



Stride Bus Rapid Transit S3 Line Transportation Report – Additional Analysis

D3458616.04-01

June 2024

Prepared by the

STRIDE

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Stride Bus Rapid Transit

Project No: D3458616.04-01
Document Title: Transportation Report – Additional Analysis
Document No.:
Revision: 003
Document Status: Final
Date: June 18, 2024
Client Name: Sound Transit
Client No:
Program Manager: Maya Hunnewell
Author: Christopher Pylant
File Name:

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Summary

Introduction

This report provides additional transportation analysis for the State Route (SR) 522/NE 145th Bus Rapid Transit (BRT) Project. The proposed project will provide BRT service along 9 miles of existing public roadway between Shoreline/Seattle and Bothell, including portions of NE 145th Street, SR 522, and local arterial streets. An analysis of project impacts was included in the 2021 Transportation Technical Memorandum, which was prepared as part of the State Environmental Policy Act (SEPA) Environmental Checklist (Sound Transit 2021). Since that time, a number of design refinements have been made to the project. This report analyzes the design refinements proposed as part of the 90 percent design submittal in relation to the results in the 2021 analysis. The memorandum addresses any potential impacts to the local transportation network resulting from project design refinements.

Design Refinements

The design refinements that have been assessed are as follows, organized by discipline:

Traffic operations:

- Addition of transit signal priority (TSP) at six intersections:
 - 20th Avenue NE/NE 145th Street
 - 25th Avenue NE/NE 145th Street
 - SR 522 (Bothell Way NE)/Beach Drive NE
 - SR 522 (Bothell Way NE)/77th Court NE
 - SR 522 (Bothell Way NE)/80th Avenue NE
 - SR 522 (Bothell Way NE)/83rd Place NE
- Changes to channelization at three intersections:
 - 35th Avenue NE/Bothell Way NE (shortening of south westbound left-turn pocket)
 - NE 153rd Avenue NE/Bothell Way NE (shortening of south westbound left-turn pocket)
 - 104th Avenue NE/NE 185th Street (elimination of eastbound right-turn pocket)
- Retention of a second park-and-ride access point at Kenmore Park-and-Ride
- Deferral of the project's three parking garages from 2024 until:
 - 2044 for the Lake Forest Park Park-and-Ride garage
 - 2034 for the Kenmore Park-and-Ride garage
 - 2034 for the Bothell Park Park-and-Ride garage

Nonmotorized:

- Westbound station refinement at 30th Avenue
- Removal of eastbound right-turn pocket at the NE 185th Street/104th Avenue NE intersection (reduced pedestrian crossing time)
- Pedestrian signal relocation at 73rd Avenue NE/NE Bothell Way

No design refinements are expected to affect freight movement.

Comparison of Findings

No transportation impacts were predicted in the 2021 Transportation Technical Memorandum (TTM), and no transportation impacts are predicted based on this additional analysis. At those locations where design refinements could affect intersection operations, a Synchro or VISSIM analysis was completed. These analyses found that 90 percent design refinements are projected to result in minimal changes to intersection delay as well as an overall improvement in intersection operation from No Build conditions to Build conditions.

The 90 percent design refinements are not expected to change the general scope, potential impacts, or proposed mitigation measures of construction. Sound Transit's commitment to best practices stated in the 2021 TTM will continue to avoid or abate transportation impacts during construction. Operational mitigation measures are as proposed in the 2021 TTM, with the addition of potential for each city to implement time-limited parking and security enforcement to address potential hide-and-ride parking resulting from the deferral of the parking garages.

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Acronyms and Abbreviations

BRT	Bus Rapid Transit
EB	eastbound
LOS	level of service
SDOT	Seattle Department of Transportation
SEPA	State Environmental Policy Act
SR	State Route
TSP	transit signal priority
TTM	Transportation Technical Memorandum
WB	westbound

1. Introduction

This report provides additional transportation analysis for the State Route (SR) 522/NE 145th Bus Rapid Transit (BRT) Project. The proposed project will provide BRT service along 9 miles of existing public roadway between Shoreline/Seattle and Bothell, including portions of NE 145th Street, SR 522, and local arterial streets. An analysis of project impacts was included in the 2021 Transportation Technical Memorandum, which was prepared as part of the State Environmental Policy Act (SEPA) Environmental Checklist (Sound Transit 2021). Since then, several design refinements have been made to the project. This report analyzes the design refinements proposed as part of the 90 percent design submittal in relation to the results in the 2021 analysis. The report addresses any potential impacts to the local transportation network resulting from project design refinements.

2. Project Description

The March 2021 SEPA Checklist described the project as follows:

Sound Transit proposes to implement the SR 522/NE 145th BRT Project, providing BRT service along 9 miles of existing public roadway between Shoreline/Seattle and Bothell, including portions of NE 145th Street, SR 522, and local arterial streets. The proposed BRT project will increase regional mobility and improve transit speed and reliability along the corridor, with interconnections to Link light rail and to other bus services. This SEPA Environmental Checklist evaluates construction and operation of the following project components:

- Two BRT stations in Shoreline/Seattle, three BRT stations in Lake Forest Park, three BRT stations in Kenmore, and four BRT stations in Bothell
- New park-and-ride garages in Lake Forest Park, Kenmore, and Bothell
- Transit queue bypass lanes, business access and transit lanes, and bus-only lanes
- Transit signal priority (TSP) improvements at certain intersections

A variety of bicycle and pedestrian improvements are also associated with some of the above components. Other elements related to this project have been reviewed in environmental documents prepared by the Washington State Department of Transportation, in partnership with Sound Transit.

The SEPA environmental documentation included the whole SR 522 BRT project corridor, and the analysis was described by project segments (or jurisdiction) as follows:

- Segment 1: Seattle/Shoreline
- Segment 2: Lake Forest Park
- Segment 3: Kenmore
- Segment 4: Bothell

Subsequent to the March 2021 SEPA Checklist, the Sound Transit Board issued Resolution No. R2021-05 in August 2021, which established a realigned capital plan for projects not yet in construction. The realignment plan deferred construction of the proposed SR 522/NE 145th BRT Project park-and-ride garages. The Lake Forest Park garage is deferred until 2044 and the Kenmore and Bothell parking garages are deferred until 2034.

The following subsections describe changes to the project that could impact transportation since the design evaluated in the 2021 SEPA analysis.

2.1 Design Refinements in 90 Percent Design

As design has progressed from 30 percent (used in the 2021 SEPA Checklist) to 90 percent, there have been design refinements, including those in utility installations, curb ramps, traffic and transit signals, parking, and right-of-way requirements. Design refinements that could have an impact on transportation are shown for each jurisdiction in Sections 2.1.1 through 2.1.5.

2.1.1 Segment 1: Seattle and Shoreline

General design:

- TSP has been added at 20th Avenue NE/25th Avenue NE.

Parking spaces (Seattle):

- Five off-street parking spaces will be removed to accommodate roadway improvements on the following parcels, identified here by the Sound Transit property identification number (BRS) and the parcel number (PIN): 4 stalls on BRS-134 (PIN 6632300643) and 1 stall on BRS-219 (PIN 7663700240).

Station design refinements (Shoreline):

- The 30th Avenue westbound (WB) station changed from pass behind to pass through, meaning pedestrians and bicyclists will need to pass through the station instead of being able to pass behind the station. There will be no change to right-of-way or temporary construction easement needs; revision to the sidewalk on private property needs to be connected to the public sidewalk.

Parking spaces (Shoreline):

- 34 total off-street parking spaces will be removed to accommodate roadway improvements on the following parcels, identified here by the Sound Transit property identification number (BRS) and the parcel number (PIN): 1 stall on BRS-124 (PIN 6632900144), 2 stalls plus potential unmarked stalls on BRS-126 (PIN 6632900141), 3 stalls on BRS-128 (PIN 6632900140), 6 stalls on BRS-130 (PIN 6632900012), 4 stalls on BRS-132 (PIN 6632900015), 4 stalls on BRS-133 (PIN 6632900010), 8 stalls on BRS-135 (PIN 6632900011), and 6 stalls on BRS-136 (PIN 3670500335).

2.1.2 Segment 2: Lake Forest Park

General design:

- TSP has been added at Beach Drive NE.
- The signal at SR 522 (Bothell Way NE)/NE 165th Street is proposed to be changed to split phasing for the EB/WB approaches.
- The southwest-bound left-turn lane at 35th Avenue NE/Bothell Way NE is proposed to be shortened from 260 feet to 120 feet.
- The southwest-bound left-turn lane at NE 153rd Street/Bothell Way NE is proposed to be shortened from 200 feet to 100 feet.

Parking:

- The 300-stall parking garage at Lake Forest Park Town Center will be deferred until 2044.

2.1.3 Segment 3: Kenmore

General design:

- The pedestrian signal on the SE corner of 73rd Avenue NE/NE Bothell Way will be relocated from the east side to the west side of the north-facing ramp to improve pedestrian access to ramp and landing area.
- TSP has been added at 77th Court NE, 80th Avenue NE, and 83rd Place NE.

Station design refinements:

- The WB station zone at Kenmore Park-and-Ride has been reduced from a three- to a two-bus bay station based on updated ridership analysis. Due to this change, the primary entrance from SR 522 (the western driveway) will remain open and the eastern park-and-ride entrance will be reduced in size to match existing conditions.

Parking:

- The 302-stall parking garage at the Kenmore Park-and-Ride will be deferred until 2034.

2.1.4 Segment 4: Bothell

General design:

- The EB right-turn pocket at the 185th Street and 104th Avenue intersection has been removed from the project, reducing the right-of-way needs in the southwest corner of the intersection.

Station design refinements:

- The station zones in both directions at 98th Avenue NE have been reduced from two- to one-bus bay stations based on updated ridership analysis. Right-of-way needs will be reduced.

Parking:

- The 300-stall parking garage at the southwest side of Pop Keeney Way will be deferred until 2034.
- The total number of on-street parking stalls proposed to be removed along the project corridor has been reduced from 64 to 51.

3. Methodology

This memorandum assesses the potential transportation impacts of the 90 percent design refinements in relation to the results found in the 2021 TTM, which was prepared as part of the SEPA Environmental Checklist (March 2021). The analysis methods for this memorandum are generally the same as presented in the 2021 TTM.

The buildout year for analysis of 90 percent design refinements remains 2042, referred to as “Future Build” in the 2021 TTM and in this document. The assumed opening years of project elements remain unchanged from the 2021 TTM, with the exception of the following:

- Lake Forest Park Park-and-Ride garage, changed from 2024 to 2044
- Kenmore Park-and-Ride garage, changed from 2024 to 2034
- Bothell Park Park-and-Ride garage, changed from 2024 to 2034

Where appropriate, physical changes to the design and/or roadway network have been analyzed using Synchro or VISSIM traffic simulation software. The left-turn pocket refinements proposed at 35th Avenue NE/SR 522 (Bothell Way NE) and NE 153rd Street/SR 522 (Bothell Way NE) in the Lake Forest Park segment were analyzed using Synchro. The design refinements affecting traffic operations in the Bothell segment were analyzed using VISSIM (Appendix A). These were analyzed at the 60 percent design submittal but remain valid for the 90 percent design submittal.

Existing crash data were reviewed at locations where design refinements are proposed to evaluate any potential impacts to safety.

Changes to parking during interim conditions (start of service to project buildout) resulting from the proposed delay of parking garages are discussed qualitatively including drop-off and hide-and-ride. Trip generation during this period was assumed to be generally less than forecasted in the 2021 TTM, which included the parking garages, because the parking spaces in the delayed garages would not be available. Other design refinements are also discussed qualitatively, consistent with the 2021 TTM.

4. Assessment of Design Refinements

This section assesses the potential transportation impacts of design refinements proposed in the 90 percent design. The existing conditions in this memorandum were assumed to be the same as those documented in the 2021 TTM. Most design refinements would have the potential to affect transportation beginning with the operation of BRT. The deferral of the proposed parking garages has the potential to affect transportation in the period between the beginning of BRT operation and the completion of the garages. The assessment of design refinements is provided in the next subsections by BRT segment.

4.1 Segment 1: Seattle and Shoreline

4.1.1 Traffic Operations

4.1.1.1 Transit Signal Priority

The 90 percent design would add TSP to the signals on NE 145th Street at 20th Avenue NE and 25th Avenue NE. TSP works by extending a green light (usually up to 10 seconds) for an approaching transit vehicle or slightly shortening a red light for a waiting transit vehicle (WSDOT 2022). Adding TSP can slightly increase delay at cross-streets. However, this would only occur when it is activated by approaching transit, a maximum of two times per 10-minute period (assuming 10-minute headways). The intersections for which TSP is proposed were projected to operate at Level of Service (LOS) B or better during both peak hours under Future Build conditions in the 2021 TTM. The addition of TSP is highly unlikely to result in a substantial change in delay at these intersections; therefore, they are still projected to operate at an acceptable LOS.

4.1.2 Freight Movement

The 90 percent design refinements are expected to have little to no effect on freight movement through the Seattle/Shoreline segment because no change is proposed to the number of through lanes and no increases in vehicle delay related to the project are anticipated to occur along SR 522.

4.1.3 Parking

A total of 39 additional off-street (private property) parking spaces are proposed to be removed in this segment due to increased right-of-way needs. These include 33 commercial spaces and 6 residential spaces. Their removal may result in a slight increase in nearby on-street parking demand due to the decrease in parking availability on private property for employees, customers, and residents.

4.1.4 Safety

The 90 percent design refinements are expected to have little to no effect on safety through the Seattle/Shoreline segment.

4.1.5 Nonmotorized Transportation

The 30th Avenue WB station has been changed from allowing pedestrians and bicyclists to pass behind the station to now requiring them to pass through the station. This could result in more conflicts with pedestrians boarding at this station, especially when it is congested.

4.2 Segment 2: Lake Forest Park

4.2.1 Traffic Operations

4.2.1.1 Parking Garage Deferral

The original design included the construction of a parking garage at the Lake Forest Park Town Center at the intersection of SR 522/Ballinger Way NE in 2024. Sound Transit’s realignment plan has now deferred its construction to 2044. Once constructed, the parking garage is projected to create 123 new trips in the PM peak hour. In the period between the start of BRT operation and the construction of the parking garage, the improved speed and reliability of the bus service through this segment may attract vehicle trips, but the total is anticipated to be much less than the projected number of trips associated with completion of the 300-stall parking garage. Some of these trips are anticipated to be drop offs (also known as “kiss-and-ride”) in the Lake Forest Park Town Center and/or City Hall parking lots. The proposed parking garage was included in the Future Build scenario in the 2021 TTM. In that study, all intersections in this segment were projected to operate at LOS C or better during both peak hours under Future Build conditions. Because the parking garage deferral will delay most vehicle trips until 2044, the intersections in this segment are projected to operate at the same LOS as projected in the 2021 TTM.

4.2.1.2 Transit Signal Priority

The 90 percent design refinements would add TSP to the signal at the SR 522 (Bothell Way NE)/Beach Drive NE intersection. TSP works by extending a green light (usually up to 10 seconds) for an approaching transit vehicle or slightly shortening a red light for a waiting transit vehicle (WSDOT 2022). The addition of TSP has the potential to slightly increase delay at cross-streets. However, this would only occur when it is activated by approaching transit, a maximum of two times per 10-minute period (assuming 10-minute headways). The intersection for which TSP is proposed was projected to operate at LOS B or better during both peak hours under Future Build conditions in the 2021 TTM. The addition of TSP is unlikely to result in a substantial change in delay at this intersection; therefore, it is still projected to operate at an acceptable LOS.

4.2.1.3 Channelization

At the intersection of 35th Avenue NE/SR 522 (Bothell Way NE), the southwest-bound left-turn pocket is proposed to be shortened from 260 feet to 120 feet. The turn pocket currently serves multiple apartment complexes on the east side of SR 522. A turn pocket analysis was completed by DKS Associates in March 2023. The analysis (DKS 2023) included AM and PM peak period Synchro models for existing and Future Build conditions. Turning movement counts were collected in March 2023. However, the number of vehicles recorded entering and exiting SR 522 was determined to be lower than anticipated, so trip generation for the existing apartments was calculated to provide a more conservative estimate. It was estimated that 73 vehicles would be entering the site during the PM peak hour and approximately half of these vehicles were assumed to be entering from the north using the left-turn pocket in question. As shown in Table 4-1, the 95-percentile queue length in the left-turn pocket for Future Build Conditions in the PM peak hour is projected to be 32.5 feet, which is much shorter than the 120-foot left-turn pocket length available for vehicle queuing with the proposed by the project design refinement. There are no queues projected in the AM peak hour.

Table 4-1. SR 522/35th Avenue NE – Southwest-bound Left-Turn Pocket 95% Queue Lengths

Scenario	AM Peak Hour	PM Peak Hour
Existing Conditions	0.0 foot	30.0 feet
Future Build Conditions	0.0 foot	32.5 feet

The existing two-way left turn lane on SR 522 between NE 153rd Street and 41st Avenue NE is proposed to be replaced with a raised median. This would eliminate left-turn access to several properties, including an apartment complex and several single-family homes. Many of these trips would need to divert to an adjacent signal to make a U-turn. As part of the 90 percent design, the southbound left-turn pocket at the NE 153rd Street/SR 522 intersection is proposed to be shortened from 200 feet to 100 feet. A turn pocket analysis was completed by DKS Associates in April 2024. The analysis (DKS 2024) included PM peak period Synchro models for Future Build conditions. An estimate of trip generation for the land uses requiring diverted trips resulted in 17 additional vehicles using the left-turn pocket in question. Modifications to the signal timing were recommended, including adding a second left-turn phase. The average queue length in the left-turn pocket for Future Build Conditions in the PM peak hour is projected to be 25 feet, which is much shorter than the 100-foot left-turn pocket length available for vehicle queuing with the proposed by the project design refinement. The 95 percent queue length of 54 feet is also much shorter than the available left-turn pocket length.

4.2.2 Freight Movement

The 90 percent design refinements are expected to have little to no effect on freight movement through the Lake Forest Park segment because no change is proposed to the number of through lanes and no increases in vehicle delay related to the project are anticipated to occur along SR 522.

4.2.3 Parking

As mentioned earlier, the deferral of the parking garage will delay most vehicle trips until 2044. However, the improved speed and reliability of the bus service through this segment may attract some additional vehicle trips before the parking garage is completed. Because there is surplus parking available at Lake Forest Park Town Center (2021 TTM), some of these additional trips may attempt to “hide-and-ride.” Hide-and-ride is the term used for parking vehicles near transit stations outside of parking provided for transit users.

4.2.4 Safety

The 90 percent design refinements are expected to have little to no effect on safety through the Lake Forest Park segment.

4.3 Segment 3: Kenmore

4.3.1 Traffic Operations

4.3.1.1 Parking Garage Deferral

The original design included the construction of a parking garage on the site of the existing Kenmore Park-and-Ride just northeast of the intersection of SR 522/73rd Avenue NE in 2024. Sound Transit’s realignment strategy has now deferred its construction to 2034. The parking garage is projected to create 143 new trips in the PM peak hour. In the period between the start of BRT operation and the construction of the parking garage, the improved speed and reliability of the bus service through this segment may attract some new trips, but the total will be much less than that projected with completion of the garage. Some of these trips will be drop offs in the existing park-and-ride surface lot. The proposed parking garage was included in the Future Build scenario in the 2021 TTM. In that study, all intersections in this segment were projected to operate at LOS D or better during both peak hours under Future Build conditions. Because the parking garage deferral will delay most vehicle trips until 2034, the intersections in this segment are projected to operate at the same LOS as projected in the 2021 TTM or better.

4.3.1.2 Transit Signal Priority

The 90 percent design would add TSP to the signals on SR 522 (NE Bothell Way) at 77th Court NE, 80th Avenue NE, and 83rd Place NE. TSP works by extending a green light (usually up to 10 seconds) for an approaching transit vehicle or slightly shortening a red light for a waiting transit vehicle (WSDOT 2022). The addition of TSP can have the potential to slightly increase delay at cross-streets. However, this would only occur when it is activated by approaching transit, a maximum of two times per 10-minute period (assuming 10-minute headways). The intersections for which TSP is proposed were projected to operate at LOS B or better during both peak hours under Future Build conditions in the 2021 TTM. The addition of TSP is unlikely to result in a substantial change in delay at these intersections; therefore, they are still projected to operate at an acceptable LOS.

4.3.1.3 Other Design Refinements

The 90 percent design would retain both existing driveways from SR 522 to Kenmore Park-and-Ride, which compared to the removal of one driveway (which was assumed previously) will improve internal circulation and help prevent vehicles from queueing onto WB SR 522.

4.3.2 Freight Movement

The 90 percent design refinements are expected to have little to no effect on freight movement through the Kenmore segment because no change is proposed to the number of through lanes and no increases in vehicle delay related to the project are anticipated to occur along SR 522.

4.3.3 Parking

As mentioned earlier, the deferral of the parking garage will delay most vehicle trips until 2034. However, the improved speed and reliability of the bus service through this segment may attract some additional vehicle trips before the parking garage is completed. The existing park-and-ride surface lot was 99 percent full on weekdays in 2017 (Metro 2017) but had fallen to 17 percent full by mid-2022. King County Metro Transit has forecasted that utilization at this park-and-ride will continue to be under 37 percent through 2039 (Fehr & Peers 2022).

4.3.4 Safety

The 90 percent design refinements are expected to have little to no effect on safety through the Kenmore segment.

4.4 Segment 4: Bothell

4.4.1 Traffic Operations

4.4.1.1 Parking Garage Deferral

The original design included the construction of a parking garage and associated retail and office space at the southwest corner of the Pop Keeney Way/Thorsk Street intersection in 2024. Sound Transit's realignment plan has now deferred its construction to 2034. The parking garage and associated commercial development is projected to create 230 new trips in the PM peak hour. In the period between the start of BRT operation and the construction of the parking garage, the improved speed and reliability of the bus service through this segment may attract some new trips, but the total will be much less than that projected with completion of the garage and commercial development. Some of these trips will be drop offs (also known as "kiss-and-ride") in the surrounding neighborhood, possibly including the Bothell Library parking lot.

The proposed parking garage was included in the Future Build scenario in the 2021 TTM. In that study, all intersections were projected to operate at LOS C or better during the AM peak hour under Future Build conditions and four intersections were projected to operate at LOS E during the PM peak hour. However, these intersections were projected to operate better than in the No Build condition, with the exception of NE 185th Street and Bothell Way, where delay is expected to increase by 1.7 seconds per vehicle. Because the parking garage deferral will delay most vehicle trips until 2034, the intersections in this segment are projected to operate at the same LOS as projected in the 2021 TTM or better.

4.4.1.2 Channelization

At the intersection of 104th Avenue NE/NE 185th Street, the eastbound right-turn pocket is proposed to be eliminated as part of the 60 percent design and was carried forward into the 90 percent design. This design refinement was analyzed in the Future 60% Traffic Operations Results memorandum completed by DKS Associates in June 2022 (Appendix A). The analysis included PM peak period Synchro models for year 2024 conditions for both 30 and 60 percent designs. As shown in Table 4-2, these models found that the intersection delay would improve with the removal of the right-turn pocket and that the 95-percentile queue length at the eastbound approach is projected to increase by 5 feet. Because the 90 percent design refinements are projected to result in an improvement in year 2024 conditions, they will also do so in the Future Build condition described in the 2021 TTM (year 2042).

Table 4-2. NE 185th Street/104th Avenue NE Right-turn Pocket Removal (PM Peak Hour)

Measure of Effectiveness	With Right-turn Pocket (30% Design)	Without Right-turn Pocket (60% Design)
Delay	30.6 seconds	29.7 seconds
95% Queue Length (EB Approach)	375 feet	380 feet

4.4.2 Freight Movement

The 90 percent design refinements are expected to have little to no effect on freight movement through the Bothell segment because no changes are proposed to the number of through lanes and no increases in vehicle delay related to the project are anticipated to occur along SR 522.

4.4.3 Parking

As mentioned previously, the deferral of the parking garage will delay most vehicle trips until 2034. However, the improved speed and reliability of the bus service through this segment may attract some additional vehicle trips before the parking garage is completed. Some of these additional trips may attempt to “hide-and-ride” in on-street parking spaces located throughout the Bothell segment.

4.4.4 Safety

The elimination of the right-turn pocket on the west leg of NE 185th Street at 104th Avenue NE results in a 10-foot reduction in pedestrian crossing distance on the west leg as compared to No Build conditions. The west leg will now have a crossing time of 9.1 seconds as compared to 12.0 seconds for No Build conditions, which will reduce the amount of time pedestrians are in the roadway.

4.4.5 Nonmotorized transportation

As mentioned previously, the eastbound right-turn pocket at the 104th Avenue NE/185th Street intersection has been proposed to be removed. This removal will shorten the time necessary for pedestrians to cross the west leg, providing improved access.

4.5 All Segments: Transit Operations

The 90 percent design proposes TSP at six additional intersections: two in Seattle/Shoreline, one in Lake Forest Park, and three in Kenmore. As mentioned in previous paragraphs, TSP is used to prolong the green signal time when a transit vehicle is approaching the intersection or to shorten red signal time for waiting transit vehicles at intersections along the transit route, resulting in increased speed and reliability for transit.

5. Mitigation Measures

The mitigation measures proposed in the 2021 TTM remain relevant for the project unless new mitigation measures are proposed herein.

5.1 Operational Mitigation

5.1.1 Traffic Operations

Minimal changes in intersection movement delay are projected, and overall improvement in intersection operations from No Build conditions to Build conditions is expected. Therefore, operational mitigation measures are not proposed.

5.1.2 Parking

5.1.2.1 Segment 2 – Lake Forest Park

The city could consider security enforcement and implementing time-limited parking that could minimize the potential for hide-and-ride parking near the Lake Forest Park Town Center station as a result of parking garage deferral.

5.1.2.2 Segment 4 – Bothell

The city could consider implementing time-limited parking that could minimize the potential for hide-and-ride parking at the 98th Avenue NE station.

5.2 Construction Mitigation

There is no change in the general scope of construction for this project. Sound Transit's implementation of the best practices stated in the 2021 TTM will continue to avoid or minimize transportation impacts during construction. Best practices include the following:

- Maintain pedestrian and bicycle movements and access using detours.
- Coordinate with the other transit agencies operating along the corridor to establish temporary bus stops, as appropriate; place signage and inform the public of temporary bus stop operations; and maintain access.
- Maintain at least one lane of travel in each direction at all times (it may be via a pre-approved detour) and keep all traffic lanes open during peak hours.
- Inform residents, businesses, and the public in advance of construction regarding timing and expected detours and lane closures.
- Maintain vehicular and nonvehicular access to properties during construction. Contractors would be required to coordinate with the residents of properties, Sound Transit, Washington State Department of Transportation, and local jurisdictions for construction activities. Notification and Sound Transit approval would be required for any access restriction needed for construction activities.
- Place signage as appropriate to inform the public of construction vehicular and nonvehicular detours, access changes, and lane closures.
- Notify fire, police, and emergency services in advance of specific construction activities, and ensure adequate detour and access for emergency services through or around work areas.

- The primary haul route for earth work (at wall and fill locations) would likely be SR 522, followed by the shortest route on arterial streets, locally designated truck streets, and some local streets. Construction vehicles will be prohibited from using the NE 181st Street access roadway to the existing Kenmore Park-and-Ride lot.
- The temporary closure of the sidewalks on NE 145th Street and SR 522 during construction would necessitate temporary pedestrian and bicycle detours. Throughout project construction, Sound Transit would maintain pedestrian access using detours and directional signage. The closure of sidewalks and resulting pedestrian and bicycle detours during construction would result in a temporary and minor changes to nonvehicular access along NE 145th Street, SR 522, 98th Avenue NE, NE 185th Street, and Beardslee Boulevard. No closures or detours are expected to occur on the Burke-Gilman Trail.
- The construction contractor would be required to establish temporary pedestrian route detours during retaining wall construction.

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Appendix A
Future 60% Traffic Operations Results Memo



STRIDE Bus Rapid Transit Future 60% Traffic Operations Results

OA 0206-19 Task 18.17

June 2022

Prepared by the

STRIDE

BRT General Engineering Consultant



STRIDE Bus Rapid Transit

Project No: RTA/OA 0206-19
 Document Title: Future 60% Traffic Operations Results
 Document No.: 18.17.02
 Revision: 0
 Document Status: Draft
 Date: 7/8/2022
 Client Name: Sound Transit
 Client No: OA 0206-19
 Program Manager: Paul Gasson
 Author: Brian Kellogg, Ben Wallach
 File Name: OA 0206-19 18.17 CUD 07 Future 60% Traffic Operations Results

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Document history and status

Revision	Date	Description	Author	Checked	Reviewed	Approved
0	7/8/2022	Draft memo submittal	BAW	WAM	ICB	BTK

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Appendix A Bothell Future 2024 30% Design Results

Appendix B Bothell Future 2024 60% Design Option Results: Main Street Closed through Downtown – PM peak hour

Appendix C Bothell Future 2024 PM Peak Hour Volumes

Acronyms and Abbreviations

BAT	Business Access and Transit (BAT) lane - a transit improvement strategy that provides lane capacity to dedicated transit vehicles in efforts to move transit more efficiently through traffic. The exception to the use of this strategy rather than a transit-only lane is that BAT lanes also allow motorists to use the lane to access business areas or to make right-turning movements at specific locations.
BRT	Bus Rapid Transit (BRT) - a high capacity transit system that delivers fast, frequent, accessible, and reliable bus service. BRT is further defined in the ST3 Regional Transit System Plan and in the U.S. Department of Transportation's Federal Transit Administration website at https://www.transit.dot.gov/research-innovation/bus-rapid-transit .
GEC	General Engineering Consultant
GEH	GEH statistic - a formula used to provide tolerances for a comparison between field data and simulation outputs.
HCM	Highway Capacity Manual
LOS	Level of Service
Metro/KCM	King County Metro
MOE	Measure of Effectiveness - one or more traffic performance measures of effectiveness used to quantify the achievement of a project's traffic operations objectives; typically reported and/or calculated from model output.
Refined Project	The selected set of Project ideas, strategies, technologies, and solutions that resulted from Phase 1 analysis and concept design of the ST3 Representative Project.
SR	State Route
ST	Sound Transit
ST3	Sound Transit 3 System Plan
TSP	Transit Signal Priority
WSDOT	Washington State Department of Transportation

1. Introduction

1.1 Overview

The SR 522/NE 145th BRT project seeks to plan for and improve transit operations within the SR 522/NE 145th corridor. Proposed improvements include transit specific treatments including transit queue by-pass lanes, bus-only lanes, and transit signal priority (TSP) among other treatments. The Vissim traffic analysis software was utilized to model several proposed improvements to support decision-making for more complex design and operations issues within Bothell city limits

1.2 Purpose of Memorandum

The purpose of this memorandum is to document the assumptions and results of the micro-simulation modeling efforts of proposed design refinements along SR 522 in Bothell and Bothell city streets for Bus Rapid Transit (BRT) in Bothell. The analysis was prepared for the PM peak hour in the Bothell models and focused on the following conditions:

- Existing Conditions
- Year of Opening 2024 Baseline (No-Build)
- Year of Opening 2024 30% Design
- Year of Opening 2024 60% Build Refinements

The year of opening for the SR 522 BRT line has been updated to 2025. Previous modeling work had used a year 2024 year of opening for purposes of volume forecasting. As the 60% design work follows the previously developed forecasts, the modeled year of opening is also 2024 for purposes of this analysis.

This memorandum describes the study area, methodology, and modeling results for the design refinements in the Bothell study area. The results provide information needed to make informed decisions on which transportation improvements to implement along SR 522 in Bothell, and Bothell city streets. The Vissim traffic analysis software, a traffic micro-simulation analysis tool, was used to evaluate the traffic operational and vehicle queueing issues related to BRT operations. The results of the models are presented and discussed so impacts and benefits to the transportation network can be estimated to inform design decisions.

1.3 Study Area

The full SR 522 BRT project area goes from Shoreline/Seattle along NE 145th Street (SR 523) from Interstate 5 to SR 522, follows SR 522 through Lake Forest Park and Kenmore, and then continues through downtown Bothell along 98th Avenue NE to NE 185th Street and Beardslee Boulevard. **Figure 1-1** shows the full Project area through Shoreline/Seattle, Lake Forest Park, Kenmore, and Bothell.

Figure 1-2 shows the Vissim study area through Bothell, modeled for this analysis. The study intersections for this sub-area are shown in **Table 1-1** alongside the traffic control changes made between existing conditions and the 30% design.

Figure 1-1. SR 522/NE 145th Bus Rapid Transit Project

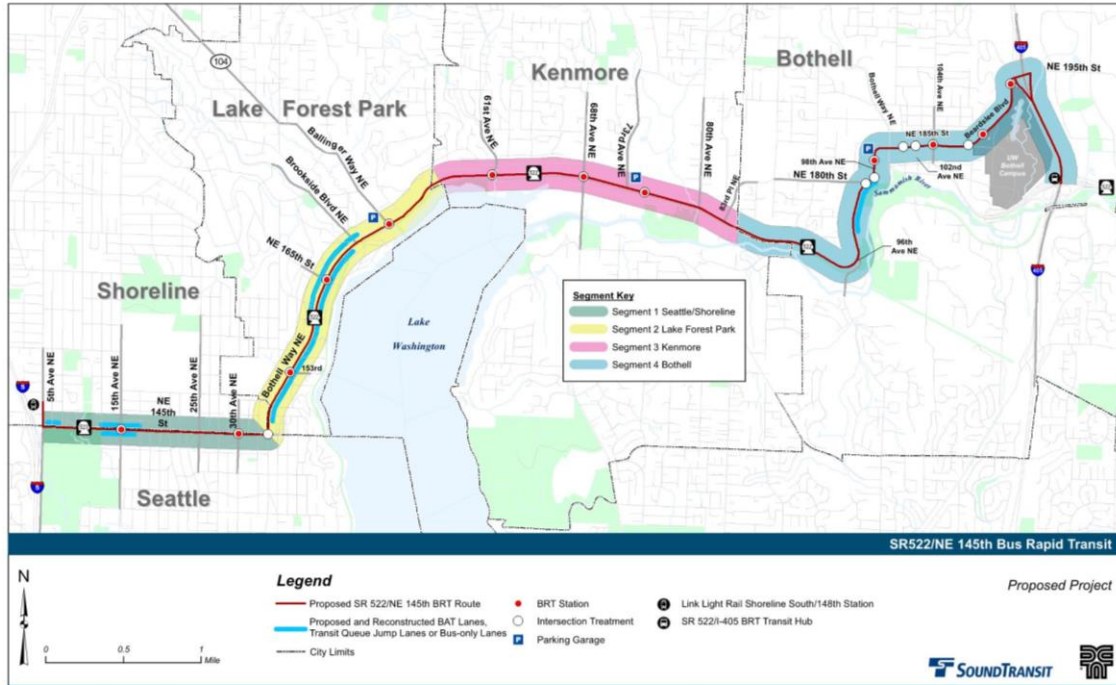


Figure 1-2. Bothell Vissim Study Area

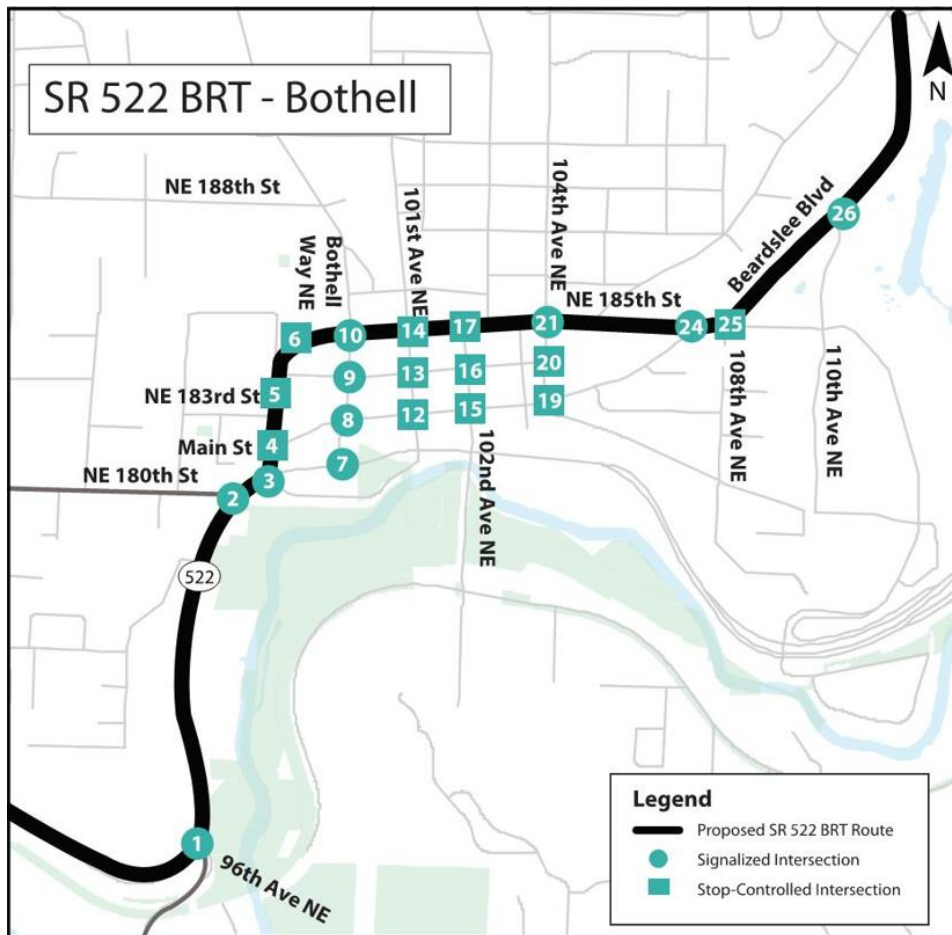


Table 1-1. Bothell Vissim Study Intersections

#	Intersection	Control Type	
		Existing	30% Design Change
1	SR 522 (Bothell Way NE) and 96th Avenue NE	Signalized	-
2	SR 522 (Bothell Way NE) and NE 180th Street	Signalized	-
3	SR 522 (Bothell Way NE) and 98th Avenue NE	Signalized	-
4	98th Avenue NE and Main Street	TWSC	TWSC (w/ HAWK Signal)
5	98th Avenue NE and NE 183rd Street	AWSC	TWSC
6	NE 185th Street and Pop Keeney Way	TWSC	-
7	Bothell Way NE and SR 522 (Woodinville Drive)	Signalized	-
8	Bothell Way NE and Main Street	Signalized	-
9	Bothell Way NE and NE 183rd Street	Signalized	-
10	Bothell Way NE and NE 185th Street	Signalized	-
12	Main Street and 101st Avenue NE	AWSC	-
13	NE 183rd Street and 101st Avenue NE	AWSC	-
14	NE 185th Street and 101st Avenue NE	AWSC	AWSC (w/ HAWK Signal)
15	Main Street and 102nd Avenue NE	AWSC	-
16	NE 183rd Street and 102nd Avenue NE	AWSC	-
17	NE 185th Street and 102nd Avenue NE	TWSC	-
19	Beardslee Boulevard and Kaysner Way	AWSC	-
20	NE 183rd Street and 104th Avenue NE	TWSC	-
21	NE 185th Street and 104th Avenue NE	AWSC	Signalized
22	Beardslee Boulevard and Sunrise Drive	TWSC	-
23	NE 185th Street and Ross Road	TWSC	-
24	NE 185th Street and Beardslee Boulevard	TWSC	Signalized
25	Beardslee Boulevard and 108th Avenue NE	TWSC	-
26	Beardslee Boulevard and 110th Avenue NE	Signalized	-

2. Methodology

This chapter provides a summary of the methods used for the analysis, including the analysis tools, approach, Measures of Effectiveness (MOEs), and assumptions (in Future Build models). A detailed discussion of the methodology was documented in, *Traffic Simulation Modeling Methods and Assumptions Technical Memorandum – 60% Design Phase* (Sound Transit June 2022).

2.1 Analysis Approach

Vissim was used for the traffic and transit operations analysis in the Bothell segment. Vissim is a microscopic modeling software that replicates individual traffic, transit, and pedestrian movements. The software is useful in capturing congested and complex traffic scenarios as well as multimodal interactions. The study area for this analysis has a high volume of transit, general-purpose vehicles, and pedestrians, as well as transit elements including transit-only lanes, transit stations, and Transit Signal Priority (TSP) which cannot be modeled well in a deterministic traffic analysis tool like Synchro. Vissim provides detailed travel time, delay, and queuing results for multi-modal corridors and captures impacts of changes to transit routes, transit station locations, signal timing, and turn restrictions.

Overall intersection and movement delay, Level of Service (LOS), movement queue length (average and 95th percentile), and corridor travel times for transit were selected as the key MOEs that represent the traffic operational performance of the Future No-Build and Build conditions. The MOEs and their differences across scenarios are valuable in supporting the decisions of BRT-related improvements.

Level of service (LOS) is the term used to denote the different operating conditions that occur on a given roadway segment/intersection under various traffic volume loads and operating conditions. It is a qualitative measure used to describe a quantitative analysis that includes factors such as roadway geometrics, signal phasing, pedestrian volumes, speed, travel delay, freedom to maneuver, and safety. Level of service provides an index to the operational qualities of a roadway segment or an intersection. Level of service designations range from A to F, with LOS A representing the best operating conditions and LOS F representing the worst operating conditions. Level of service designation is reported differently for signalized and unsignalized intersections.

The Future No-Build model and Future Build models are prepared with forecasted future traffic volumes. The Future No-Build and Build models are based on Existing Conditions models that are quantitatively calibrated with turning movement counts, queue conditions, transit travel times, and general-purpose vehicle travel times collected in the field. This provides a basis for comparison of Existing Conditions, Future No-Build and Build conditions. In the Bothell study area, future build scenarios were tested for an analysis year-of-opening of 2024 (as of 60% design, the actual expected year-of-opening is 2025).

2.2 Model Assumptions

The Vissim analysis for the Bothell study area followed WSDOT protocols. The model for 60% design was based on a Vissim model previously developed for the conceptual engineering phase of the Project.

The Bothell Vissim models were based on the Existing Conditions Vissim model documented in the *Existing Conditions/Calibration Bothell Vissim Results Technical Memorandum* (Sound Transit Sept 2019). The existing conditions model was developed and calibrated to field conditions as part of a previous phase of the Project. For this study, a year of opening 2024 30% design model was developed for comparison with the build scenarios considered for the 60% design phase.

The following assumptions applied to existing year and future Vissim models:

- The simulation included a 30-minute seeding period ahead of the peak hour for loading the network.

- Desired speeds were based on posted speed limits in the field. Changes to the posted speed limits and horizon year speeds were coordinated with the Transit Integration team prior to the modification of desired speeds.
- Reduced speed zones for turning movements were 9 miles per hour for right turns and 15 miles per hour for left turns (consistent with Synchro and Vissim protocol). These values were adjusted to match field conditions where applicable.
- Pedestrian volumes from turning movement counts were entered into the Vissim models. For horizon year, pedestrian growth were based on projected ridership growth.
- Bicycle volumes were not included in the model.
- Parking interactions were modeled on NE 185th Street only.
- Simulation output was reviewed from individual model runs to validate that there were no fatal simulation errors. Simulation results were based on an average of 10 validated simulation runs.
- Turning movement counts in Vissim were validated using the GEH statistic, a formula used to provide tolerances for a comparison between field data and simulation outputs. This statistic was used as part of the WSDOT's Vissim protocol for calibration.
- Peaking profiles and truck percentages were based on collected turning movement counts.

3. MODEL SCENARIOS AND RESULTS

This chapter describes the 2019 Existing Conditions, Future 2024 Baseline, Future 2024 30% Design, and Future 2024 Build models (60% Design options) developed for the Bothell study area and their results. Vissim was used to analyze the area for the PM peak hour.

3.1 Existing Conditions

A 2019 Existing Conditions model was developed and calibrated based on existing:

- Turning movement counts including pedestrian counts
- Transit service
- Signal timing
- Channelization
- Field observations
- Parking along 185th Avenue NE

The Existing Conditions model was used as a starting point for all future 2024 and 2042 models. Results from the existing conditions model are documented in the Existing Conditions/Calibration Bothell Vissim Results Technical Memorandum (Sound Transit September 2019).

3.2 Future 2024 Baseline

Future 2024 PM Baseline (ie. No-Build) model results were reported as part of the memo titled Vissim Technical Memorandum: Future No-Build and Build Results (Seattle/Shoreline and Bothell), submitted in May 2021. An overview of the 2024 Baseline scenario and model results from that memo are summarized here.

The PM peak volumes developed for the 2024 Baseline scenario were carried over into the 30% design and 60% design traffic models and are provided in Appendix C.

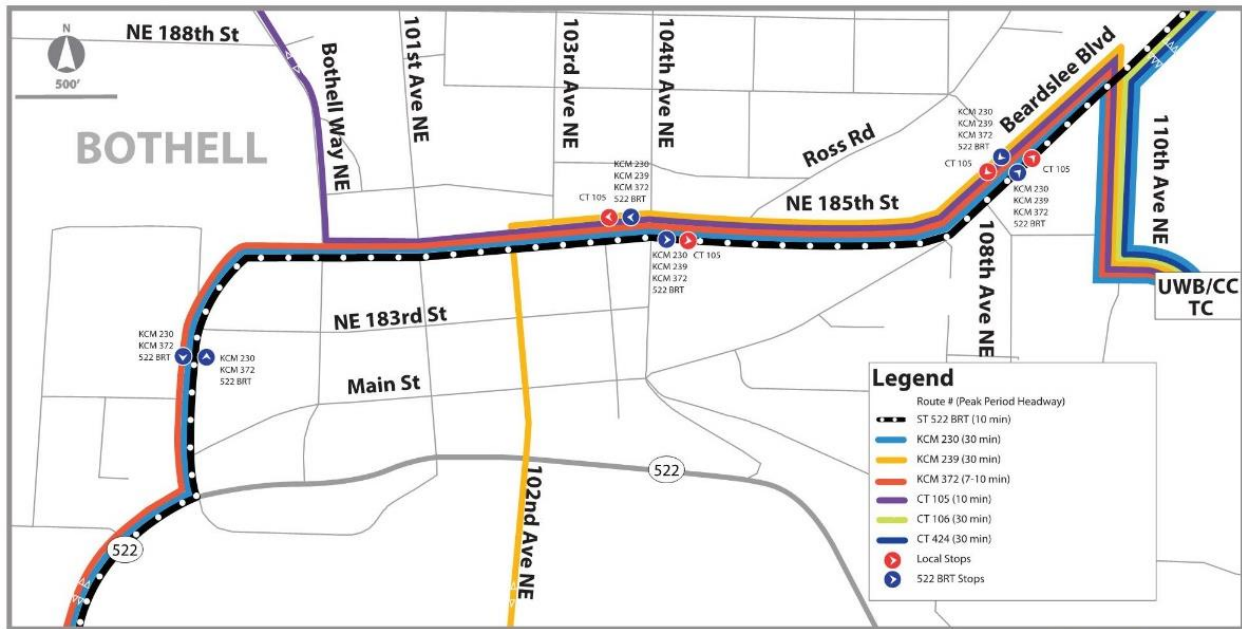
3.2.1 Overview of 2024 Baseline Updates

The future Baseline model included the following main changes from existing conditions:

- Volume growth from 2019 to 2024, forecasted based on anticipated household and employment growth in the City of Bothell and including volumes associated with planned BRT parking garage, and adjusted for volume balancing
- Transit service changes as developed by Sound Transit's Transit Integration Team in collaboration with King County Metro and Community Transit. The Future 2024 Baseline transit service map for Bothell is shown in **Figure 3-1**.
- Updated channelization and intersection configurations along Main Street and Beardslee Boulevard based on identified capital projects anticipated by the City of Bothell. These changes from existing conditions include:
 - **Main Street and 98th Avenue NE** – Main Street was re-aligned with NE 182nd Street at 98th Avenue NE. The new intersection will be a two-way stop control intersection for the eastbound and westbound approaches.

- **Beardslee Boulevard and 110th Avenue NE** – The northwest-bound approach on 110th Avenue NE was reconfigured to dual left turn lanes and a shared through/right turn lane
- **Beardslee Boulevard between NE 185th Street and NE 112th Avenue NE** – The northeast-bound direction was widened by adding a second northeast-bound lane

Figure 3-1. Future 2024 Baseline Transit Service



3.2.2 Future 2024 Baseline PM Model Results

Future 2024 Baseline PM peak intersection delay and LOS are shown in **Figure 3-2**. Failing LOS results along 104th Avenue NE are largely due to future projected growth, with the intersections along that corridor being stop-controlled. SR 522 was also shown to have long queues and high delay, with the intersection of SR 522 and Bothell Way NE operating at near-capacity.

Figure 3-2. Future 2024 Baseline PM Peak Hour Delay Results

SR 522/NE 145th BRT

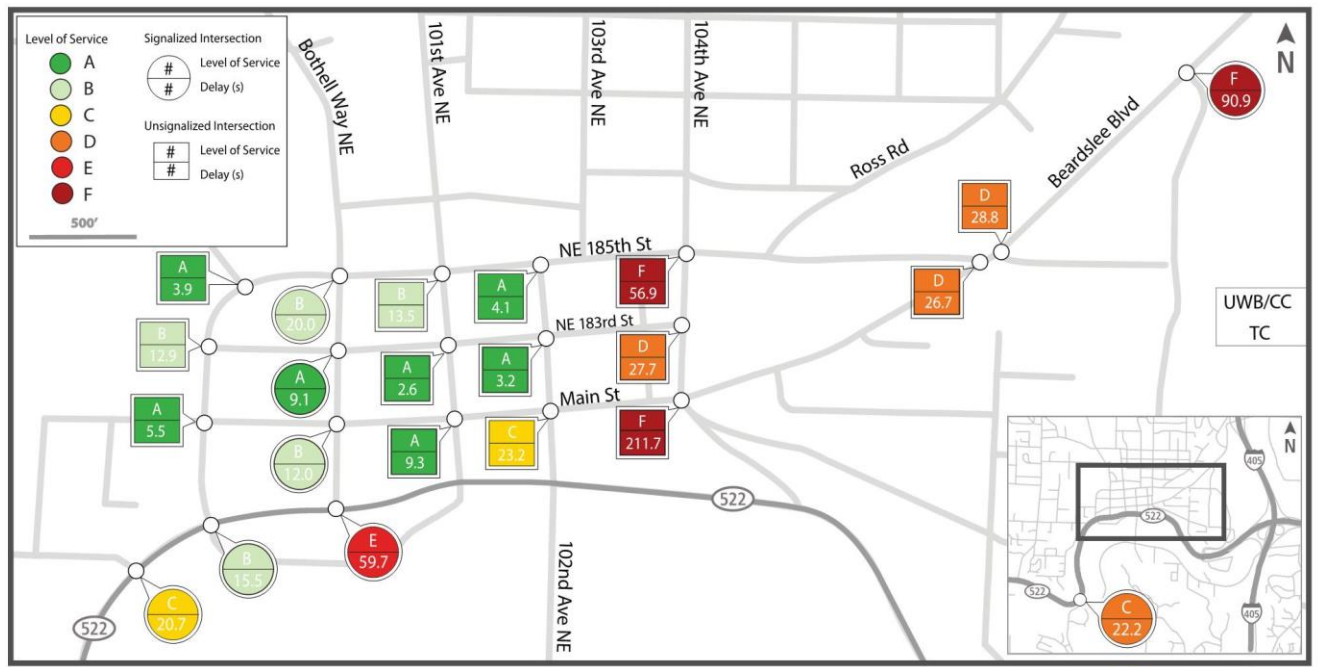


Table 3-1 shows the transit delay and LOS by movement throughout the proposed BRT corridor along 98th Avenue NE and NE 185th Street. In the 2024 Baseline PM condition, buses face high delay along the SR 522 portion of their route, as well as along NE 185th Street at Bothell Way and at 104th Avenue NE.

Table 3-1. Future 2024 Baseline PM Transit Delay and LOS

Intersection	Approach	Movement	Delay (seconds/vehicle)	LOS
NE 96th Street and SR 522	Northbound	Through	16	B
	Southbound	Through	3	A
NE 180th Street and SR 522	Northeast-bound	Through	57	E
	Southbound	Through	2	A
NE 98th Avenue and SR 522	Eastbound	Left	59	E
	Southbound	Right	11	B
Main Street and NE 98th Ave	Northbound	Through	4	A
	Southbound	Through	14	B
NE 183rd Street and 98th Avenue NE	Northbound	Through	27	D
	Southbound	Through	16	C
Pop Keeney Way and NE 185th St	Eastbound	Through	2	A
	Westbound	Through	1	A

Intersection	Approach	Movement	Delay (seconds/vehicle)	LOS
NE 185th Street and Bothell Way NE	Eastbound	Through	66	E
	Westbound	Through	50	D
NE 185th Street and 101st Avenue NE	Eastbound	Through	12	B
	Westbound	Through	8	A
NE 185th Street and 102nd Avenue NE	Eastbound	Through	2	A
	Westbound	Through	13	B
NE 185th Street and 104th Avenue NE	Eastbound	Through	31	D
	Westbound	Through	51	F
NE 185th Street and Beardslee Blvd	Eastbound	Left	69	F
	Southwest-bound	Right	3	A
NE 108th Street and Beardslee Blvd	Northbound	Through	1	A
	Southbound	Through	48	E
NE 110th Street and Beardslee Blvd	Northbound	Through	55	D
	Southbound	Through	133	F

3.3 Future 2024 30% Design

The Future 2024 30% Design scenario includes projected 2024 PM volumes, several transit assumptions, and improvements along Main Street and Beardslee Boulevard as described below.

3.3.1 Transit Service

The northbound/eastbound BRT route travels along SR 522 to 98th Avenue NE where it makes an eastbound left. The BRT then continues onto NE 185th Street, makes an eastbound left at NE 185th Street and Beardslee Boulevard, and travels through Beardslee Boulevard and 110th Avenue NE leaving the Bothell Vissim analysis segment. The southbound/westbound BRT route along the Bothell segment enters on Beardslee Boulevard traveling through the Beardslee Boulevard and 110th Avenue NE intersection and makes a southwest-bound right turn onto NE 185th Street. Transit then continues onto 98th Avenue NE, makes a southbound right movement at 98th Avenue NE and SR 522, traveling along SR 522 until it leaves the Bothell Vissim segment passing SR 522 and 96th Avenue NE.

3.3.2 Intersection Configuration

The Future 2024 30% Design model includes updated intersection configurations at several locations. Lane configuration updates from the Baseline (No-Build) scenario are as follows:

- **SR 522 and 98th Avenue NE** – NB/EB buses continue into the eastbound left turn lane from the through movement at SR 522 and NE 180th Street. The WB BAT lane begins at the receiving leg of the SB right movement.
- **SR 522 and NE 180th Street** – The two-way left turn lane was converted to a bus-only turn bay of 1,230 feet to allow transit to bypass the northeast-bound SR 522 queues. NB/EB BRT and local buses proceed through

the intersection in the northeast-bound left turn lane. Another left turn lane (outside of the bus-only turn bay) for general-purpose vehicles was also extended to 250 feet. A westbound lane through the intersection serves BRT as well.

- **SR 522 between 96th Ave NE and NE 180th Street** – A westbound BAT lane was included connecting the existing BAT lanes at the two adjacent intersections. Added a southbound to northbound u-turn pocket and acceleration lane.
- **Main Street and 98th Avenue NE** – The northbound approach on Main Street was reconfigured with an added a left-turn bay and separated through and right-turn lanes. The southbound approach on Main Street was updated to include an added a left-turn bay. In addition, a Rectangular Rapid Flashing Beacon (RRFB) was included on the north leg of the intersection.
- **NE 183rd Street and 98th Avenue NE** – The intersection was changed from an all-way stop to a two-way stop for the EB/WB approaches.
- **NE 185th Street and Pop Kenney Way** – The travel lanes were widened to 15 feet from Pop Kenney Way to Bothell Way to accommodate BRT.
- **Bothell Way and NE 185th Street** – The WB left turn pocket was removed for a wider lane.
- **NE 185th Street and 101st Avenue NE** – The intersection was changed from an all-way stop to a two-way stop for the NB/SB approaches. An RRFB was included on the east leg of the intersection
- **NE 185th Street and 102nd Avenue NE** – An EB right turn pocket was included at the intersection.
- **NE 185th Street and 104th Avenue NE** – The intersection was modified to include a new traffic signal, as well as an EB right turn pocket and WB right turn pocket.
- **NE 185th Street and Beardslee Boulevard** – The intersection was modified to include a new traffic signal. The northeast-bound left turn movement was restricted and a southwest-bound right turn pocket was included.
- **Beardslee Boulevard and 108th Avenue NE** – The southwest-bound Beardslee Boulevard approach added a left-turn bay. A HAWK signal was included between NE 185th Street and 110th Avenue NE for crossing Beardslee Boulevard.
- **Beardslee Boulevard and 110th Avenue NE** – The northwest-bound approach on 110th Avenue NE was reconfigured to reduce the number of through lanes from two to one.

There are eight signalized intersections in the 30% Design network. All other intersections included in the Vissim model are either two-way stop-controlled or four-way stop-controlled. The signalized intersections include:

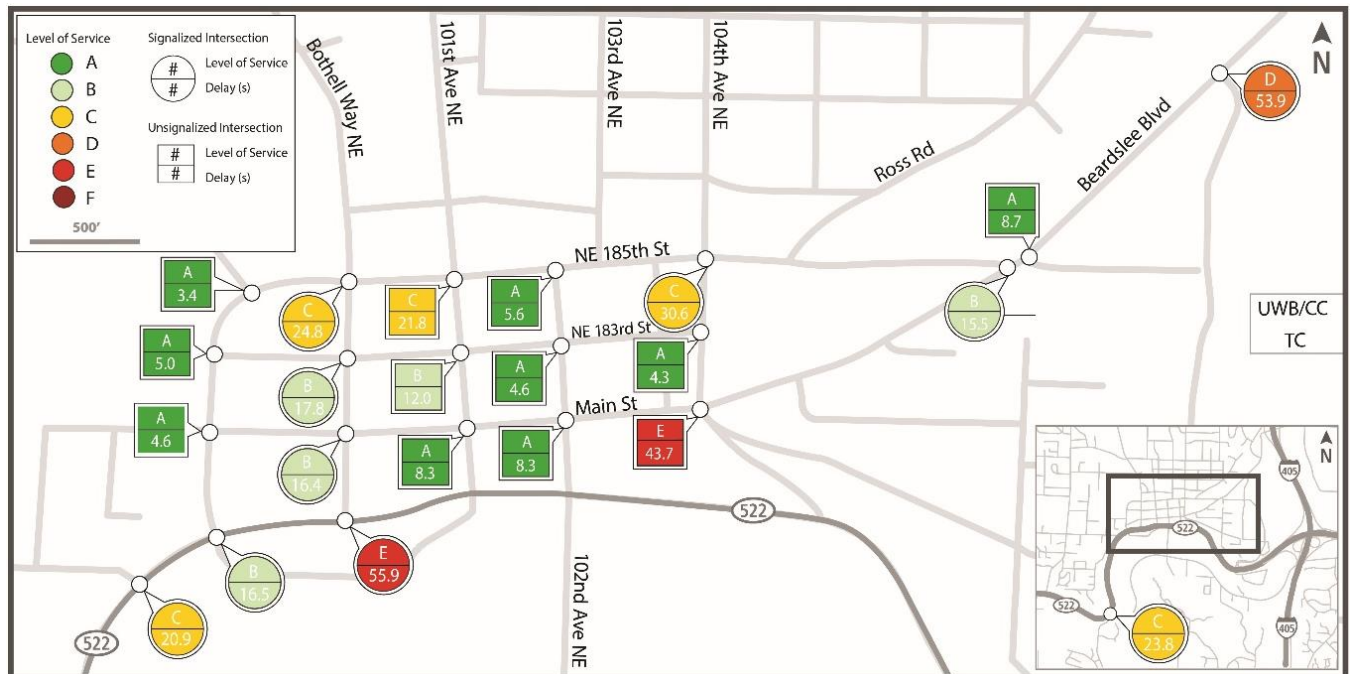
- SR 522/96th Avenue NE
- SR 522/180th Avenue NE
- SR 522/98th Avenue NE/180th Avenue NE
- SR 522/Bothell Way NE
- Bothell Way NE/Main Street
- Bothell Way NE/NE 183rd Street
- Bothell Way NE/NE 185th Street
- Beardslee Boulevard/110th Avenue NE

3.3.3 Future 2024 30% Design Intersection Delay

Figure 3-3 below shows the 2024 30% Design PM peak hour intersection LOS and delay. As was shown in the 2024 Baseline (No-Build) model, higher volumes in the network due to the future projected growth results in reduced LOS and higher delay compared to existing conditions. One signalized and one unsignalized intersection (Main Street and 104th Avenue NE and SR 522 and Bothell Way NE) would operate at LOS E, and the remaining signalized and unsignalized intersections would operate at LOS D or better in the PM peak hour.

Delay on SR 522 is primarily due to high traffic volumes. High westbound demand at the four-way stop control intersection of Main Street and 104th Avenue NE causes long queues to develop which affect southwest-bound traffic back to Beardslee Boulevard and 110th Avenue NE. High northbound and westbound demand at Main Street and 104th Avenue NE causes that intersection to operate at LOS E. Complete intersection delay results can be found in Appendix A.

Figure 3-3. Future 2024 30% Design PM Peak Hour Results



3.3.4 Future 2024 30% Design Queuing

The PM peak hour has queuing in areas of the model which affects the general-purpose traffic and transit along the corridor. Complete 95th percentile queue results can be found in Appendix A. The main areas that experience the most disruptive queuing are:

- Northbound along 104th Avenue NE from the NE 185th Street intersection to the Main Street intersection.
- Southwest-bound queuing along Beardslee Boulevard NE from 104th Avenue NE and Main Street to 110th Avenue NE and Beardslee Boulevard NE. This queuing is primarily caused by high westbound demand at NE 185th Street and 104th Avenue NE and at Main Street and 104th Avenue NE.
- Northwest-bound queuing at the 110th Avenue NE and Beardslee Boulevard intersection.
- Westbound queuing at the SR 522 and Bothell Way NE intersection.
- Eastbound queuing at the SR 522 and NE 180th Street intersection.

- Westbound and eastbound queuing at the 104th Avenue NE and NE 185th Street intersection.

3.3.5 Future 2024 30% Design Transit Delay

Table 3-2 shows the Future 2024 30% Design PM peak transit movement delay and LOS at BRT corridor intersections. High delay transit movements along the corridor include:

- Eastbound left at SR 522 and NE 98th Avenue
- Northbound through at 110th Avenue NE and Beardslee Boulevard

Table 3-2. Future 2024 30% Design PM Transit Delay and LOS

Intersection	Approach	Movement	Delay (seconds/vehicle)	LOS
NE 96th Street and SR 522	Northbound	Through	9.8	A
	Southbound	Through	3.3	A
NE 180th Street and SR 522	Northeast-bound	Through	30.8	C
	Southbound	Through	20.2	C
NE 98th Avenue and SR 522	Eastbound	Left	55.5	E
	Southbound	Right	18.5	B
Main Street and NE 98th Ave	Northbound	Through	3.4	A
	Southbound	Through	1.3	A
NE 183rd Street and 98th Avenue NE	Northbound	Through	16.1	C
	Southbound	Through	0.2	A
Pop Keeney Way and NE 185th St	Eastbound	Through	1.4	A
	Westbound	Through	0.4	A
NE 185th Street and Bothell Way NE	Eastbound	Through	9.8	A
	Westbound	Through	36.6	D
NE 185th Street and 101st Avenue NE	Eastbound	Through	5.6	A
	Westbound	Through	3.6	A
NE 185th Street and 102nd Avenue NE	Eastbound	Through	2.5	A
	Westbound	Through	4.7	A
NE 185th Street and 104th Avenue NE	Eastbound	Through	26.3	C
	Westbound	Through	15.0	B
NE 185th Street and Beardslee Blvd	Eastbound	Left	41.3	D
	Southwest-bound	Right	1.1	A
NE 108th Street and Beardslee Blvd	Northbound	Through	2.1	A

Intersection	Approach	Movement	Delay (seconds/vehicle)	LOS
	Southbound	Through	16.9	C
NE 110th Street and Beardslee Blvd	Northbound	Through	69.9	E
	Southbound	Through	41.6	D

3.4 Future 2024 60% Design Scenarios

As documented in previous phases of the Project, Sound Transit has identified transit travel time goals for the Bothell subarea of six to eight minutes. As such, several options were modeled to inform the Future 2024 60% Design Build scenarios. The scenarios include Added Transit Phase at SR 522 and 98th Avenue NE, Main Street Closure between Bothell Way NE and 102nd Avenue NE, and Removal of eastbound right-turn bay at NE 185th Street and 104th Avenue NE (with and without Main Street closure). The goal of these improvements is to reduce travel times to or near the stated goal. All scenarios were modified from the 30% Design model. These scenarios were developed and are documented below.

3.4.1 Added Transit Phase at SR 522 and 98th Avenue Scenario

The Added Transit Phase at SR 522 and 98th Ave scenario model proposes to add a separate signal phase which would allow the BRT eastbound left movement to be completed separately from the general purpose eastbound left movement. This timing adjustment would eliminate potential conflicts between busses and general-purpose vehicles attempting to make an eastbound left movement side-by-side during the same signal phase.

The added transit phase at SR 522 and 98th Avenue NE was shown in modeling to have minor delay impacts at that intersection but little effect on the rest of the modeled network. **Table 3-3** shows the transit and general-purpose delay at the intersection. The results indicate that a specific transit phase would slightly increase delay for both transit and general-purpose vehicles. Likewise, queue lengths shown in **Table 3-4** were only slightly longer with the added transit phase. This change overall did not appear to have any effects on operations elsewhere in the study area.

Table 3-3. Transit vs. General-Purpose Delay at 98th Avenue NE and SR 522

Intersection	Approach	Movement	30% Design		Added Transit Phase		
			Delay (seconds/vehicle)	LOS	Delay (seconds/vehicle)	LOS	
Transit Operations							
98th Avenue NE and SR 522	Eastbound	Left	55.5	E	57.0	E	
	Southbound	Right	18.5	B	20.9	C	
General-Purpose Operations							
98th Avenue NE and SR 522	Northbound	Left	46.6	D	47.9	D	
		Through	44.3	D	43.0	D	
		Right	24.5	C	23.3	C	
	Southbound	Left	61.2	E	68.6	E	
		Through	61.8	E	73.7	E	
		Right	17.8	B	21.9	C	
	Eastbound	Left	64.7	E	66.9	E	
		Through	15.1	B	15.9	B	
		Right	12.1	B	12.4	B	
	Westbound	Left	65.4	E	67.3	E	
		Through	11.1	B	13.5	B	
		Right	7.3	A	10.6	B	
	Total Intersection			16.5	B	18.4	B

Table 3-4. Modeled Queue Lengths at 98th Avenue NE and SR 522

Intersection	Approach	Lane Group	95 th Percentile Queue (feet)	
			30% Design	Added Transit Phase
98th Avenue NE and SR 522	Northbound	L/T/R	155	140
	Southbound	Left/Thru	360	360
		Right	125	180
	Eastbound	Left (GP)	105	110
		Left (Bus)	135	130
		Thru/Right	405	405
	Westbound	Left	115	125
		Thru/Right	435	430

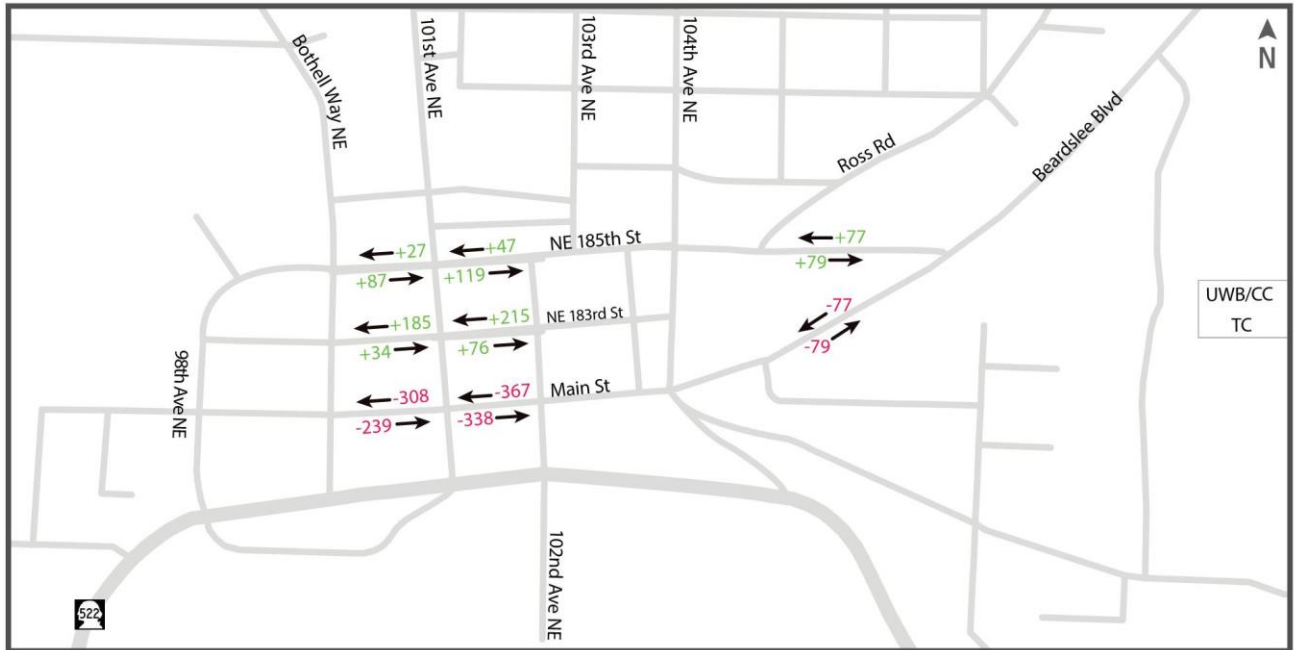
3.4.2 Main Street Closure Through Downtown Bothell Scenario

This scenario was modeled such that vehicular traffic was removed from Main Street between Bothell Way NE and 102nd Avenue NE. This segment of Main Street was closed to traffic during the COVID-19 pandemic and remains closed to the current day. This option analyzes the scenario in which this portion of Main Street remains closed to vehicular traffic through the horizon years for this project.

To study the Main Street closure, the vehicle paths which crossed through that closure area were manually rerouted - generally using NE 185th Street, NE 183rd Street or in some cases SR 522/Kaysner Way. While this does not represent a full or formal traffic volume forecast, this methodology allowed for the study of increased volumes on alternative routes and the identification of potential areas of congestion with a permanent Main Street closure from Bothell Way to 102nd Avenue. **Figure 3-4** shows the volume diversion at key locations in the network as a result of the Main Street closure.

Figure 3-4. Examined Volume Diversion with Main Street Closure

SR 522/NE 145th BRT

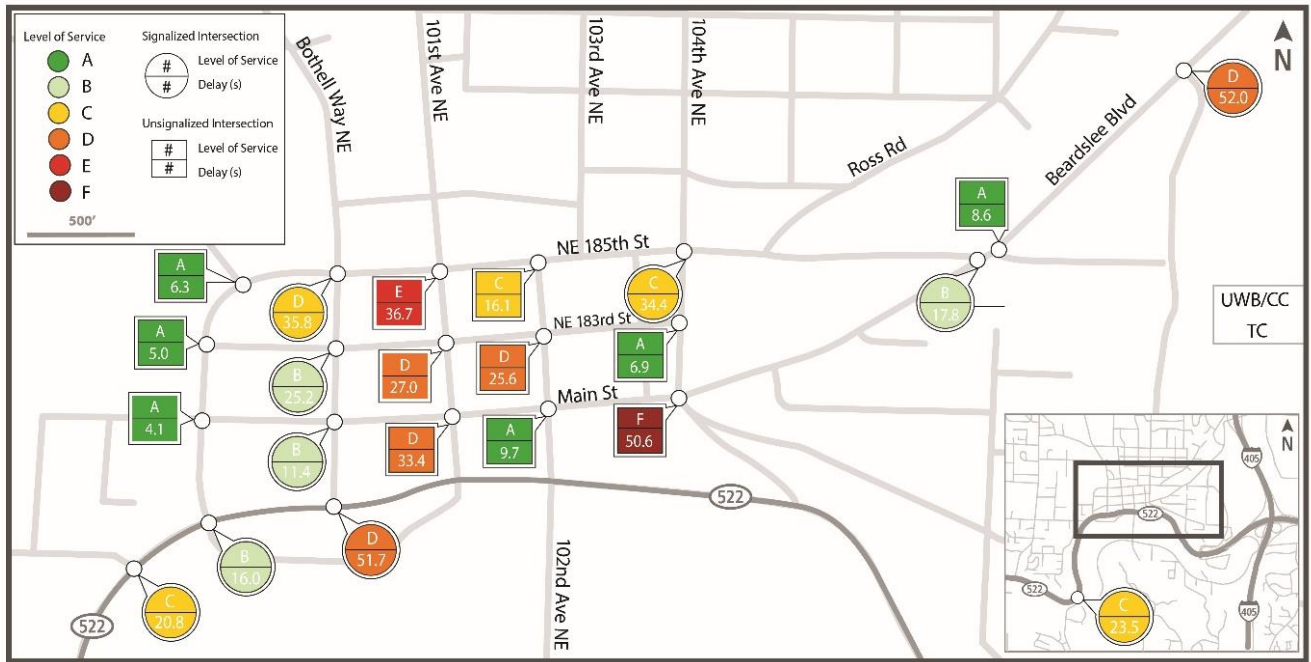


2024 PM Main St Closure through Downtown Bothell Diversion



Modeling the closure of Main Street between Bothell Way NE and 102nd Avenue NE shifted many of those trips to parallel routes along NE 183rd Street and NE 185th Street, both of which are two lane roadways. The added demand on these roadways caused significant increases in vehicle delay compared with the 30% Design scenario. **Figure 3-5** shows the Main Street Closure through Downtown PM peak hour intersection LOS and delay. Detailed intersection delay results are also given in Appendix B.

Figure 3-5. Future 2024 Main Street Closure through Downtown PM Peak Hour Results



Queuing also increased at several intersections as a result of the Main Street closure between Bothell Way NE and 102nd Avenue NE as compared with the 30% Design scenario. The largest increases in 95th percentile queuing were located at the following locations:

- Westbound right queuing at the SR 522 and Bothell Way NE intersection (150 feet to 710 feet)
- Westbound left and westbound right queuing at the Bothell Way NE and NE 183rd Street intersection (135 feet to 735 feet and 205 feet to 695 feet, respectively)
- Northbound queuing at the NE 185th Street and 102nd Avenue NE intersection (150 feet to 950 feet)
- Westbound through queuing at the NE 185th Street and 104th Avenue NE intersection (590 feet to 1,085 feet)

Transit operations showed higher delay along NE 185th Street, as shown in **Table 3-5**, particularly for the eastbound movement at 104th Ave NE. However, it was noted that the intersections along NE 185th Street did not cause failing LOS for transit movements.

Table 3-5. Main Street Closure through Downtown Transit Delay and LOS

Intersection	Approach	Transit Movement	95 th Percentile Queue (feet)		Main Street Closure	
			Delay (seconds per vehicle)	LOS	Delay (seconds per vehicle)	LOS
NE 96th Street and SR 522	Northbound	Through	9.8	A	9.5	A
	Southbound	Through	3.3	A	3.0	A
NE 180th Street and SR 522	Northeast-bound	Through	30.8	C	29.7	C
	Southwest-bound	Through	20.2	C	16.7	B
NE 98th Avenue and SR 522	Eastbound	Left	55.5	E	57.2	E
	Southbound	Right	18.5	B	19.6	B
Main Street and NE 98th Ave	Northbound	Through	3.4	A	3.3	A
	Southbound	Through	1.3	A	0.2	A
NE 183rd Street and 98th Avenue NE	Northbound	Through	16.1	C	17.1	C
	Southbound	Through	0.2	A	0.9	A
Pop Keeney Way and NE 185th St	Eastbound	Through	1.4	A	4.5	A
	Westbound	Through	0.4	A	0.9	A
NE 185th Street and Bothell Way NE	Eastbound	Through	9.8	A	17.3	B
	Westbound	Through	36.6	D	42.3	D
NE 185th Street and 101st Avenue NE	Eastbound	Through	5.6	A	17.1	C
	Westbound	Through	3.6	A	5.5	A
NE 185th Street and 102nd Avenue NE	Eastbound	Through	2.5	A	7.5	A
	Westbound	Through	4.7	A	10.1	B
NE 185th Street and 104th Avenue NE	Eastbound	Through	26.3	C	43.5	D
	Westbound	Through	15.0	B	19.5	B
NE 185th Street and Beardslee Blvd	Eastbound	Left	41.3	D	42.8	D
	Southwest-bound	Right	1.1	A	0.7	A
NE 108th Street and Beardslee Blvd	Northeast-bound	Through	2.1	A	2.0	A
	Southwest-bound	Through	16.9	C	17.4	C
NE 110th Street and Beardslee Blvd	Northeast-bound	Through	69.9	E	62.3	E
	Southwest-bound	Through	41.6	D	38.6	D

3.4.3 Removal of the Eastbound Right-Turn Bay at NE 185th Street and 104th Avenue NE

Due to limited ROW width at the 185th Street and 104th Ave NE intersection, the Removal of the eastbound right-turn bay at NE 185th Street and 104th Avenue NE scenario considered whether this turn bay could be removed in the 60% Design plans. In the 30% Design, the eastbound right-turn is only 25 feet long.

This scenario was modeled both with Main Street fully open and with Main Street closed between Bothell Way and 102nd Avenue NE.

The delay and queue effects of removing the eastbound right turn bay at NE 185th Street and 104th Avenue NE are shown in **Table 3-6** and **Table 3-7**, respectively. Along NE 185th Street, removal of the turn bay resulted in negligible differences in average delays both in eastbound and westbound directions. The queue length impacts were also minimal. The right turn bay removal was also analyzed in the context of the Main Street closure and expected added traffic on NE 185th Street. The combination of these two changes would be expected to cause higher delay in both directions along NE 185th Street. In addition, queues along that corridor were shown to back up from 104th Avenue NE to Bothell Way NE and cause other congestion points along roadways crossing NE 185th Street.

Table 3-6. Transit vs. General-Purpose Delay at NE 185th Street and 104th Avenue NE

Intersection	Approach	Movement	Delay (seconds/vehicle)			
			30% Design	RT Bay Removed	RT Bay Removed + Main St Closure	
Transit Operations						
NE 185th Street and 104th Avenue NE	Eastbound	Through	26.3	24.8	48.0	
	Westbound	Through	15.0	15.2	17.8	
General-Purpose Operations						
NE 185th Street and 104th Avenue NE	Northbound	Left	25.3	26.8	26.2	
		Through	24.3	24.8	24.8	
		Right	26.0	28.3	27.4	
	Southbound	Left	57.2	54.8	51.8	
		Through	50.5	47.7	44.2	
		Right	54.6	51.5	50.1	
	Eastbound	Left	28.7	30.0	54.4	
		Through	27.6	26.9	50.4	
		Right	24.3	25.4	47.9	
	Westbound	Left	26.3	25.5	31.7	
		Through	23.1	21.4	28.0	
		Right	26.0	24.5	26.9	
	Total Intersection			30.6	29.7	35.1

Table 3-7. Modeled Queue Lengths at NE 185th Street and 104th Avenue NE

Intersection	Approach	Lane Group	95 th Percentile Queue (feet)		
			30% Design	With RT Bay Removed	RT Bay Removed + Main St Closure
NE 185th Street and 104th Avenue NE	Northbound	L/T/R	455	410	500
	Southbound	L/T/R	415	415	415
	Eastbound	Left/Thru	375	380	625*
		Right	345	-	-
	Westbound	Left/Thru	590	530	1090
		Right	410	385	500

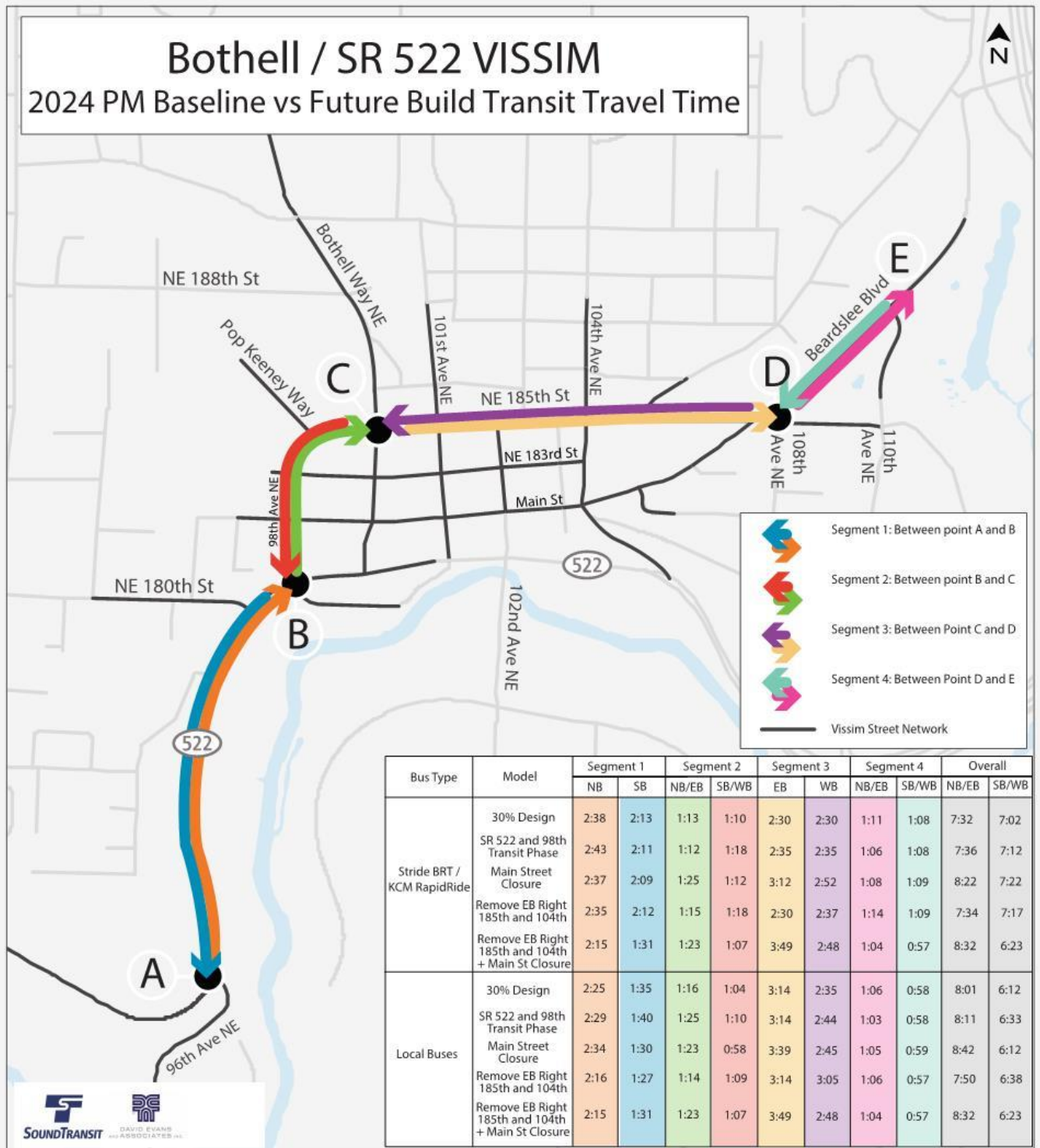
*Queue only measures to next intersection – full queue was found to extend to Bothell Way NE

3.5 Transit Travel Time Results

To summarize all of the scenarios analyzed, transit travel time results for both BRT and local routes are presented in **Figure 3-6**. The travel time results indicate that adding a transit phase to the SR 522 and 98th Avenue intersection will result in a slight increase in travel times compared with the 30% Design scenario, likely due to decreased signal efficiency with the additional phase. Removing the eastbound right-turn pocket at the NE 185th Street and 104th Ave NE intersection is also expected to slightly increase travel times compared with the 30% Design scenario. Transit travel times were greatest in both alternatives in which Main Street is closed between Bothell Way and 102nd Avenue NE. This can be attributed to the increased intersection delay caused by the vehicle diversion from Main Street to NE 185th Street and NE 183rd Street.

Sound Transit has identified transit travel time goals for the Bothell subarea of six to eight minutes. The 30% Design, Added Transit Phase at SR 522 and 98th Ave, and Removal of Eastbound Right at NE 185th Street and 104th Avenue NE scenarios show that 2024 travel times will fall within the target range. However, scenarios with Main Street Closure included exceed eight minutes by 22 to 24 seconds for northbound/eastbound BRT routes.

Figure 3-6. Future 2024 Transit Travel Time Results per Scenario (minutes:seconds)



4. Summary

The results of the SR 522 BRT project analysis for the Bothell area are presented in this memorandum, along with descriptions of the study area, methodology, and proposed BRT project improvements as part of the 60% design package. To evaluate several options in support of the 60% Design, the Vissim traffic analysis software was utilized to model several build scenarios for comparison. Analyzed scenarios in the Bothell segment included the following:

- Adding a transit phase to the SR 522 and 98th Ave NE intersection
- Closing Main Street between Bothell Way and 102nd Street NE
- Removing the eastbound right turn pocket at the NE 185th Street and 104th Avenue NE intersection

The analysis was prepared for 2024 PM peak hour in the Bothell models. BRT travel time will meet Sound Transit's goal travel time through the network of eight minutes in the Bothell segment, with the exception of the northbound/eastbound direction for scenarios in which Main Street is closed through downtown which exceed eight minutes by 22 to 24 seconds.

The Main Street closure through downtown would divert trips to NE 185th Street and NE 183rd Street. The added demand on these roadways caused increases in vehicle delay compared with the 30% Design scenario, which had considered Main Street as fully open. Additional transit priority or mitigation measures would be recommended along NE 185th Street to accommodate a permanent Main Street closure in downtown Bothell. Adding a transit phase to the SR 522 and 98th Ave NE intersection and removing the right turn pocket at the NE 185th Street and 104th Avenue NE intersection are expected to have only minor, localized impacts to traffic operations.

5. References

Sound Transit. June 2022. *Traffic Simulation Modeling Methods and Assumptions*.

Sound Transit. Sept 2019. *Existing Conditions/Calibration Bothell Vissim Results Technical Memorandum*.

Sound Transit. May 2021. *Vissim Technical Memorandum: Future No-Build and Build Results (Seattle/Shoreline and Bothell)*,

Appendix A
Bothell Future 2024 30% Design Results

PM General-Purpose Delay and 95th Percentile Queue

Intersection	Movement	Delay (seconds/vehicle)	LOS	95 th % Queue (feet)
96th Avenue NE and SR 522	NBT	20.8	C	715
	NBR	13.7	B	100
	SBL	70.6	E	190
	SBT	12.6	B	670
	WBL	57.3	E	285
	WBR	18.3	B	270
	Intersection	23.8	C	-
NE 180th Street and SR 522	SBL	85.1	F	370
	SBR	65.1	E	70
	EBL	101.4	F	250
	EBT	24.8	C	1290
	WBT	7.6	A	435
	WBR	8.6	A	-
	Intersection	20.9	C	-
98th Avenue NE and SR 522	NBL	46.6	D	-
	NBT	44.3	D	155
	NBR	24.5	C	-
	SBL	61.2	E	360
	SBT	61.8	E	-
	SBR	17.8	B	125
	EBL	64.7	E	105
	EBT	15.1	B	405
	EBR	12.1	B	-
	WBL	65.4	E	115
	WBT	11.1	B	435
	WBR	7.3	A	-
	Intersection	16.5	B	-
Main Street and 98th Avenue NE	NBL	3.0	A	-
	NBT	0.3	A	-
	NBR	0.7	A	-
	SBL	1.5	A	-
	SBT	1.6	A	40

Intersection	Movement	Delay (seconds/vehicle)	LOS	95 th % Queue (feet)
	SBR	3.2	A	-
	EBL	9.1	A	-
	EBT	8.1	A	60
	EBR	6.8	A	-
	WBL	15.5	C	-
	WBT	13.7	B	60
	WBR	7.5	A	-
	Intersection	4.6	A	-
NE 183rd Street and 98th Avenue NE	NBL	2.4	A	-
	NBT	1.4	A	15
	NBR	2.9	A	-
	SBL	1.0	A	-
	SBT	0.8	A	15
	SBR	1.0	A	-
	EBL	9.3	A	-
	EBT	9.2	A	60
	EBR	6.5	A	-
	WBL	11.9	B	-
	WBT	12.4	B	90
	WBR	9.1	A	-
	Intersection	5.0	A	-
Pop Keeney Way and NE 185th Street	SBL	9.5	A	-
	SBR	8.1	A	-
	EBL	1.1	A	20
	EBT	0.3	A	-
	WBT	0.7	A	15
	WBR	1.6	A	-
	Intersection	3.4	A	-
NE 185th Street and Bothell Way	NBL	15.2	B	45
	NBT	13.9	B	305
	NBR	12.1	B	-
	SBL	22.4	C	160
	SBT	23.2	C	345

Intersection	Movement	Delay (seconds/vehicle)	LOS	95 th % Queue (feet)
	SBR	24.1	C	-
	EBL	41.3	D	215
	EBT	31.0	C	180
	EBR	20.3	C	-
	WBL	49.9	D	-
	WBT	56.5	E	445
	WBR	46.0	D	-
	Intersection	24.8	C	-
101st Avenue NE and NE 185th Street	NBL	80.4	F	-
	NBT	78.3	F	785
	NBR	75.3	F	-
	SBL	34.8	D	-
	SBT	32.3	D	130
	SBR	29.8	D	-
	EBL	14.3	B	-
	EBT	4.8	A	220
	EBR	4.2	A	-
	WBL	7.1	A	-
	WBT	7.8	A	420
	WBR	7.2	A	-
	Intersection	21.8	C	-
NE 185th Street and 102nd Avenue NE	NBL	17.0	C	-
	NBR	14.1	C	150
	EBT	0.4	A	-
	EBR	3.3	A	-
	WBL	1.6	A	-
	WBT	3.1	A	65
	Intersection	5.6	A	-
NE 185th Street and 104th Avenue NE	NBL	25.3	C	-
	NBT	24.3	C	455
	NBR	26.0	C	-
	SBL	57.2	E	-
	SBT	50.5	D	415

Intersection	Movement	Delay (seconds/vehicle)	LOS	95 th % Queue (feet)
	SBR	54.6	D	-
	EBL	28.7	C	-
	EBT	27.6	C	375
	EBR	24.3	C	345
	WBL	26.3	C	-
	WBT	23.1	C	590
	WBR	26.0	C	410
	Intersection	30.6	C	-
NE 185th Street and Beardslee Boulevard	NEBL	0.0	A	-
	NEBT	8.3	A	180
	SWBT	7.4	A	155
	SWBR	1.3	A	115
	EBL	51.5	D	490
	EBR	21.3	C	490
	Intersection	15.5	B	-
108th Avenue NE and Beardslee Boulevard	NEBT	1.2	A	-
	NEBR	1.1	A	-
	SWBL	14.2	B	-
	SWBT	14.0	B	525
	NBL	19.1	C	110
	NBR	9.2	A	110
	Intersection	8.7	A	-
110th Avenue NE and Beardslee Boulevard	NEBL	49.8	D	20
	NEBT	54.3	D	615
	NEBR	15.8	B	-
	SWBL	60.6	E	435
	SWBT	47.4	D	640
	SWBR	17.5	B	-
	SEBL	72.4	E	280
	SEBT	77.6	E	280
	SEBR	42.5	D	280
	NWBL	75.1	E	270
	NWBT	79.5	E	800

Intersection	Movement	Delay (seconds/vehicle)	LOS	95 th % Queue (feet)
	NWBR	58.6	E	800
	Intersection	53.9	D	-
Bothell Way and SR 522	SBL	43.3	D	360
	SBR	33.7	C	360
	EBL	63.4	E	430
	EBT	14.5	B	465
	WBT	101.2	F	1405
	WBR	75.0	E	150
	Intersection	55.9	E	-
Main Street and Bothell Way	NBT	10.7	B	330
	NBR	7.9	A	-
	SBL	11.1	B	65
	SBT	10.5	B	260
	SBR	14.0	B	-
	EBL	43.5	D	80
	EBT	75.1	E	145
	EBR	18.8	B	-
	WBL	52.3	D	295
	WBT	52.4	D	190
	WBR	23.0	C	-
	Intersection	16.4	B	-
NE 183rd Street and Bothell Way	NBT	17.2	B	-
	NBR	11.3	B	305
	SBT	13.3	B	-
	SBR	10.7	B	-
	EBL	35.6	D	250
	EBT	34.3	C	-
	EBR	47.1	D	45
	WBL	36.6	D	90
	WBT	41.6	D	-
	WBR	22.4	C	135
	Intersection	17.8	B	-
Main Street and NE 101st Street	NBL	12.6	B	-

Intersection	Movement	Delay (seconds/vehicle)	LOS	95 th % Queue (feet)
	NBT	12.6	B	-
	NBR	12.4	B	-
	SBL	3.8	A	-
	SBT	3.4	A	-
	SBR	3.4	A	-
	EBL	13.1	B	-
	EBT	7.4	A	-
	EBR	9.0	A	-
	WBL	8.3	A	-
	WBT	6.7	A	-
	WBR	9.6	A	-
	Intersection	8.3	A	-
	101st Avenue NE and NE 183rd Street	NBL	21.7	C
NBT		32.3	D	-
NBR		32.2	D	-
SBL		2.3	A	-
SBT		2.1	A	-
SBR		1.8	A	-
EBL		8.6	A	-
EBT		2.8	A	-
EBR		4.7	A	-
WBL		2.2	A	-
WBT		3.0	A	-
WBR		11.2	B	-
Intersection		12.0	B	-
Main Street and 102nd Avenue NE	NBL	10.4	B	-
	NBT	10.0	B	-
	NBR	9.3	A	-
	SBL	2.5	A	-
	SBT	2.2	A	-
	SBR	4.8	A	-
	EBL	0.0	A	-
	EBT	8.5	A	-

Intersection	Movement	Delay (seconds/vehicle)	LOS	95 th % Queue (feet)
	EBR	8.8	A	-
	WBL	7.6	A	-
	WBT	7.5	A	-
	WBR	6.2	A	-
	Intersection	8.3	A	-
102nd Avenue NE and NE 183rd Street	NBL	4.1	A	-
	NBT	3.4	A	-
	NBR	2.5	A	-
	SBL	8.3	A	-
	SBT	5.4	A	-
	SBR	5.4	A	-
	EBL	10.9	B	-
	EBT	8.7	A	-
	EBR	8.3	A	-
	WBL	4.2	A	-
	WBT	2.4	A	-
	WBR	2.2	A	-
	Intersection	4.6	A	-
Main Street and 104th Avenue NE	NBL	93.6	F	1660
	NBT	93.8	F	-
	NBR	94.0	F	-
	SBL	6.6	A	250
	SBT	8.8	A	-
	SBR	9.4	A	-
	EBL	4.5	A	90
	EBT	3.9	A	-
	EBR	3.7	A	-
	WBL	12.0	B	290
	WBT	12.1	B	-
	WBR	8.6	A	-
	Intersection	43.7	E	-
NE 183rd Street and 104th Avenue NE	NBL	6.2	A	-
	NBT	5.8	A	-

Intersection	Movement	Delay (seconds/vehicle)	LOS	95th % Queue (feet)
	SBT	1.2	A	-
	SBR	1.1	A	-
	EBL	9.3	A	-
	EBR	2.8	A	-
	Intersection	4.3	A	-

Appendix B
**Bothell Future 2024 60% Design Option Results: Main
Street Closed through Downtown – PM peak hour**

PM General-Purpose Delay and 95th Percentile Queue

Intersection	Movement	Delay (seconds/vehicle)	LOS	95 th % Queue (feet)
96th Avenue NE and SR 522	NBT	21.2	C	795
	NBR	14.1	B	90
	SBL	70.5	E	185
	SBT	11.5	B	655
	WBL	58.0	E	305
	WBR	18.1	B	275
	Intersection	23.5	C	-
NE 180th Street and SR 522	SBL	78.6	E	310
	SBR	59.4	E	70
	EBL	100.8	F	285
	EBT	25.7	C	1380
	WBT	7.2	A	435
	WBR	8.5	A	-
	Intersection	20.8	C	-
98th Avenue NE and SR 522	NBL	46.4	D	-
	NBT	42.6	D	140
	NBR	22.7	C	-
	SBL	52.9	D	265
	SBT	60.5	E	-
	SBR	18.2	B	135
	EBL	64.4	E	95
	EBT	15.2	B	405
	EBR	12.8	B	-
	WBL	68.2	E	135
	WBT	10.6	B	425
	WBR	7.4	A	-
	Intersection	16.0	B	-
Main Street and 98th Avenue NE	NBL	2.0	A	-
	NBT	0.3	A	-
	NBR	0.8	A	-
	SBL	0.0	A	-
	SBT	1.7	A	20

Intersection	Movement	Delay (seconds/vehicle)	LOS	95 th % Queue (feet)
	SBR	2.4	A	-
	EBL	8.0	A	-
	EBT	7.2	A	60
	EBR	6.2	A	-
	WBL	12.4	B	-
	WBT	12.2	B	55
	WBR	0.0	A	-
	Intersection	4.1	A	-
NE 183rd Street and 98th Avenue NE	NBL	2.5	A	-
	NBT	1.7	A	20
	NBR	3.1	A	-
	SBL	0.9	A	-
	SBT	0.9	A	15
	SBR	1.4	A	-
	EBL	9.5	A	-
	EBT	9.5	A	65
	EBR	6.8	A	-
	WBL	11.2	B	-
	WBT	11.1	B	90
	WBR	9.9	A	-
	Intersection	5.0	A	-
Pop Keeney Way and NE 185th Street	SBL	16.8	C	275
	SBR	14.1	B	275
	EBL	1.3	A	15
	EBT	2.9	A	125
	WBT	0.9	A	20
	WBR	2.2	A	20
	Intersection	6.3	A	-
NE 185th Street and Bothell Way	NBL	0.0	A	-
	NBT	20.2	C	305
	NBR	24.0	C	-
	SBL	57.9	E	995
	SBT	40.7	D	985

Intersection	Movement	Delay (seconds/vehicle)	LOS	95 th % Queue (feet)
	SBR	45.8	D	-
	EBL	43.6	D	130
	EBT	37.1	D	265
	EBR	40.1	D	-
	WBL	50.9	D	-
	WBT	55.0	D	445
	WBR	46.3	D	-
	Intersection	35.8	D	-
101st Avenue NE and NE 185th Street	NBL	156.3	F	-
	NBT	144.0	F	800
	NBR	150.1	F	-
	SBL	77.4	F	-
	SBT	80.0	F	300
	SBR	73.0	F	-
	EBL	27.0	D	-
	EBT	11.5	B	395
	EBR	8.4	A	-
	WBL	14.6	B	-
	WBT	12.7	B	430
	WBR	10.6	B	-
	Intersection	36.7	E	-
NE 185th Street and 102nd Avenue NE	NBL	45.4	E	905
	NBR	39.4	E	905
	EBT	6.4	A	425
	EBR	14.4	B	430
	WBL	10.7	B	590
	WBT	8.0	A	590
	Intersection	16.1	C	-
NE 185th Street and 104th Avenue NE	NBL	27.9	C	-
	NBT	26.4	C	605
	NBR	30.0	C	-
	SBL	53.8	D	-
	SBT	47.7	D	415

Intersection	Movement	Delay (seconds/vehicle)	LOS	95 th % Queue (feet)
	SBR	55.5	E	-
	EBL	45.5	D	-
	EBT	41.9	D	600
	EBR	37.3	D	600
	WBL	29.9	C	-
	WBT	28.6	C	1085
	WBR	25.8	C	405
	Intersection	34.4	C	-
NE 185th Street and Beardslee Boulevard	NEBT	8.8	A	125
	SWBT	8.5	A	130
	SWBR	1.8	A	240
	EBL	50.7	D	585
	EBR	24.9	C	585
	Intersection	17.8	B	-
108th Avenue NE and Beardslee Boulevard	NEBT	1.4	A	-
	NEBR	1.4	A	-
	SWBL	15.7	C	775
	SWBT	13.9	B	775
	NBL	11.8	B	90
	NBR	6.2	A	90
	Intersection	8.6	A	-
110th Avenue NE and Beardslee Boulevard	NEBL	44.3	D	20
	NEBT	52.6	D	600
	NEBR	14.7	B	-
	SWBL	56.8	E	415
	SWBT	42.7	D	595
	SWBR	16.3	B	-
	SEBL	75.6	E	315
	SEBT	78.6	E	300
	SEBR	41.5	D	300
	NWBL	75.2	E	590
	NWBT	81.1	F	800
	NWBR	59.0	E	800

Intersection	Movement	Delay (seconds/vehicle)	LOS	95 th % Queue (feet)
	Intersection	52.0	D	-
Bothell Way and SR 522	SBL	38.7	D	360
	SBR	30.4	C	360
	EBL	63.3	E	430
	EBT	14.8	B	425
	WBT	91.0	F	1405
	WBR	69.6	E	710
	Intersection	51.7	D	-
Main Street and Bothell Way	NBT	12.0	B	330
	NBR	0.0	A	-
	SBL	7.5	A	-
	SBT	9.5	A	265
	SBR	15.9	B	-
	EBL	47.3	D	45
	EBT	0.0	A	25
	EBR	10.7	B	-
	WBL	0.0	A	-
	WBT	0.0	A	-
	WBR	0.0	A	-
	Intersection	11.4	B	-
NE 183rd Street and Bothell Way	NBT	25.7	C	-
	NBR	23.9	C	340
	SBT	19.0	B	-
	SBR	15.6	B	-
	EBL	38.3	D	320
	EBT	34.3	C	-
	EBR	44.8	D	45
	WBL	37.6	D	70
	WBT	45.5	D	-
	WBR	28.2	C	735
	Intersection	25.2	C	-
Main Street and NE 101st Street	NBL	0.0	A	-
	NBT	51.0	F	-

Intersection	Movement	Delay (seconds/vehicle)	LOS	95 th % Queue (feet)
	NBR	51.0	F	-
	SBL	0.0	A	-
	SBT	1.5	A	-
	SBR	0.0	A	-
	EBL	7.0	A	-
	EBT	0.0	A	-
	EBR	0.0	A	-
	WBL	1.6	A	-
	WBT	0.0	A	-
	WBR	0.0	A	-
	Intersection	33.4	C	-
	101st Avenue NE and NE 183rd Street	NBL	92.2	F
NBT		103.6	F	-
NBR		89.6	F	-
SBL		3.6	A	-
SBT		1.8	A	-
SBR		3.5	A	-
EBL		0.0	A	-
EBT		2.8	A	-
EBR		2.5	A	-
WBL		6.4	A	-
WBT		7.2	A	-
WBR		27.9	D	-
Intersection		27.0	D	-
Main Street and 102nd Avenue NE	NBL	0.0	A	-
	NBT	15.7	C	-
	NBR	15.2	C	-
	SBL	3.0	A	-
	SBT	2.2	A	-
	SBR	0.0	A	-
	EBL	0.0	A	-
	EBT	3.3	A	-
	EBR	0.0	A	-

Intersection	Movement	Delay (seconds/vehicle)	LOS	95 th % Queue (feet)
	WBL	4.9	A	-
	WBT	4.7	A	-
	WBR	6.4	A	-
	Intersection	9.7	A	-
102nd Avenue NE and NE 183rd Street	NBL	21.1	C	-
	NBT	19.5	B	-
	NBR	22.8	C	-
	SBL	47.5	E	-
	SBT	42.0	E	-
	SBR	40.1	E	-
	EBL	49.7	E	-
	EBT	37.0	E	-
	EBR	38.6	E	-
	WBL	10.0	A	-
	WBT	6.1	A	-
	WBR	7.2	A	-
	Intersection	25.6	D	-
	Main Street and 104th Avenue NE	NBL	102.3	F
NBT		100.2	F	1660
NBR		100.1	F	-
SBL		5.1	A	-
SBT		6.7	A	195
SBR		6.7	A	-
EBL		4.0	A	-
EBT		2.9	A	45
EBR		2.5	A	-
WBL		7.5	A	-
WBT		7.6	A	245
WBR		6.7	A	-
Intersection		50.6	E	-
NE 183rd Street and 104th Avenue NE	NBL	9.4	A	-
	NBT	9.0	A	-
	SBT	0.9	A	-

Intersection	Movement	Delay (seconds/vehicle)	LOS	95th % Queue (feet)
	SBR	1.0	A	-
	EBL	16.8	C	-
	EBR	5.5	A	-
	Intersection	6.9	A	-

Appendix C
Bothell Future 2024 PM Peak Hour Volumes

