street to the transit roadway, thereby restricting the drop-off traffic access to the station area to right turns only from NE 100th Street. This mitigation would result in LOS B for the stop controlled approaches on 3rd Ave NE at NE 100th Street. This would allow the signals on NE 100th Street at 1st Ave NE and the transit roadway to operate well for transit access to the transit center and local circulation, eliminating the westbound queues on NE 100th Street.

Summary

The FSEIS identified project mitigation to be a contribution to the intersection improvements at NE Northgate Way and 5th Ave NE. These improvements were completed in 2013 by SDOT.

This 2030 analysis reveals LOS F conditions are expected at on arterial intersection (1st Ave NE at Northgate Way) under Baseline and Build conditions with less than 10 second increase in average delay at the intersection. No project is identified by SDOT for improving the intersection operation above LOS F and signal timing modifications are suggested for the location to help manage congestion.

A driveway from Northgate Mall to 1st Ave NE would operate at LOS F under Baseline and Build conditions. No mitigation is proposed for this private access driveway. Alternate access to 1st Ave NE is provided via internal circulation within the Mall, with signal control at NE 107th Street intersection with 1st Ave NE.

Mitigation is proposed to restrict the eastbound left turn movement at the NE 100th Street and transit roadway signal to reduce westbound queues and restore acceptable LOS at 3rd Ave NE and NE 100th Street. If approved, this action would be incorporated into the design for the station area and on-street transit center at Northgate.

CONSTRUCTION TRAFFIC

According to the FSEIS for the project, all of the light rail alternatives would involve temporary road closures for construction of the tunnel, guideway and station area. Construction would require the temporary (multi-year) use of some properties adjacent to the permanent station site and the guideway. Construction activities would include hauling of spoils and construction materials and use of heavy equipment. Station areas, portals and guideway alignment would be the locations with the highest intensity of construction activity.

Construction of the tunnel contract, N125, is underway with construction activities focused on 1st Ave NE between NE 92nd Street and the I-5 Northgate interchange. As detailed in the Northgate Link Extension Traffic Engineering Report, general impacts due to construction involve short term and partial road closures of 1st Ave NE between NE 92nd Street and NE 100th Street and temporary displacement of on-street parking. Construction staging activities have closed the WSDOT park and ride lots west of 1st Ave NE.

Construction of the light rail guideway, contract N180, and the Northgate Station area (N160) will involve a larger construction work area. Construction will maintain two-way travel along 1st Ave NE and will require closing one northbound lane on 1st Ave NE from NE 100th Street to approximately NE 106th Street through much of the construction period. N160 Contract activities will start before completion of the N125 contract work and both contracts rely on construction access and activity along 1st Ave NE.

Construction of the straddle bents and guideway crossing 1st Ave NE will require a two-lane closure on 1st Ave NE for short duration. Night-time full roadway closures would be required for delivery and installation of girders, guideway and station components. Detours will be provided for the street and intersection closures needed, with close coordination between the Contractor and SDOT.

Contract N160 will result in permanent and temporary impacts to off-street parking. The west lot of the Northgate Transit Center will be closed during construction and will serve as the main construction zone for the station. During construction, the contractor work zone will temporarily displace parking along the western edge of the Northgate Mall parking lot. Sound Transit will provide temporary parking in the project vicinity during construction.

Construction activities underway for the Northgate Link Extension construction are consistent with those outlined in the FSEIS for the project.