APPENDIX H

Transportation Technical Memorandum

AE 0055-17 6.2.1 Transportation Technical Memorandum

March 2021

SoundTransit

Summary

The purpose of this transportation technical memorandum is to document the traffic operations, present the results of project traffic analyses, and document the project's effects on all modes of travel. The analysis assessed motorized and non-motorized traffic, as well as parking and safety issues. This transportation technical memorandum is an appendix to the SR 522/NE 145th Bus Rapid Transit (BRT) Project checklist for the State Environmental Policy Act (SEPA) environmental documentation.

The SR 522/NE 145th BRT Project (project) is part of a new Bus Rapid Transit (BRT) system that would provide fast, frequent, and reliable bus service along the State Route (SR) 522/NE 145th project corridor, with interconnections to light rail and other bus service in the region. The proposed project improves transit speed and reliability throughout the corridor with a series of capital improvements that includes business access and transit (BAT) lanes and transit queue bypass lanes, intersection and signal operation improvements, sidewalk improvements combined with roadway improvements, and park-and-ride garages. The improvements occur on NE 145th Street between 5th Avenue NE and SR 522, along SR 522 to Bothell, and along Bothell city streets to I-405. Projected ridership with the BRT system is approximately 8,900 per day by 2040.

Proposed roadway and intersection improvements and park-and-ride garages would result in traffic conditions that are similar to today or improved. No adverse impacts are anticipated as a result of the SR 522/NE 145th BRT Project. During construction temporary impacts would occur, such as roadway closures during off-peak hours, sidewalk closures and detours on side streets, as well as temporary parking impacts during construction of park-and-ride garages. No adverse impacts are anticipated as a result of temporary construction impacts of the SR 522/NE 145th BRT Project.

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Acronyms and Abbreviations

ADA	Americans with Disabilities Act
AVL	automatic vehicle location
AWSC	all-way stop control
BAT	business access and transit
BEB	Battery Electric Bus
BRT	bus rapid transit
CAD/AVL	Computer-Aided Dispatch/Automatic Vehicle Location
CT	Community Transit
HSS	highway of statewide significance
ITE	Institute of Transportation Engineers
ITS	intelligent transportation systems
LOS	level of service
LPI	leading pedestrian interval
Metro	King County Metro
mph	miles per hour
MUTCD	Manual of Uniform Traffic Control Devices
N/A	not applicable
OWSC	one-way stop control
PSRC	Puget Sound Regional Council
SDOT	Seattle Department of Transportation
SEPA	State Environmental Policy Act
SR	State Route
ST3	Sound Transit 3 Plan
ST Express	Sound Transit Express
ST Model	Sound Transit Incremental Model
TAZ	Traffic Analysis Zone
TOD	transit-oriented development
TSP	Transit Signal Priority
TWSC	two-way stop control
UW	University of Washington
WSDOT	Washington State Department of Transportation

Definitions

ADA	The Americans with Disabilities Act of 1990, or ADA, is a civil rights law that prohibits discrimination based on disability. The term “ADA” is used to refer to the design requirements of the ADA.
AVL	Automatic vehicle location (AVL) refers to technology integrated within transit vehicles to provide data for the tracking and dispatching of transit vehicles.
BAT	Business access and transit (BAT) refers to a transit lane that allows use by other vehicles to access abutting businesses (WSDOT 2019b).
BRT	Bus rapid transit (BRT) is a high-capacity transit system that delivers fast, frequent, accessible, and reliable bus service. BRT is further defined in the Sound Transit 3 Regional Transit System Plan and in the US Department of Transportation’s Federal Transit Administration website at transit.dot.gov/research-innovation/bus-rapid-transit.
Bus-only lane	A bus-only lane is a lane restricted to buses, often on certain days and times, and generally is used to improve travel time for buses that would otherwise be held up by traffic congestion.
Headway	The amount of time between transit vehicle arrivals at a stop.
HSS	Highways of statewide significance (HSSs) include interstate highways and other principal arterials that are needed to connect major communities in the state. HSS routes are designated by the Washington State Transportation Commission and adopted by the state legislature.
LPI	Leading pedestrian interval (LPI) gives pedestrians an advance walk signal before the motorists get a green light, giving the pedestrian several seconds to start in the crosswalk where there is a concurrent signal. An LPI improves pedestrian visibility to drivers, and drivers are more likely to yield to the pedestrian.
Near-level boarding	Near-level boarding refers to the platform height. Near-level boarding occurs at BRT stations to decrease boarding and lighting durations. For the SR 522/NE 145th BRT near-level boarding is a nine-inch platform height.
Near-side/ far-side	Terms used with bus stops and stations. *Near-side* refers to a bus stop or station positioned just before the intersection. *Far-side* indicates a bus stop or station that is located immediately after the intersection.
SR 522/NE 145th BRT Project	A project of the Sound Transit 3 Plan initiative that voters approved in November 2016 (Sound Transit 2016) that provides for BRT service between the Shoreline South/148th Link light rail station, Seattle, Shoreline, Lake Forest Park, Kenmore, and Bothell.
Stride	The brand name for Sound Transit service provided by a bus rapid transit system.
Transit queue bypass lane	An additional travel lane at the approach to a signalized intersection restricted to transit vehicles only. Buses in the transit queue bypass lane get a "head-start" over other queued vehicles and can therefore merge into the regular travel lanes immediately beyond the signal.
TSP	Transit signal priority (TSP) is a term for a set of operational improvements that use technology to reduce dwell time at traffic signals for transit vehicles by holding the green signal phase longer or shortening a red signal phase. TSP may be implemented at individual intersections or across corridors or entire street systems.

1 PROJECT DESCRIPTION

The SR 522/NE 145th BRT Project (project) is part of a new Bus Rapid Transit (BRT) system that would provide fast, frequent, and reliable bus service along the State Route (SR) 522/NE 145th project corridor, with interconnections to light rail and other bus service in the region. The project would provide BRT service (to be called "Stride") along about 9 miles of roadway between the Sound Transit Shoreline South/148th Link light rail station[1] and the SR 522/I-405 Transit Hub. The transit hub is in the design phase and is being provided by the Washington Department of Transportation (WSDOT) I-405/SR 522 Vicinity to SR 527 Express Toll Lanes Improvement Project.

The project would include business access and transit (BAT) lanes, transit queue bypass lanes, signal upgrades and transit signal priority (TSP) for transit speed and reliability, three new park-and-ride garages (Lake Forest Park, Kenmore and Bothell), and twelve BRT stations[2] between the Shoreline South/148th Link light rail station and the SR 522/I-405 Transit Hub. The west end of the project would connect with a roundabout at NE 145th Street and 5th Avenue NE, proposed by the City of Shoreline, to improve traffic flow at the intersection and which would improve BRT travel time and reliability through the intersection.

The project would also include constructing or reconstructing sidewalks where the BAT lanes and transit queue bypass lanes are constructed and at some intersections in the immediate vicinity of BRT stations. Some transit queue bypass lanes and BAT lanes result in roadway widening. Intersection and sidewalk construction includes upgrading curb ramps to current Americans with Disabilities Act (ADA) standards.

Right-of-way and easement acquisitions would occur to allow for construction and operation of the BRT service and related access improvements. Stormwater management would be provided as needed to comply with pertinent law and codes. Utility connections would be provided as necessary.

Most BRT station platforms (e.g., the sidewalk that the shelter sits upon) would be double-length platforms (accommodating two 60-foot coaches) to accommodate shared use by Sound Transit with King County Metro (Metro) and local Community Transit buses (the three transit agencies operating in the corridor). SR 522/NE 145th BRT service would be provided with 14 three-door articulated coaches with the Stride brand, including 10 Battery Electric Buses (BEBs) and 4 diesel hybrid buses. Service headways (the amount of time between bus arrivals at a stop) would be 10 minutes, which translates to 12 total BRT vehicles per hour along the project corridor. Sound Transit would prioritize use of the BEBs for this service as much as possible, and the BEBs (rather than the diesel hybrid buses) would be the bus type used for most of the service, all day. The span of service would be 19 hours on Monday through Saturday and 17 hours on Sunday. The estimated 2042 ridership forecast for the SR 522/NE 145th BRT system is approximately 8,900 riders per day.

Station shelters would have a consistent look and feel throughout the BRT system, but individual platform design would vary based on site conditions and transit integration

[1] Environmental review of the Shoreline South/148th Station has been covered under the Sound Transit Lynnwood Link Extension Project State Environmental Policy Act Environmental Impact Statement
[2] Each station proposed for construction as part of this project includes an eastbound platform and a westbound platform.

assumptions at each location. Each station would include Stride-branded shelters and lighting, and most platforms would be elevated 9 inches to ease boarding and alighting. The project would also include intelligent transportation systems (ITS) features: off-board fare payment for Sound Transit service, electronic rider information with bus arrival times, Computer-Aided Dispatch/Automatic Vehicle Location (CAD/AVL), TSP, and enhanced safety and security at certain stations.

Figure 1-1 shows the proposed project, including the route, station locations, and park-and-ride garage locations. The State Environmental Policy Act (SEPA) Checklist document includes layouts for the three park-and-ride garages. This technical memorandum reflects the project as described and as shown in the Conceptual Engineering Design Plans (see Appendix A of the SEPA Checklist).

The following is a summary of the proposed project's major components, by segment:

- **Segment 1:** Seattle/Shoreline (NE 145th Street): westbound transit queue bypass lane on NE 145th Street from approximately 100 feet east of 8th Avenue NE to approximately 100 feet prior to 5th Avenue NE, transit queue bypass lanes on NE 145th Street at 15th Avenue NE in each direction, two stations (15th Avenue NE and 30th Avenue NE), and a shared bus left-turn/general-purpose traffic through lane at the eastbound approach to SR 522.

- **Segment 2:** Lake Forest Park: northbound/eastbound BAT lane from approximately NE 145th Street to south of Brookside Boulevard NE; reconstructed BAT lane southbound/westbound between Beach Drive and 38th Avenue NE; a new 300-stall park-and-ride garage located at the Lake Forest Park Town Center; three stations (NE 153rd Street, NE 165th Street, and Lake Forest Park Town Center); retaining walls in certain locations; and minor roadway, roadside and intersection improvements in certain locations where other improvements would occur.

- **Segment 3:** Kenmore: three stations (61st Avenue NE, 68th Avenue NE, and the Kenmore Park-and-Ride); and a new park-and-ride garage providing 300 additional stalls at the Kenmore Park-and-Ride, including vehicle access modification.

- **Segment 4:** Bothell: northbound/eastbound center bus-only lane to bus-only left-turn lane along SR 522 beginning approximately 700 feet south of Hall Road (just north of the Yakima Fruit Market & Nursery) to 98th Avenue NE; four stations (98th Avenue NE at NE 182nd Street, NE 185th Street at 104th Avenue NE, Beardslee Boulevard at University of Washington [UW] Bothell/Cascadia College, and Beardslee Boulevard near NE 195th Street); a new park-and-ride garage at a site in the southwest quadrant of 98th Avenue NE and Pop Keeney Way providing 300 net additional parking spaces with commercial frontage as required by the City of Bothell municipal code, new traffic signal and intersection reconstruction on NE 185th Street at 104th Avenue NE and at Beardslee Boulevard; and sidewalks, planting strips and minor intersection improvements at certain locations where other improvements would occur.

The analysis and discussion of the proposed project in this technical memorandum is presented according to the four project segments, which are described in further detail below (from west to east).

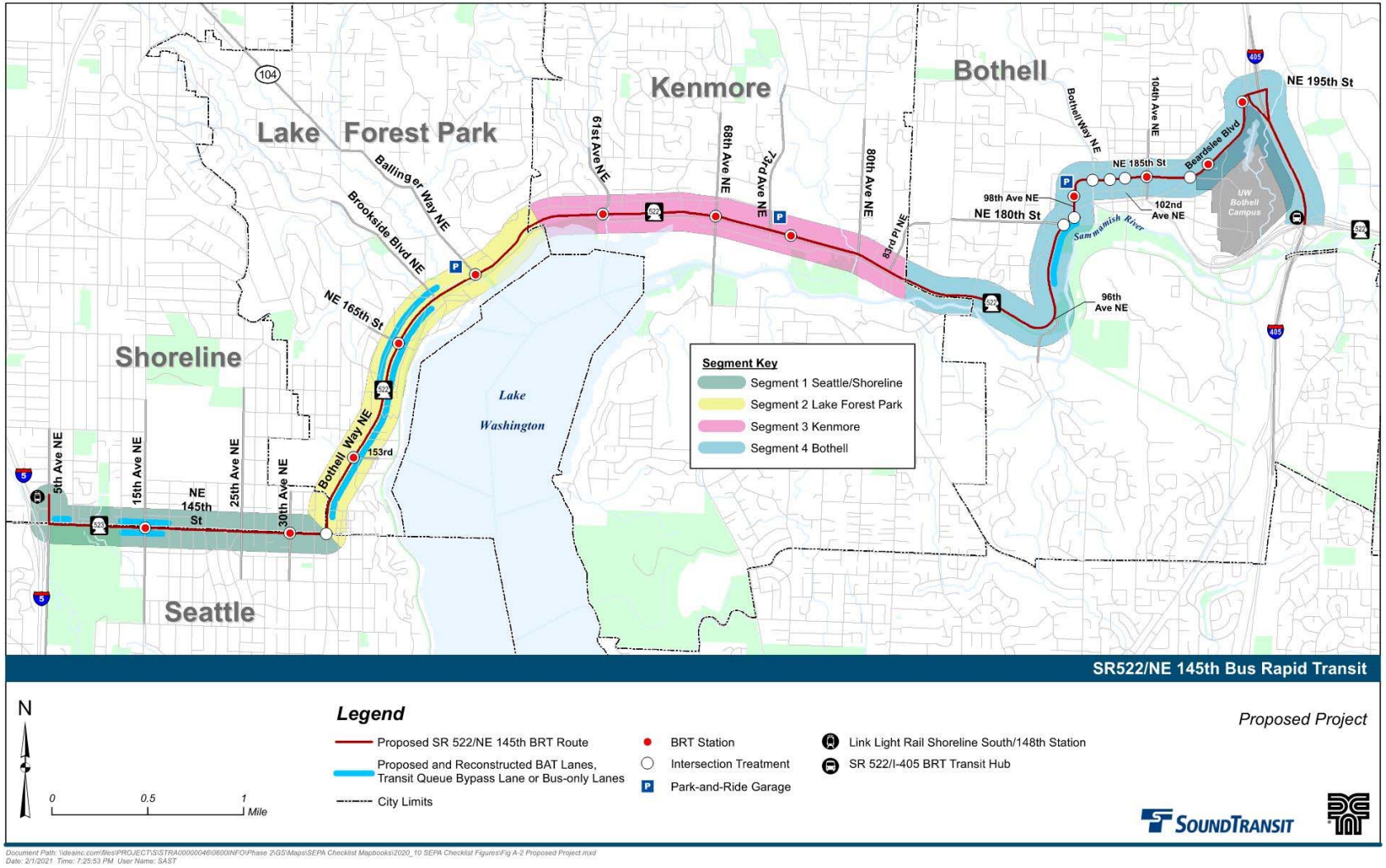

Figure 1-1 Proposed project

1.1 Segment 1: Seattle/Shoreline

For purposes of this analysis, this project segment extends along NE 145th Street from 5th Avenue NE to the intersection of NE 145th Street and SR 522. The City of Seattle municipal boundary is the center line of NE 145th Street. The City of Shoreline municipal boundary is the right-of-way line on the north side of NE 145th Street. The area between the NE 145th Street centerline and the north side right-of-way is unincorporated King County; in this area, the Washington Department of Transportation (WSDOT) has jurisdiction of the roadway and Seattle Department of Transportation (SDOT) has jurisdiction for signal operations. This project segment and its related station locations and new roadway features are shown in **Figure 1-2**.

The entrance to the Shoreline South/148th Link light rail station (station being developed as a separate Sound Transit project and shown on **Figure 1-1** and **Figure 1-2**) is located on 5th Avenue NE, approximately 400 feet north of the intersection with NE 145th Street.

In the eastbound direction, the project would include a new transit queue bypass lane beginning east of 12th Avenue NE and ending west of 17th Avenue NE, with a BRT station at 15th Avenue NE.

The intersection of NE 145th Street and SR 522 would be modified to reduce delay for transit. The west leg (eastbound approach) to SR 522 would be as follows from the center line to the curb:

- Two general-purpose left turn lanes
- One lane shared with general-purpose through traffic and left-turning buses
- One right-turn pocket

The east leg (westbound approach) to SR 522 would be as follows:

- One left-turn lane
- One shared through/right-turn lane

The westbound approach would be reduced from three lane to two lanes. The westbound lanes, west of SR 522, would be reduced from two lanes to one lane to accomplish this design. Other minor intersection modifications would occur to align the westbound travel lanes; these intersection modifications would be accomplished without increasing the number of lanes on the west leg.

Note: Components shown on this figure would all be located along NE 145th Street. Offset shown is due to limitation of graphic.

Figure 1-2 Segment 1: Seattle/Shoreline

In the westbound direction, there would be two segments of transit queue bypass lanes: (1) between 17th Avenue NE and 12th Avenue NE to provide for bus movement into and out of the 15th Avenue NE station area and improve transit speed and reliability through the signalized intersections, and (2) starting east of 8th Avenue NE and extending to just east of 5th Avenue NE, where it would connect into a right-turn pocket to be built by the separate Sound Transit Lynnwood Link Extension project. Eventually this transit queue bypass lane around 8th Avenue NE would provide a queue bypass for buses entering Shoreline's proposed roundabout at NE 145th Street and 5th Avenue NE (SR 523 N/NE145th Street & I-5 Interchange Project).

At the westbound transit queue bypass lane from 8th Avenue NE to just east of 5th Avenue NE, there would be an 8-foot sidewalk along the length of the transit queue bypass lane. A 12-foot-wide shared-use pedestrian and bicycle facility, westbound along the length of the transit queue bypass lane, was requested by the City of Shoreline and evaluated as a more conservative scenario.

The 15th Avenue NE Station would include a far-side eastbound platform and a near-side westbound platform. Near-side refers to a platform just prior to the intersection and far-side refers to a platform location across the intersection. Both of the station platforms would be 10 feet wide. The eastbound platform would include a 6-foot-wide facility for pedestrians and bicycles behind the platform. The westbound platform would include an 8-foot-wide facility for pedestrians and bicycles behind the station.

The 30th Avenue NE Station would include an eastbound near-side platform and a westbound far-side platform. Both of the platforms would be 10 feet wide. The eastbound and westbound platforms would include a 6-foot-wide facility for pedestrians and bicycles behind the platform.

New sidewalks would be provided where construction occurs for the transit queue bypass lanes and stations, as shown in **Figure 1-2** as pedestrian improvements. Some locations would have an approximately 4- to 5-foot-wide planted buffer between the transit queue bypass lane and the sidewalk. ADA curb ramps would be upgraded to current standards at intersections that include project construction. Crosswalks in each direction would be provided at signalized intersections near BRT stations. TSP treatments would be provided at signalized intersections to improve speed and reliability. The SEPA Checklist Appendix A provides conceptual engineering plans for the transit queue bypass lanes, other roadway improvements and the BRT stations in this segment.

1.2 Segment 2: Lake Forest Park

This segment of the project extends from the intersection of SR 522 and NE 145th Street to the intersection of SR 522 (Bothell Way NE) and SR 104 (Ballinger Way NE) in Lake Forest Park. This project segment and the related station locations, new roadway features and the park-and-ride garage are shown in **Figure 1-3**. The Lake Forest Park segment would include roadway widening to complete the gap in the northbound BAT lane from NE 145th Street to Beach Drive NE. There is an existing BAT lane in the southbound direction through this project segment that is reconstructed due to a shift in the roadway alignment to the west. The reconstructed southbound BAT lane is also shown in **Figure 1-3.**

The existing two-way left-turn lane would be converted to a narrower raised median between NE 155th Street and NE 165th Street, and property access would be limited to right-in/right-out only. A new 6-foot-wide sidewalk and 4-foot-wide landscape buffer would be constructed for the length of the new BAT lane, with some short sections including only a sidewalk. The sidewalk would cross over McAleer Creek near Brookside Boulevard NE as a 100-foot-long sidewalk bridge. Along this segment of SR 522, the project includes TSP treatments. The SEPA Checklist Appendix A provides conceptual engineering plans for the BAT lane, BRT stations and the park-and-ride garage at Lake Forest Park Town Center.

Figure 1-3 Segment 2: Lake Forest Park

The project includes a 300-stall park-and-ride garage at the Lake Forest Park Town Center, west of the Lake Forest Park City Hall building. Vehicular access to and from the garage would be at NE 175th Street and Ballinger Way NE and an existing driveway on SR 522. **Figure 1-4** shows the footprint of the Lake Forest Park Park-and-Ride garage.

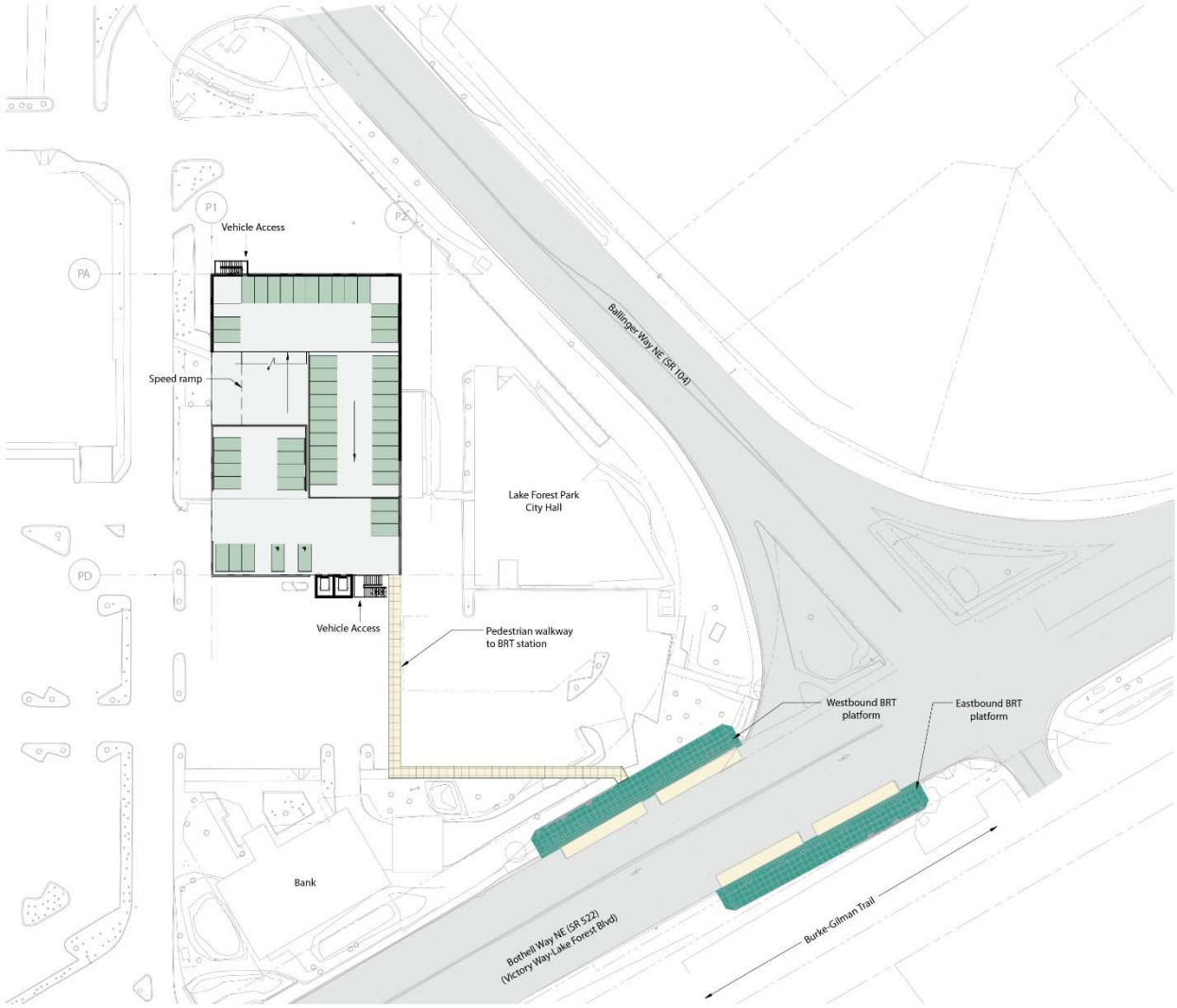

Figure 1-4 Lake Forest Park Park-and-Ride garage

1.3 Segment 3: Kenmore

This segment of the project on SR 522 extends from 57th Avenue NE to 83rd Place NE in Bothell. The project segment and proposed improvements are shown in **Figure 1-5**. On SR 522 in this segment, BAT lanes are already in place and would be used by BRT service. A new park-and-ride garage, which would increase park-and-ride capacity by approximately 300 stalls, would be constructed in the southeast quadrant of the existing Metro-operated Kenmore Park-and-Ride. TSP would also be added at three signalized intersection locations, and there would be minor modifications to intersections, as shown on **Figure 1-5**. The SEPA Checklist Appendix A provides the conceptual engineering plans for the BRT stations and the park-and-ride garage.

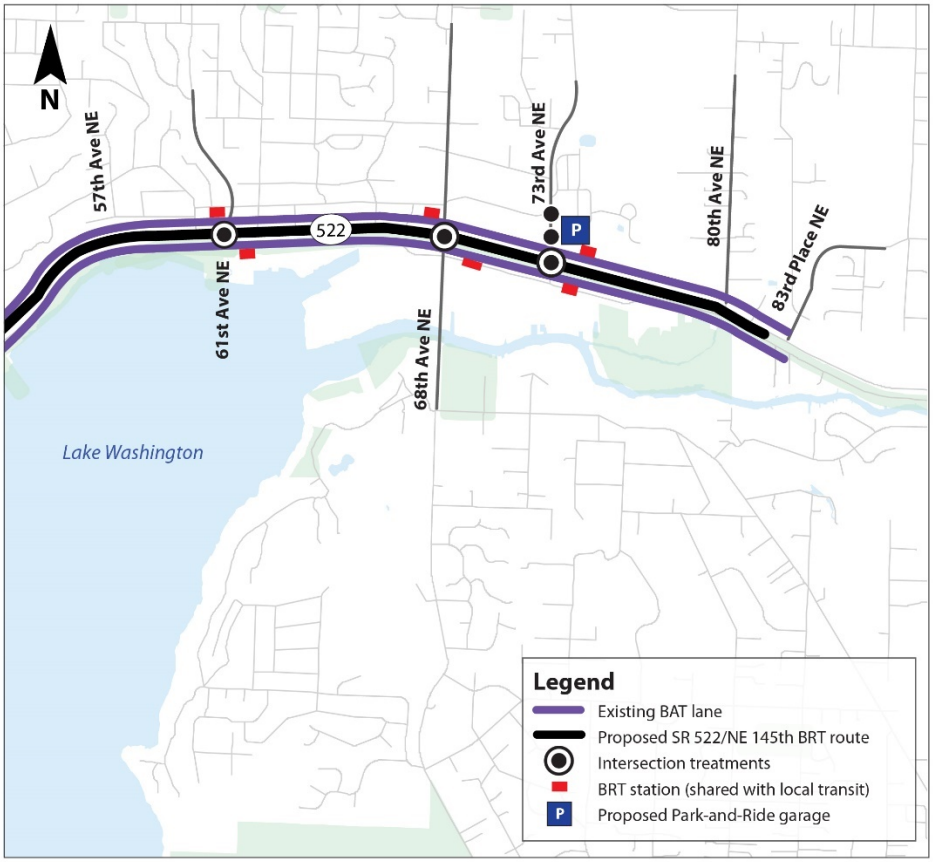

Figure 1-5 Segment 3: Kenmore

The new four-level park-and-ride garage would be adjacent to SR 522 and the westbound BRT station platform. For purposes of this review, the garage was conservatively assumed to include transit improvements for Metro on the ground floor, including nine layover spaces and two active bays within the garage. Metro would also provide for stalls exceeding the 300 stalls funded by the Sound Transit 3 Plan (ST3). Final decisions on this garage size and layout will be made pending agreement with Metro. The park-and-ride garage is shown in **Figure 1-6**. Metro buses would enter the site via the access road (NE 181st Street) to and from 73rd Avenue NE, and could exit the site via the access road or by exiting from the garage onto SR 522 (right-turn only). General-purpose vehicles would access the garage from the driveway just north of the St. Vincent de Paul building, to reduce traffic on NE 181st Street, adjacent to a Great Blue Heron rookery. The driveway would be revised for outbound traffic with a left-turn and right-turn lane. There would be a right-in/right-out-only access to the garage from SR 522. The access into the garage on both the north and south sides would use ramps to bring general-purpose vehicles to the second floor of the garage.

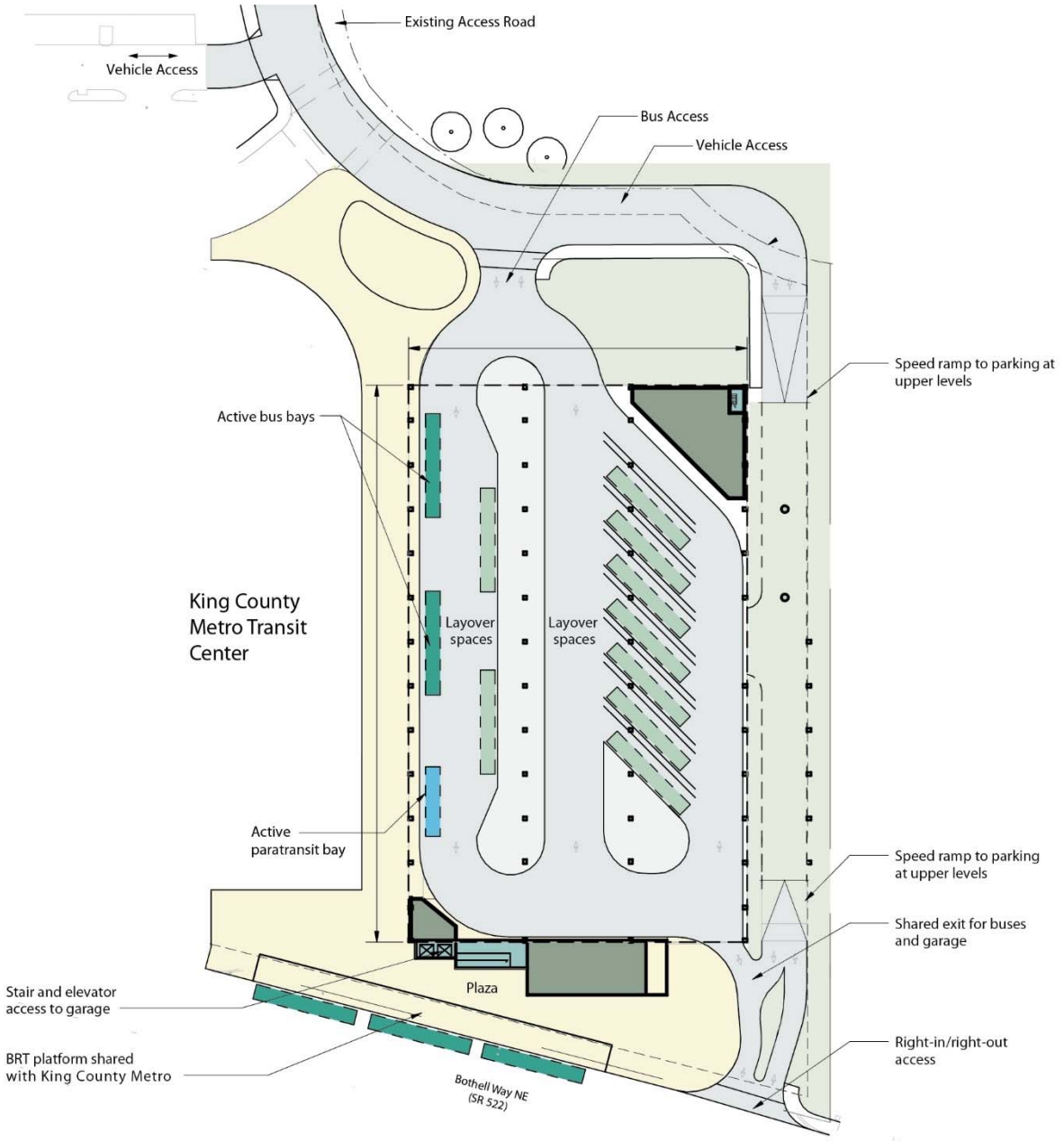

Figure 1-6 Kenmore Park-and-Ride garage and transit facilities

1.4 Segment 4: Bothell

This segment of the project is located on SR 522 (Bothell Way NE) between 83rd Place NE and 98th Avenue NE, on 98th Avenue NE between SR 522 and NE 185th Street, on NE 185th Street between 98th Avenue NE and Beardslee Boulevard, and on Beardslee Boulevard between NE 185th Street and NE 195th Street. This project segment includes an eastbound center bus-only lane on SR 522 that would become a bus-only left-turn lane at 98th Avenue NE, a northbound-to-southbound U-turn provision at NE 180th Street and 98th Avenue NE, a southbound-to-northbound U-turn provision approximately1,000 feet south of Haul Road on SR 522, BRT stations, a park-and-ride garage, and roadway improvements, as shown in **Figure**

1-7. The SEPA Checklist Appendix A provides the conceptual engineering plans for the BAT lanes, stations and park-and-ride garage.

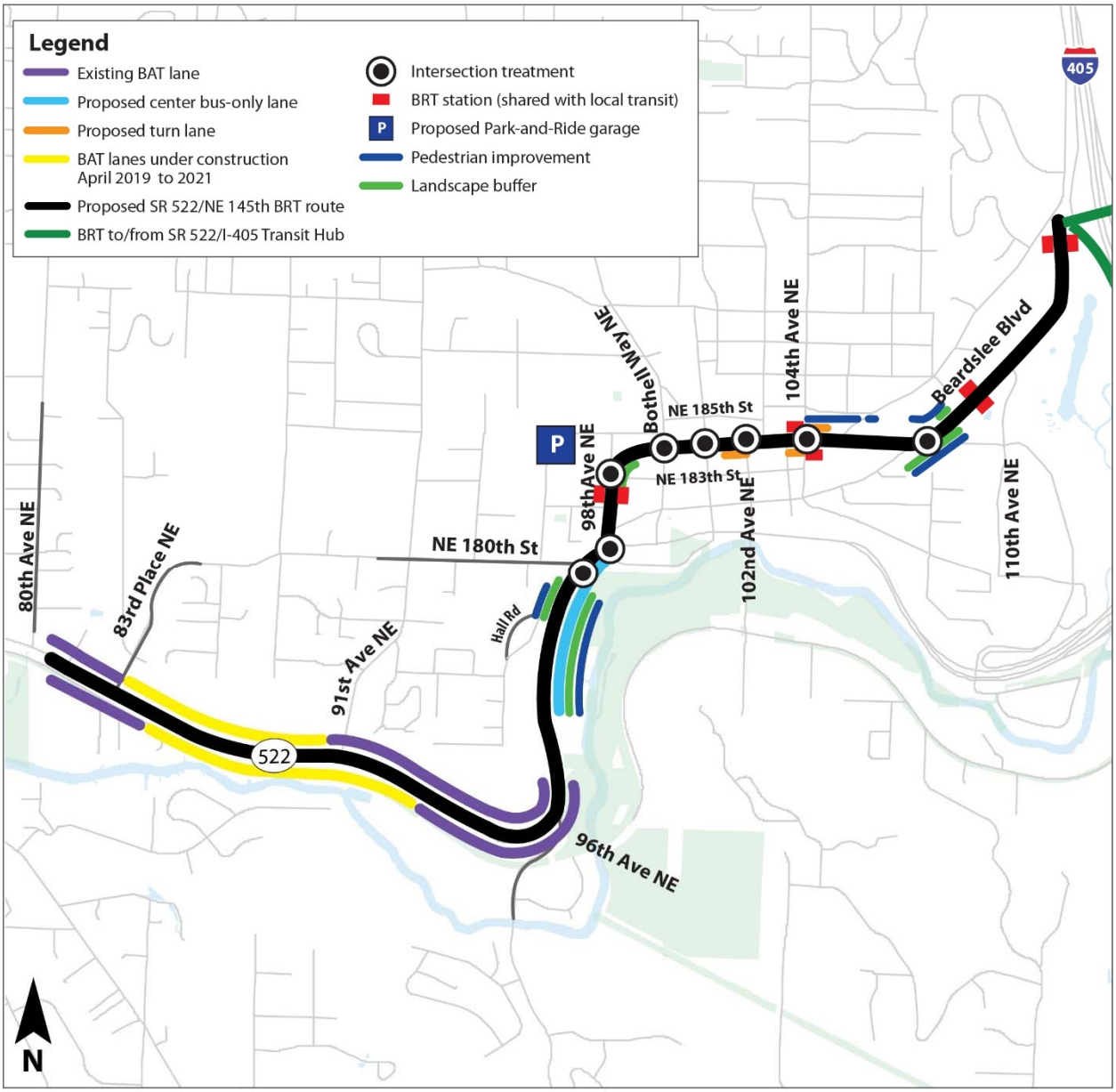

Figure 1-7 Segment 4: Bothell

The eastbound center-running bus-only lane on SR 522 would begin north of 96th Avenue NE, approximately 1,000 feet south of Hall Road. The center-running bus-only lane would replace the existing center two-way left-turn lane. Eastbound buses would continue through the NE 180th Street intersection to a second eastbound bus-only left-turn lane that would be constructed at 98th Avenue NE. The eastbound bus through movement at NE 180th Street would occur concurrently with the eastbound general-purpose through movement. The eastbound bus-only left-turn movement at 98th Avenue NE would occur concurrently with the

general-purpose eastbound left-turn movement. The project would include TSP treatments on SR 522 at signalized intersections to reduce transit delays resulting from traffic.

On Bothell city streets, BRT would operate on 98th Avenue NE, NE 185th Street and Beardslee Boulevard in mixed traffic. A number of improvements would occur to improve transit speed and reliability, listed from west to east below.

The intersection of 98th Avenue NE and NE 183rd Street would be converted from all-way stop control to two-way stop control for the east and west movements. The northbound platform at the NE 182nd Street Station would be at-grade, shared with Metro at the existing bus stop, and buses would stop in the travel lane. At the southbound platform, buses would stop in the travel lane.

Through the curve on 98th Avenue NE, on-street parking would be removed to retain a northbound left-turn pocket and two 11-foot travel lanes. At the approach to NE 185th Street, parking on the north side of the street would be eliminated to retain the eastbound-to-northbound left-turn lane and two 11-foot travel lanes. The intersection of 101st Avenue NE would be converted from all-way stop control to two-way stop control for the north and south movements.

The intersection of 102nd Avenue NE would include an eastbound right-turn pocket.

At the intersection of NE 185th Street and 104th Avenue NE, a westbound right-turn lane and an eastbound right-turn pocket would be constructed to reduce delay to BRT for the through movement, and the intersection would be signalized.

The intersection of NE 185th Street and Beardslee Boulevard would be signalized and would include traffic preemption for the fire station. Each leg would be a one-lane approach for the through lane. A westbound right-turn pocket would be provided. An eastbound bike lane would be provided on Beardslee Boulevard. Northbound left turns from Beardslee Boulevard onto NE 185th Street would be prohibited. A new northbound left-turn pocket would be added on the north side of the intersection to provide for left turns from Beardslee Boulevard into the fire station. Pavement markings and signage would be used to keep the area clear in front of the fire station. On Beardslee Boulevard, the planned BRT station is mid-block, west of 110th Avenue NE. The station platforms would be constructed following the eastbound road widening that would occur with future development associated with the *University of Washington Bothell/Cascadia College Campus Master Plan* (University of Washington 2017). The eastbound and westbound platforms would have buses stop in the outer of the two eastbound travel lanes, and the bicycle facility would be behind the station. The westbound platform would be at grade with a temporary Metro bus shelter and would be improved as a BRT station when and if future development modifies the roadway.

The BRT route would continue to the new SR 522/I-405 Transit Hub being developed in the northwest quadrant of the interchange of I-405 and SR 522 that would provide the interface between the SR 522/NE 145th BRT and I-405 BRT Stride routes. The SR 522/NE 145th BRT would travel southbound on the NE 195th Street on-ramp and diverge off to the new transit hub. SR 522/NE 145th BRT westbound travel would return to SR 522 by leaving the transit hub and traveling eastbound on SR 522 to the I-405 northbound on-ramp, diverge to the NE 195th Street off-ramp, and turn left and west to cross over I-405 to Beardslee Boulevard. No new improvements are proposed by this project to access that transit hub.

The proposed Bothell Park-and-Ride garage would be located on the southwest side of Pop Keeney Way. The garage would be a three-story structure with 300 new parking spaces, as shown in **Figure 1-8**.

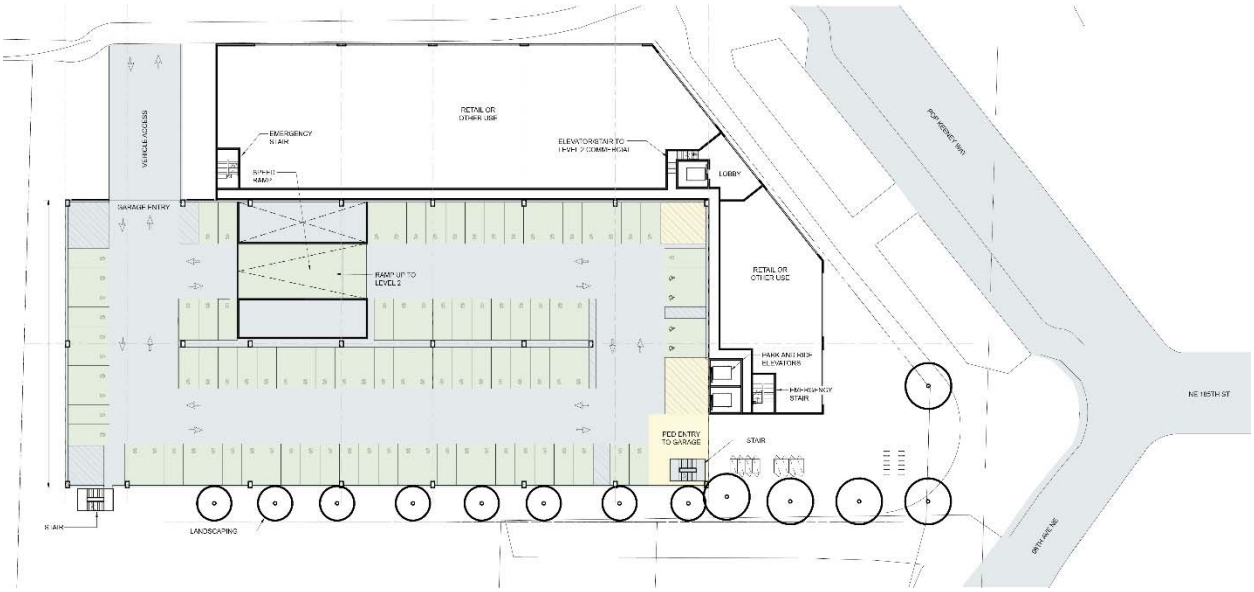

Figure 1-8 Bothell Park-and-Ride garage

2 TRANSPORTATION ANALYSIS METHODS

This chapter describes the methods used to analyze transportation and traffic effects of construction and operation of the SR 522/NE 145th BRT Project. The operational traffic analysis was structured to provide technical information about existing conditions, future No-Build conditions, and future Build conditions with the project. Attachment A (Traffic Forecasting and Simulation Modeling Methods and Assumptions Technical Memorandum) (Sound Transit 2020), provides more detail about the traffic analysis methodologies used for bus and general-purpose traffic operations. The technical memorandum was reviewed by the cities of Seattle, Shoreline, Lake Forest Park, Kenmore and Bothell, and by Metro, Community Transit and WSDOT.

2.1 Traffic analysis and model development

The existing conditions baseline year for traffic analysis is 2018 during the AM and PM peak hours, reflecting the two time periods with the highest on-street traffic volumes as a worst-case condition. Turning movement counts were conducted for the AM and PM peak hours for study area intersections to determine existing baseline traffic volumes. Volumes were balanced between intersections, and the balanced network reflects the typical weekday AM and PM peak hour traffic conditions. Existing transit routes were used to validate bus travel times for most of each segment. Existing transit operations were measured using the modeled delay for the expected transit movement at each intersection within the study area.

The intersection level of service and delay definitions from the Highway Capacity Manual 2010 (Transportation Research Board 2010), which were used to help assess transportation impacts, are provided in **Table 2-1**.

Table 2-1 Level of service and delay definitions at intersections

Average Control Delay (seconds per vehicle)			
Level of Service	**Signalized Intersection**	**Unsignalized Intersection**	**Traffic Characteristics**
A	<10	<10	Free flow
B	> 10 and < 20	> 10 and < 15	Stable flow (slight delays)
C	> 20 and < 35	> 15 and < 25	Stable flow (acceptable delays)
D	> 35 and < 55	> 25 and < 35	Approaching unstable flow (tolerable delay—occasionally wait through more than one signal cycle before proceeding)
E	> 55 and < 80	> 35 and < 50	Unstable flow (approaching intolerable delay)
F	> 80	> 50	Forced flow (jammed)

(1) SOURCE: 2010 *Highway Capacity Manual*, Transportation Research Board.

Signalized intersection level of service (LOS) is defined in terms of a weighted average control delay for the entire intersection. Control delay quantifies the increase in travel time that a vehicle experiences due to the traffic signal control as well as provides a surrogate measure for driver discomfort and fuel consumption. Signalized intersection LOS is stated in terms of average control delay per vehicle (in seconds) during a specified time period (e.g., weekday PM peak hour). Control delay is a complex measure based on many variables, including signal phasing

and coordination (i.e., progression of movements through the intersection and along the corridor), signal cycle length, and traffic volumes with respect to intersection capacity.

Three modeling tools were used to evaluate traffic operations: (1) travel demand forecasting software (EMME); (2) traffic operations analysis software (Synchro); and (3) Vissim (a microsimulation model), which is used only in Segment 1, provides more detailed operational analysis than Synchro and more accurately reflects complex traffic operations of intersection channelization, BAT lanes, transit vehicle interactions, turning vehicle interaction, pedestrian crossing, TSP and queue jumps. Vissim was used for Segment 1 to provide detailed modeling of the complex interactions around the freeway interchange in this area, as well as the interactions between general-purpose and transit vehicles for the proposed project. Vissim provided detailed queuing effects at the intersections and the resulting effects to transit operations. All intersections that were modeled along the entire project corridor are described in Section 3.

Traffic generated by the three proposed park-and-ride garages was included in the PM peak hour traffic models for each project segment. The PM peak hour was evaluated because it is a higher peak hour than the AM peak hour for park-and-ride facilities. Additional study intersections were included in the traffic analysis based on the traffic assignment of park-and-ride garage trips to the street network. Attachment B (Parking Garage Traffic Impacts Methodology) (Sound Transit 2019) provides additional descriptions of trip generation, trip distribution and traffic assignment methodology. Trip generation and distribution for each proposed park-and-ride garage were prepared to identify new trips likely generated by these facilities, for use in the future year Build models. The Sound Transit Incremental Model was used to distribute park-and-ride garage trips to and from their destinations, with destinations combined by Traffic Analysis Zones (TAZs) (Sound Transit 2019). Assignment of park-and-ride garage trips was based on intersection turning movement counts.

Transit Signal Priority (TSP) operations proposed by the project at intersections along the corridor were considered as an input to the models to help understand any potential traffic impacts.[3]

As noted above, Synchro and Vissim traffic models were developed to evaluate traffic operations with respect to vehicle delay and LOS at each intersection. **Table 2-2** summarizes the traffic analysis methodology and the modeling tools applied, by segment, and AM and PM peak hours.

[3] Sound Transit will conduct additional TSP modeling as final design progresses and in coordination with local jurisdictions.

Table 2-2 Summary of traffic analysis methodology and models

Segment	Peak hour	Project components	Modeling tool	Notes
NE 145th Street	AM	Transit queue bypass lane, channelization	Vissim	
	PM	Transit queue bypass lane, channelization	Vissim	
Lake Forest Park	AM	BAT lane, channelization	Synchro	
	PM	BAT lane, channelization, park-and-ride garage	Synchro	Added intersections for park-and-ride garage analysis
Kenmore	AM	(no new component)	Synchro	
	PM	Park-and-ride garage	Synchro	Added intersections for park-and-ride garage analysis
Bothell	AM	Bus-only lane, channelization	Synchro	
	PM	Bus-only lane, channelization, park-and-ride garage	Synchro	Added intersections for park-and-ride garage analysis

The existing conditions models were developed with the following data.

Weekday turning movement counts from the AM and PM peak hours were input to the existing conditions baseline model. Peak hour bus volumes were used as input to the Vissim model. Transit travel times measured in the field were based on automatic vehicle location (AVL) data provided by Metro, Community Transit and Sound Transit. Bus dwell time data was coded and calibrated based on AVL data and expected ridership, as coordinated by the transit agencies. General-purpose travel times were calibrated from intersection to intersection based on field data. Traffic volume data at minor unsignalized streets or driveways were coded as right-in right-out streets in the model to better balance the general-purpose traffic volumes. Percentages of heavy vehicles (e.g., trucks, buses and recreational vehicles) were based on collected turning-movement count data. Pedestrian crossings at signalized and unsignalized intersections with crosswalks, and additional midblock crossings were also included where applicable. Bicycles were not included in the model, because counts are low and would have minimal impact on traffic operations results.

For Segment 4, the City of Bothell provided signal timing data, and field observations were used to verify operations for all project areas within its jurisdiction. Parking interactions on NE 185th Street (Bothell) were included in the model and were based on turnover and occupancy data collected in the field.

The horizon year for traffic analysis is 2042 for consistency with Sound Transit and the Puget Sound Regional Council (PSRC) forecasts, Federal Transit Administration guidelines, and WSDOT traffic analysis guidelines for roadway improvements. The PSRC EMME model for the study area provided the future No Build 2042 travel demand and traffic volumes. The PSRC 2042 traffic volumes reflect full build-out of local jurisdictions' comprehensive plans. Future No-Build 2042 traffic volumes were adjusted for Shoreline, relative to the PSRC traffic forecasts, based on the City of Shoreline's updated zoning assumptions. Future No-Build 2042 PM peak

hour traffic volumes were adjusted for Bothell intersections, relative to the PSRC traffic forecasts, using PM peak hour future traffic volumes from the City of Bothell *Downtown Transportation Needs Assessment, Downtown Revitalization Transportation Plan* (City of Bothell 2008). Future 2042 No-Build traffic volumes reflect approximately full build-out of the cities' planned land uses in the comprehensive plans.

Future Build conditions were analyzed using 2042 traffic forecasts with the proposed project. The analysis presents traffic conditions for all segments as intersection delay and LOS. Proposed project components are transit speed and reliability improvements that include BAT lanes, transit queue bypass lanes, TSP, and modifications to existing signal timing that provide for more efficient intersection operations. Future Build conditions include traffic generated by the proposed park-and-ride garages, as described above.

2.2 Freight analysis

A freight analysis was prepared by identifying the WSDOT and city freight classifications along the BRT route. WSDOT classifies all highways, county roads and city streets by reported annual gross truck tonnage, ranging from T-1, with the highest tonnage, to T-5, with the least tonnage. Freight is carried by trucks along the BRT route. Truck-freight movement prefers to travel outside of congested conditions, and therefore a potential impact to truck-fright operations could occur if the hours of congestion increased due to the project. The analysis also assessed effects to truck mobility where roadways would be reconstructed as part of the project.

2.3 Parking analysis

For the proposed Lake Forest Park Park-and-Ride garage, the Institute of Transportation Engineers (ITE) *Parking Generation Manual*, 5th Edition (ITE 2019) was used to estimate parking demand of the Lake Forest Park Town Center shared parking conditions for future No-Build and Build conditions. The analysis addressed the resulting parking demand versus capacity, accounting for the parking spaces that would likely be displaced by the garage.

The proposed Kenmore Park-and-Ride garage would increase park-and-ride capacity and improve conditions relative to parking demand. Impacts to existing parking from construction of the proposed park-and-ride garage would be temporary and are addressed in Chapter 6 (Construction Impacts and Mitigation).

At the proposed Bothell Park-and-Ride garage site (commonly known as "Bothell Lot P"), there is no existing parking, and no parking demand/impact analysis was prepared.

The analysis of on-street parking along the proposed project alignment addressed the number of on-street parking spaces displaced with the proposed project design. On-street parking spaces were assumed to be fully utilized to ensure the most conservative level of analysis.

2.4 Safety analysis

A safety analysis was prepared for each segment using six years of vehicle crash data from WSDOT (2013–2017) to identify existing safety issues as a baseline. Vehicle crash data were sorted by segment, by crash type and by year for a qualitative review of segment safety issues and patterns that could indicate a safety concern for BRT operation in the corridor. The project improvements were qualitatively evaluated to determine whether they could address any safety concerns identified or whether they could result in a safety concern.

In addition to the review of vehicle crash data, the safety analysis included a review of pedestrian and bicycle crashes, by location, to qualitatively address whether a change in geometry or signal timing could be needed, as a result of the project, to address pedestrian and bicycle safety. Pedestrian crossing distances and the associated increases in road crossing walk times were identified at locations where roadway widening associated with BAT lanes, transit queue bypass lanes, bus-only lanes, and turn lanes would occur. Walk times were calculated based on the Manual of Uniform Traffic Control Devices (MUTCD) (USDOT 2009) using the standard of 3.5 feet per second as the normal speed and 3.0 feet per second for slower pedestrians. Section 2.5 below provides additional information on the nonmotorized analysis that was completed.

2.5 Nonmotorized transportation analysis

Pedestrian impacts (or benefits) were considered nearf the proposed stations. Bicycle impacts (or benefits) of the project were evaluated based on existing and proposed bicycle facilities, and access to BRT stations. The analysis identified how the project would interact with or impact existing nonmotorized transportation facilities along the corridor, including whether improvements to pedestrian or bicycle facilities are proposed or would be needed. Project nonmotorized facilities include reconstructed sidewalks, new nonmotorized shared-use path facilities, nonmotorized pathways through or passing behind platforms, and ADA ramp improvements to current standards.

2.6 Transit analysis

The existing, Future No Build, and Build transit operations analysis is based on the revisions to service at bus stops and BRT station locations. The analysis of potential changes in bus stops used the 522 BRT Bus Stop Rebalancing Plan – Proposed 2024 (Metro 2020) as a basis for changes in bus stops that would occur with the implementation of BRT service and proposed station locations. The consolidation of bus stops would improve transit speed and reliability for this shared facility, because it would reduce the dwell time associated with each stop. The stop consolidation also would reduce the frequency at which a BRT coach would be stopped behind a Metro coach. The analysis includes an identification of whether existing bus stops and BRT station locations are at an unsignalized intersections to indicate whether rider walk routes are at unsignalized or signalized intersections.

2.7 Construction analysis

This analysis qualitatively evaluated whether and how construction activities could affect traffic operations, pedestrian and bicycle facilities, parking, and existing bus stop operations, as well as considering likely detours and temporary impacts to parking during park-and-ride garage construction.

3 EXISTING TRANSPORTATION CONDITIONS

Existing transportation conditions are presented in the subsections below, by project segment, and for project components shown in **Figure 1-1**. For existing conditions, the roadway components described include the number of travel lanes, transit priority lanes or treatments, posted speed limits, walkways, bikeway facilities, bus stop locations, on-street parking, intersection types and level of control, and current traffic. For existing conditions, the traffic operations at corridor intersections describe AM and PM peak hour traffic conditions. Existing safety conditions are presented, along with a summary of historical crash data. Freight route classifications are presented for each project segment.

Figure 3-1 shows the existing intersections in the study area that were evaluated, and **Table 3-1** lists these intersections and describes how they are currently controlled.

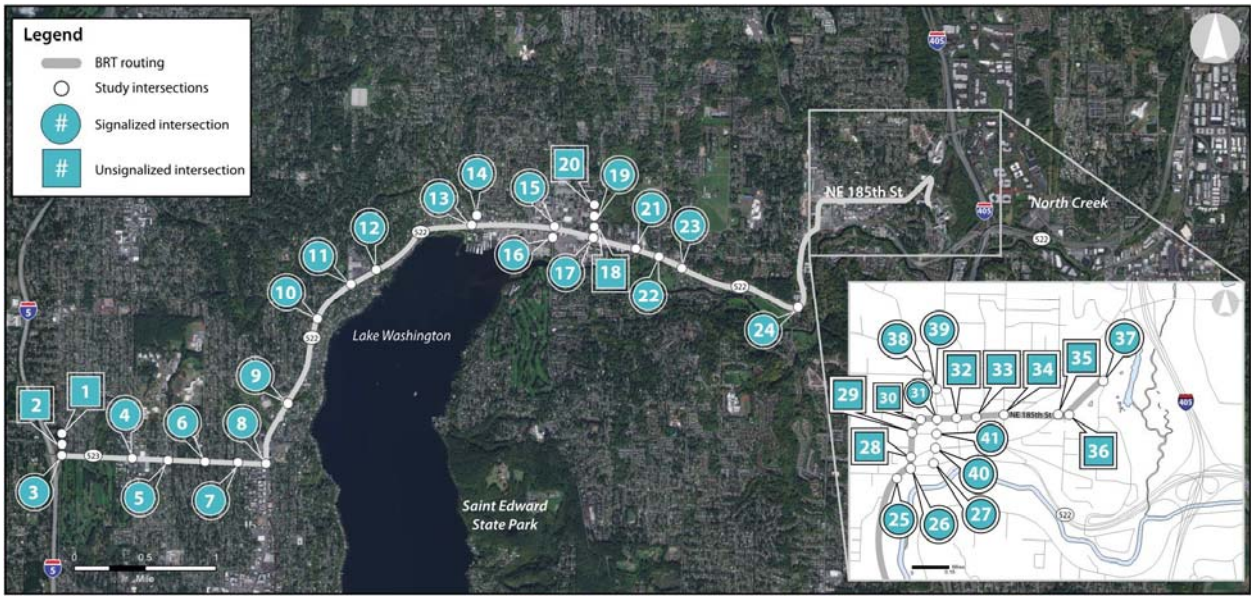

Figure 3-1 Traffic operational analysis study area intersections

Table 3-1 Traffic analysis study intersections

Intersection Number[1]	Intersection	Control Type[2]	Owner/Operator[3]
1	5th Avenue NE and NE 148th Street	TWSC	Shoreline
2	5th Avenue NE and I-5 northbound on-ramp	OWSC	WSDOT
3	NE 145th Street and 5th Avenue NE	Signalized	WSDOT
4	NE 145th Street and 15th Avenue NE	Signalized	SDOT
5	NE 145th Street and 20th Avenue NE	Signalized	SDOT
6	NE 145th Street and 25th Avenue NE	Signalized	SDOT
7	NE 145th Street and 30th Avenue NE	Signalized	SDOT
8	NE 145th Street and SR 522 (Bothell Way NE/Lake City Way NE)	Signalized	SDOT
9	SR 522 (Bothell Way NE) and NE 153rd Street	Signalized	WSDOT
10	SR 522 (Bothell Way NE) and NE 165th Street	Signalized	WSDOT
11	SR 522 (Bothell Way NE) and Beach Drive NE	Signalized	WSDOT
12	SR 522 (Bothell Way NE) and Ballinger Way NE (SR 104)	Signalized	WSDOT
13	SR 522 (Bothell Way NE) and 61st Avenue NE	Signalized	WSDOT
14	61st Avenue NE and NE 181st Street	Signalized	WSDOT
15	SR 522 (Bothell Way NE) and 68th Avenue NE	Signalized	WSDOT
16	68th Avenue NE and NE 175th Street	Signalized	WSDOT
17	SR 522 (Bothell Way NE) and 73rd Avenue NE	Signalized	WSDOT
18	SR 522 and park-and-ride north driveway	OWSC	Kenmore
19	73rd Avenue NE and NE 181st Street	Signalized	Kenmore
20	73rd Avenue NE and NE 182nd Street	OWSC	Kenmore
21	SR 522 (Bothell Way NE) and 77th Court NE	Signalized	WSDOT
22	SR 522 (Bothell Way NE) and 80th Avenue NE	Signalized	WSDOT
23	SR 522 (Bothell Way NE) and 83rd Place NE	Signalized	WSDOT
24	SR 522 (Bothell Way NE) and 96th Avenue NE	Signalized	Bothell/Snohomish County
25	SR 522 (Bothell Way NE) and NE 180th Street	Signalized	Bothell/Snohomish County
26	SR 522 (Bothell Way NE) and 98th Avenue NE	Signalized	Bothell/Snohomish County
27	SR 522 (Woodinville Drive) and Bothell Way NE	Signalized	WSDOT
28	98th Avenue NE and Main Street	OWSC	Bothell
29	98th Ave NE and NE 183rd Street	AWSC	Bothell
30	NE 185th Street and Pop Keeney Way	OWSC	Bothell
31	NE 185th Street and Bothell Way NE	Signalized	Bothell/Snohomish County

Intersection Number[1]	Intersection	Control Type[2]	Owner/Operator[3]
32	NE 185th Street and 101st Avenue NE	AWSC	Bothell
33	NE 185th Street and 102nd Avenue NE	OWSC	Bothell
34	NE 185th Street and 104th Avenue NE	AWSC	Bothell
35	NE 185th Street and Beardslee Boulevard	OWSC	Bothell
36	Beardslee Boulevard and 108th Avenue NE	OWSC	Bothell
37	Beardslee Boulevard and 110th Avenue NE	Signalized	Bothell/Snohomish County
38	Bothell Way NE and NE 188th Street	TWSC	Bothell
39	Bothell Way NE and Reder Way	Signalized	Bothell/Snohomish County
40	Bothell Way NE and Main Street	Signalized	Bothell/Snohomish County
41	Bothell Way NE and NE 183rd Street	Signalized	Bothell/Snohomish County

(1) Intersection numbers are shown on Figure 3-1 for study intersections.
(2) All-way stop control (AWSC), one-way stop control (OWSC), two-way stop control (TWSC).
(3) Seattle Department of Transportation (SDOT), Washington State Department of Transportation (WSDOT).

The review of six years of WSDOT crash data (January 1, 2013, through December 31, 2018) prepared for subsection 3.1.2 Safety was reviewed for the relationship between congestion and crash data. On SR 522 within the project segments, there were 2,072 crashes in six years, or an average of 345 crashes per year. This equates to approximately one crash each day of the year. Each crash is a likely contributor to recurring congestion within the corridor, resulting in delays for general-purpose traffic and for transit operations. Dominant crash types are a combination of rear-end and sideswipe and a combination of right-angle and left-turn crashes in the corridor. The high share of rear-end and sideswipe crashes is an indication of high levels of traffic congestion in Segment 1 where stopped traffic can lead to rear-end crashes or sudden lane changes and sideswipe crashes. Right-angle and left-turn crashes can be an indication of both congested conditions and a lack of left-turn channelization, as along NE 145th Street. Locations of pedestrian crashes in the corridor are identified for each BRT project segment presented below.

3.1 Segment 1: Seattle/Shoreline

NE 145th Street (SR 523) is the BRT route in the Seattle Shoreline segment. NE 145th Street is a four-lane principal arterial with a posted speed limit of 35 miles per hour (mph). The WSDOT state route designation for SR 523 is a non-highway of statewide significance (non-HSS) and designated as a Regionally Significant State Highway by the PSRC. The roadway has sidewalks on both sides; these sidewalks have some width limitations because of the presence of utility poles in the sidewalk within the limited right-of-way. The arterial has rolling terrain. There are no bike lanes on NE 145th Street. Turn pockets are in place approaching key intersections at 15th Avenue NE and at SR 522/Bothell Way.

The intersections included in the analysis are along NE 145th Street where the project would modify intersection channelization. In addition, the intersection of 5th Avenue NE is included to

tie in to the analysis of 5th Avenue NE to the Shoreline South/148th Link light rail station that was prepared for the Lynnwood Link Extension project. On NE 145th Street, intersections have signal control at 5th Avenue NE, at 15th Avenue NE, at 20th Avenue NE, at 25th Avenue NE, at 30th Avenue NE and at SR 522/Bothell Way. Signal control is two-phased at 20th Avenue NE, 25th Avenue NE and 30th Avenue NE, where left turns are made from the through lane, and left turns yield to oncoming traffic (permissive left turns).

Land uses adjacent to NE 145th Street are primarily single-family residential mixed with some multifamily residential uses, a commercial area near the 15th Avenue NE intersection, and commercial land use near SR 522/Bothell Way. Residential and commercial driveways access NE 145th Street directly. Traffic on NE 145th Street is a mix of regional and local through traffic and local traffic.

Figure 3-2 provides a close-up view of the intersections studied in this particular segment and also denotes the signals currently unsignalized that will have signals in the future year.

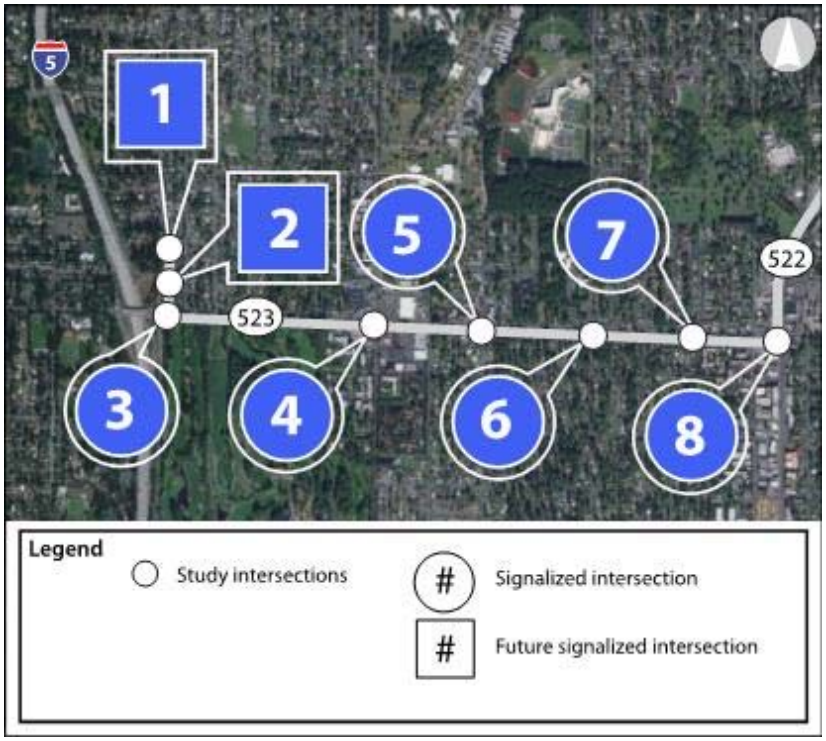

Figure 3-2 NE 145th Street Vissim operational analysis study area and intersections

3.1.1 Traffic operations

Figure 3-3 presents existing AM peak hour intersection LOS and delay, and **Figure 3-4** presents existing PM peak hour intersection LOS and delay. The intersection of 5th Avenue NE and NE 145th Street operates at LOS F during the AM and PM peak hours. Signal timing at 5th Avenue NE and NE 145th Street operates with split-phase signal timing operations in the northbound and southbound directions. With cycle lengths of 100 seconds in the AM peak period and 120 seconds in the PM peak period, the split-phase operations limit the amount of green time for those two movements, and affect the delay and queuing seen at the intersection.

The intersection of NE 145th Street and SR 522 operates at LOS F during the AM and PM peak hours. The signal operates with split-phase signal timing operations in the eastbound and westbound directions. The north-south movement remains green until there is a call by the east-west traffic. The maximum cycle length is 150 seconds in the AM peak period and 230 seconds in the PM peak period. Heavy volumes in the eastbound, northbound and southbound directions, as well as the cycle lengths, contribute to the delay and queuing seen at the intersection. During the PM peak hour, the eastbound queue extends to approximately 31st Avenue NE.

During the AM peak hour, westbound queues from NE 145th Street and the I-5 southbound ramp extend through the intersection at 5th Avenue NE and extend to 10th Avenue NE, affecting traffic operations on NE 145th Street along the BRT route. During the PM peak hour, the average westbound queue on NE 145th Street at 5th Avenue NE extends to 8th Avenue NE.

At the intersection of NE 145th Street and 15th Avenue NE, eastbound queues extend approximately 350 feet from the intersection during the PM peak hour.

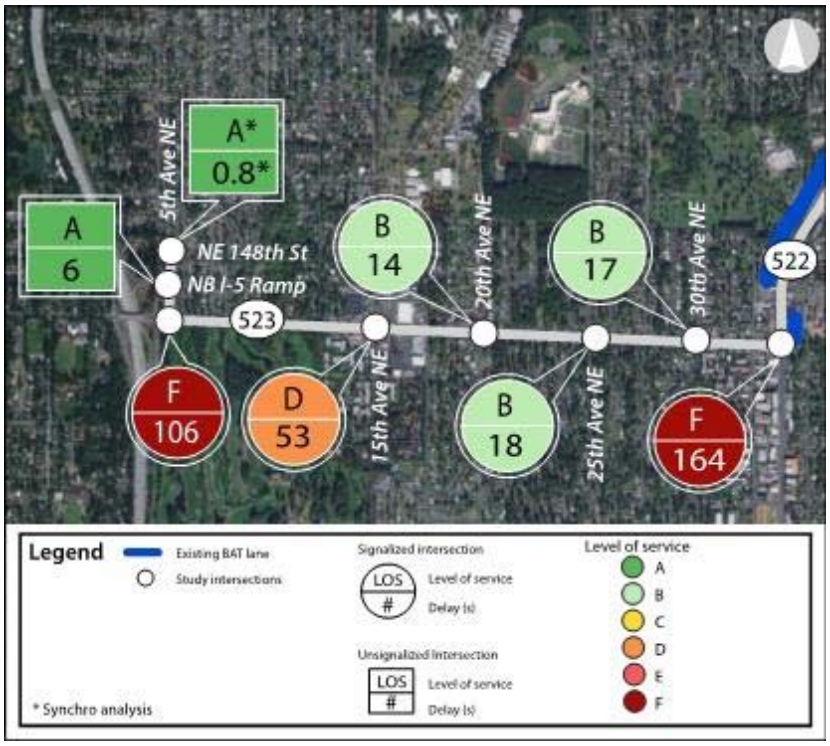

Figure 3-3 NE 145th Street existing AM peak hour LOS and delay

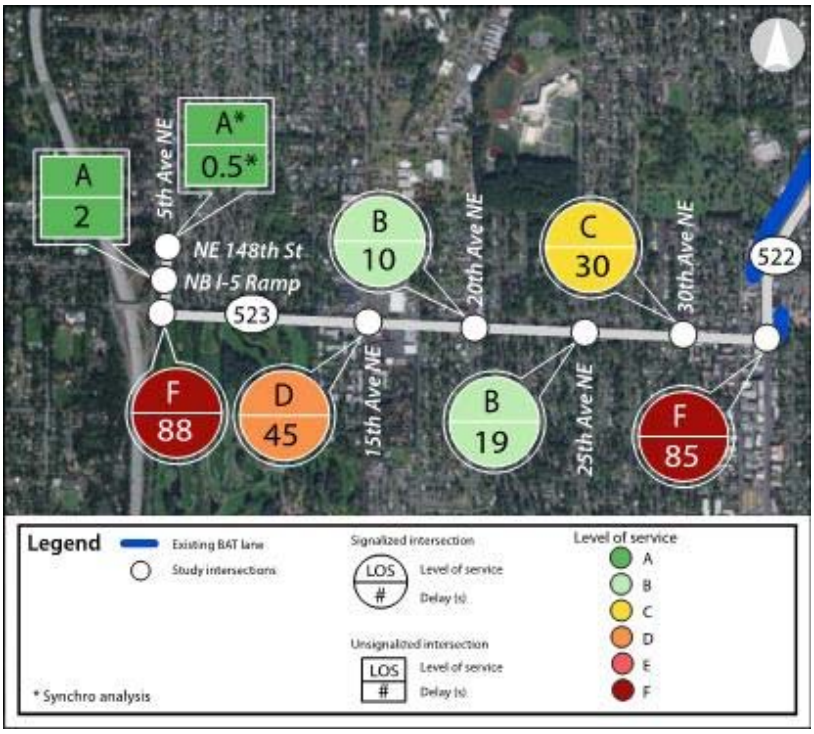

Figure 3-4 NE 145th Street existing PM peak hour LOS and delay

3.1.2 Freight movement

NE 145th Street/SR 523 is classified as a major truck street by SDOT. WSDOT also classifies SR 523 as a T-3 truck facility from SR 99 to SR 522, with 3.3 percent trucks and 2,130,000 annual tonnage on the roadway (from SR 99 to SR 522) (WSDOT 2017).

3.1.1 Parking

There is no on-street parking along this project segment. There is a park-and-ride lot with leased spaces from the Shoreline Methodist Church at 14520 25th Avenue NE.

3.1.2 Safety

Crash data were provided by WSDOT for the six-year period from 2013 to 2018. There were 678 crashes in the 1.45-mile-long NE 145th Street segment that occurred during the six-year period, ranging from 91 to 125 crashes per year and averaging 78 crashes per mile per year. Segment 1 had the highest number of crashes per mile per year of the four project segments. Dominant crash types were rear-end/sideswipe (51 percent) and right-angle/left-turn (38 percent). The high share of rear-end and sideswipe crashes is an indication of high levels of traffic congestion in Segment 1 where stopped traffic can lead to rear-end crashes or sudden lane changes and sideswipe crashes. The four-lane roadway with limited turn pockets of NE 145th Street is a challenge for left-turn maneuvers, which is reflected in the high share of right-angle/left-turn crashes. There were 16 crashes involving pedestrians, including one fatal crash in which a vehicle traveling straight struck and killed a pedestrian crossing NE 145th Street at

25th Avenue NE. There were crashes involving pedestrians both at signalized intersections and midblock, indicating a safety concern in Segment 1 for pedestrians.

Table 3-2 summarizes the crash types by year in the NE 145th Street segment, and **Table 3-3** summarizes those crashes by severity. **Figure 3-5** shows the pedestrian and bicycle crashes that occurred in the segment by location.

Table 3-2 NE 145th Street 2013–2018 crash data summary

Segment	Crash Type	Year						Total
		2013	2014	2015	2016	2017	2018	
NE 145th Street	Other	4	2	4	5	0	5	20
	Fixed Object	4	4	8	3	0	6	25
	Right Angle	19	26	28	23	39	31	166
	Sideswipe	11	13	12	19	11	13	79
	Head On	0	1	0	1	0	0	2
	Left Turn	15	19	13	17	12	14	90
	Rear End	36	51	38	46	54	42	267
	Right Turn	1	1	3	1	1	1	8
	Parked Vehicle	0	1	1	1	0	0	3
	Bicycle	0	1	0	0	0	1	2
	Pedestrian	1	6	5	1	1	2	16
Totals		**91**	**125**	**112**	**117**	**118**	**115**	**678**

Source: WSDOT
Note: Under 23 U.S. Code § 148 and 23 U.S. Code § 409, safety data, reports, surveys, schedules, lists compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential crash sites, hazardous roadway conditions, or railway-highway crossings are not subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

Table 3-3 NE 145th Street 2013–2018 crash severity summary

Segment	Crash Severity	Year						Total
		2013	2014	2015	2016	2017	2018	
NE 145th Street	Dead at Scene	0	0	0	0	0	0	0
	Died in Hospital	0	0	0	1	0	0	1
	No Apparent Injury	63	77	76	81	85	82	464
	Possible Injury	19	31	29	30	26	28	163
	Suspected Minor Injury	8	14	6	4	5	5	42
	Suspected Serious Injury	0	2	0	0	2	0	4
	Unknown	1	1	1	1	0	0	4
Totals		**91**	**125**	**112**	**117**	**118**	**115**	**678**

NE 145th Street has experienced pedestrian and bicycle crashes, as shown in **Figure 3-5**. Multiple pedestrian crashes were recorded at 15th Avenue NE, the location of one of the proposed BRT stations.

Figure 3-5 also shows the pedestrian and bicycle crashes by severity and volume. Pedestrian and bicycle icons in the figure indicate the location of pedestrian or bicycle crashes in this segment: yellow indicates a minor injury crash; orange indicates a serious injury crash; and red indicates a fatal crash. Topics of concern for pedestrian and bicycle safety near the proposed BRT stations are visibility and potential conflicts with turning vehicles.

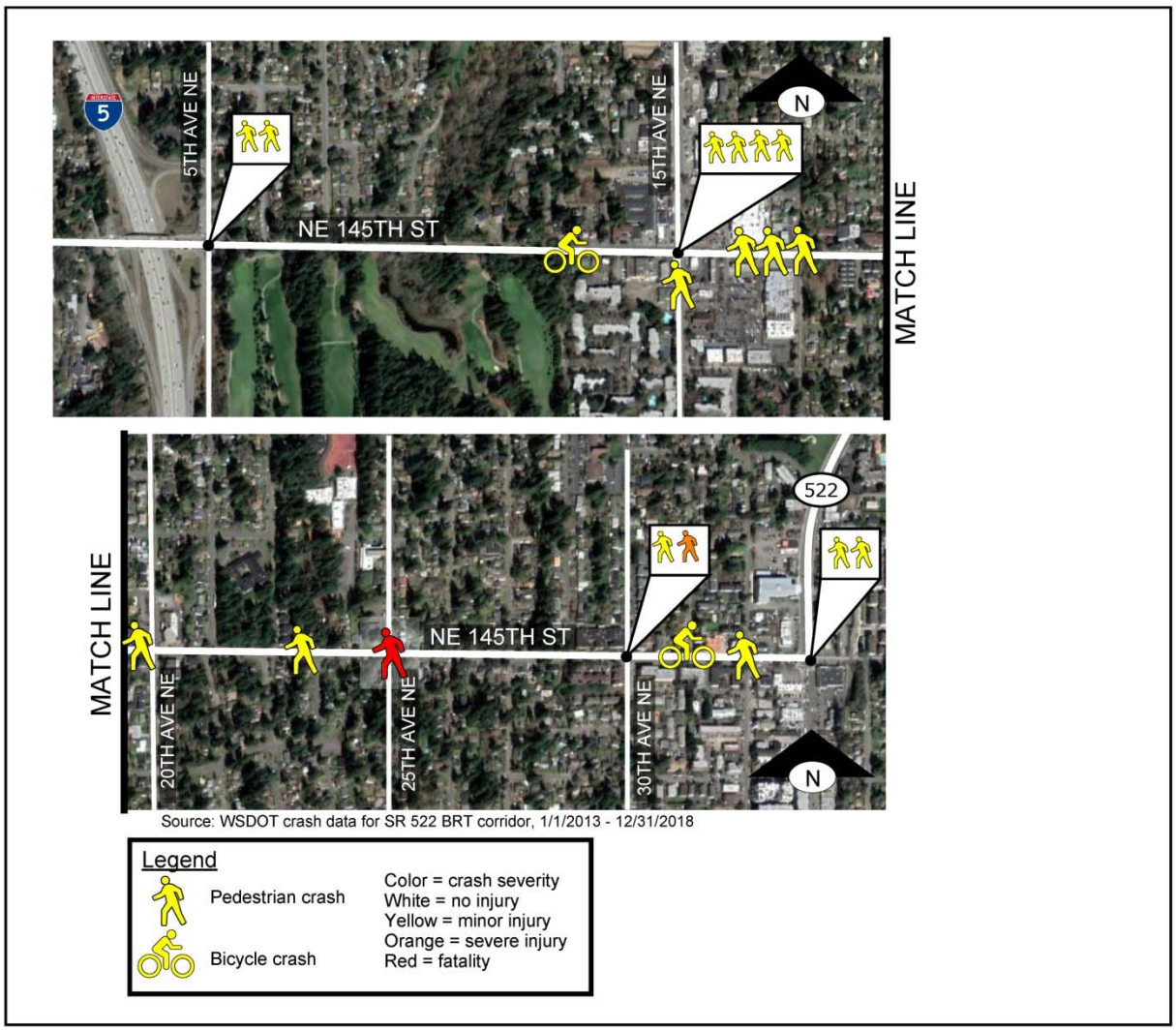

Figure 3-5 NE 145th Street pedestrian and bicycle crash data by location

3.1.3 Nonmotorized transportation

NE 145th Street generally has 5-foot-wide continuous sidewalks located adjacent to the outside travel lanes. The sidewalks have utility poles within the walk area. The ADA curb ramps do not meet current guidelines. There are no existing bicycle facilities.

3.2 Segment 2: Lake Forest Park

SR 522 is a four- to five-lane principal arterial roadway with an existing southbound BAT lane and a relatively short northbound BAT lane in the vicinity of the Lake Forest Park Town Center. The posted speed limit is 40 mph from NE 145th Street to SR 104/Ballinger Way NE. SR 522 is designated a highway of statewide significance (HSS).

SR 522 has segments with a raised median and turn pockets for left turns or U-turns, as well as segments with a two-way left-turn lane to accommodate property access to driveways. Land uses adjacent to SR 522 are primarily single-family residential. There are steep sloped areas towards Lake Washington that limit connecting streets to SR 522. Residential driveway access is limited due to the steep slopes.

Within the Lake Forest Park segment, intersections on SR 522 have signal control at NE 145th Street, NE 153rd Street, NE 165th Street, Beach Drive/NE 170th Street and Ballinger Way/SR 104. Other intersections have stop control for side-street traffic.

3.2.1 Traffic operations

In addition to the study area intersections identified in Chapter 2, the City of Lake Forest Park requested the following unsignalized intersections on SR 522 to be evaluated for the PM peak hour:

- NE 149th Street
- 39th Avenue NE
- Lake Forest Park Town Center

Figure 3-6 presents the existing AM peak hour intersection LOS and delay, and **Figure 3-7** presents existing PM peak hour intersection LOS and delay for study intersections in the Lake Forest Park segment of SR 522. The intersections operate at LOS C or better during the AM and PM peak hours.

As discussed above for NE 145th Street, the signal operations and the heavy volumes at the intersection of NE 145th Street and SR 522 cause delay to transit at the southbound approach to NE 145th Street. The AM operations show the southbound right movement failing, because the southbound direction (inbound towards the light rail station) is the peak direction.

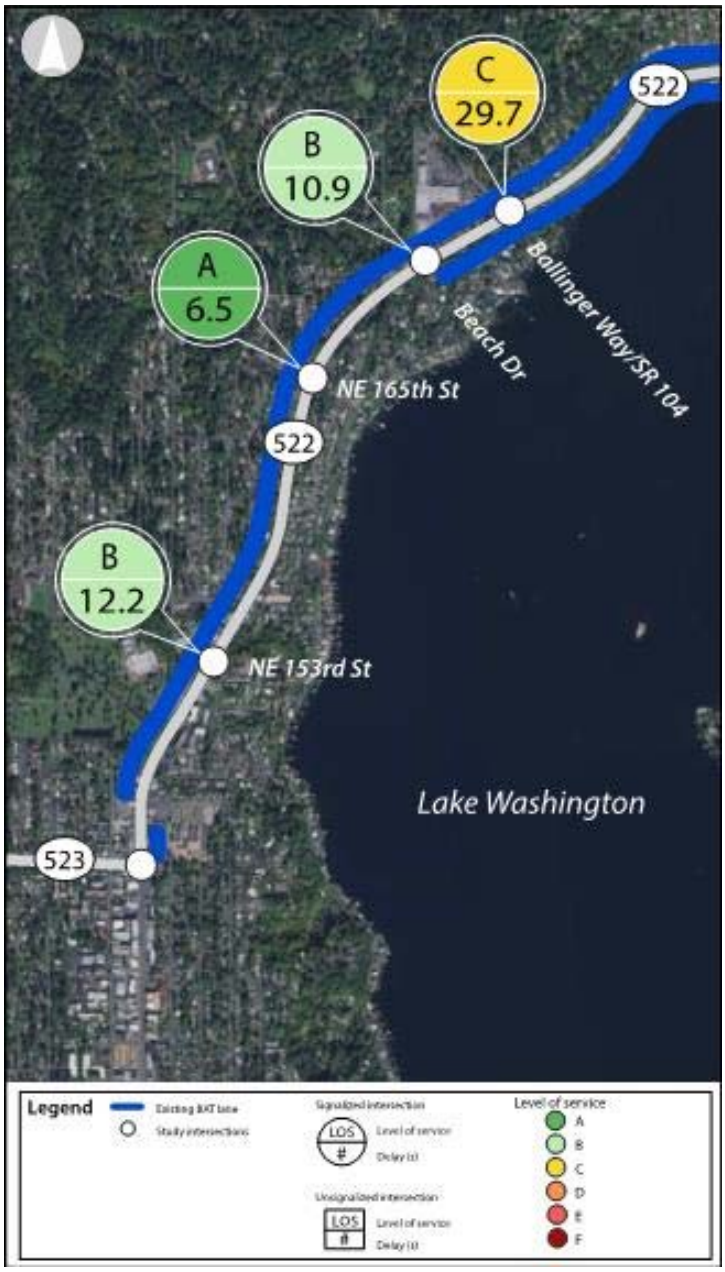

Figure 3-6 Lake Forest Park existing AM peak hour LOS and delay

Figure 3-7 Lake Forest Park existing PM peak hour LOS and delay

3.2.2 Freight movement

SR 522 through the Lake Forest Park segment is classified as a T-2 freight corridor in the WSDOT Freight and Goods Transportation System, with 3,920,000 annual tonnage moved by truck and 3.9 percent trucks (WSDOT 2017).

3.2.3 Parking

The existing town center parking has a supply of approximately 931 spaces (based on Google Earth inventory, plus or minus 10 spaces). Drive-by observations indicate there are vacant spaces on the upper level of the town center on the north side of the commercial buildings. Parking is shared by businesses in the town center. There is no on-street parking along the project segment and no existing park-and-ride facilities.

3.2.4 Safety

Table 3-4 summarizes six years of WSDOT crash data from January 1, 2013, through December 31, 2018. There was a total of 362 crashes on SR 522 in the Lake Forest Park segment during those six years, which represents 37 crashes per mile per year for Segment 2, about half that of Segment 1. The dominant crash type for the segment is the combined rear-end/sideswipe crash type, which makes up about 65 percent of the crashes, likely associated with the congested conditions along the roadway. **Table 3-5** summarizes the severity of the crashes in the Lake Forest Park segment.

Table 3-4 2013–2018 Lake Forest Park SR 522 crash data summary

Segment	Crash Type	Year						Total
		2013	2014	2015	2016	2017	2018	
Lake Forest Park	Other	2	3	1	4	2	2	14
	Fixed Object	7	7	3	6	5	3	31
	Right Angle	5	7	4	10	8	4	38
	Sideswipe	8	9	5	12	16	7	57
	Head On	0	0	0	1	0	0	1
	Left Turn	2	4	3	4	3	5	21
	Rear End	30	35	22	24	39	30	180
	Right Turn	1	0	1	1	1	1	5
	Parked Vehicle	0	0	1	0	0	0	1
	Bicycle	1	3	1	2	0	0	7
	Pedestrian	3	0	0	2	0	2	7
Totals		**59**	**68**	**41**	**66**	**74**	**54**	**362**

Source: WSDOT

Note: Under 23 U.S. Code § 148 and 23 U.S. Code § 409, safety data, reports, surveys, schedules, lists compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential crash sites, hazardous roadway conditions, or railway-highway crossings are not subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

Table 3-5 2013–2018 Lake Forest Park SR 522 crash severity summary

Segment	Crash Severity	Year						Total
		2013	2014	2015	2016	2017	2018	
Lake Forest Park	Dead at Scene	0	0	0	0	1	0	1
	Died in Hospital	0	0	0	0	0	1	1
	No Apparent Injury	36	44	22	43	54	32	231
	Possible Injury	16	18	13	15	14	16	92
	Suspected Minor Injury	5	3	4	4	2	5	23
	Suspected Serious Injury	0	2	2	3	1	0	8
	Unknown	2	1	0	1	2	0	6
Totals		**59**	**68**	**41**	**66**	**74**	**54**	**362**

Figure 3-8 shows the locations of pedestrian and bicycle crashes in the Lake Forest Park segment. There were seven crashes involving pedestrians and seven crashes involving bicyclists. There were two fatal crashes in the corridor: one in which a pedestrian was struck crossing SR 522 near NE 155th Street, and another vehicle crash that involved the raised median.

Figure 3-8 also shows the pedestrian and bicycle crashes by severity and volume. Pedestrian and bicycle icons in the figure indicate the location of pedestrian or bicycle crashes in the Lake Forest Park segment: green indicates no injury; yellow indicates a minor injury crash; orange indicates a serious injury crash; and red indicates a fatal crash. Topics of concern for pedestrian and bicycle safety near the proposed BRT stations are the arterial crossing locations and potential conflicts with turning vehicles. There are limited places for pedestrians to cross SR 522 in this segment.

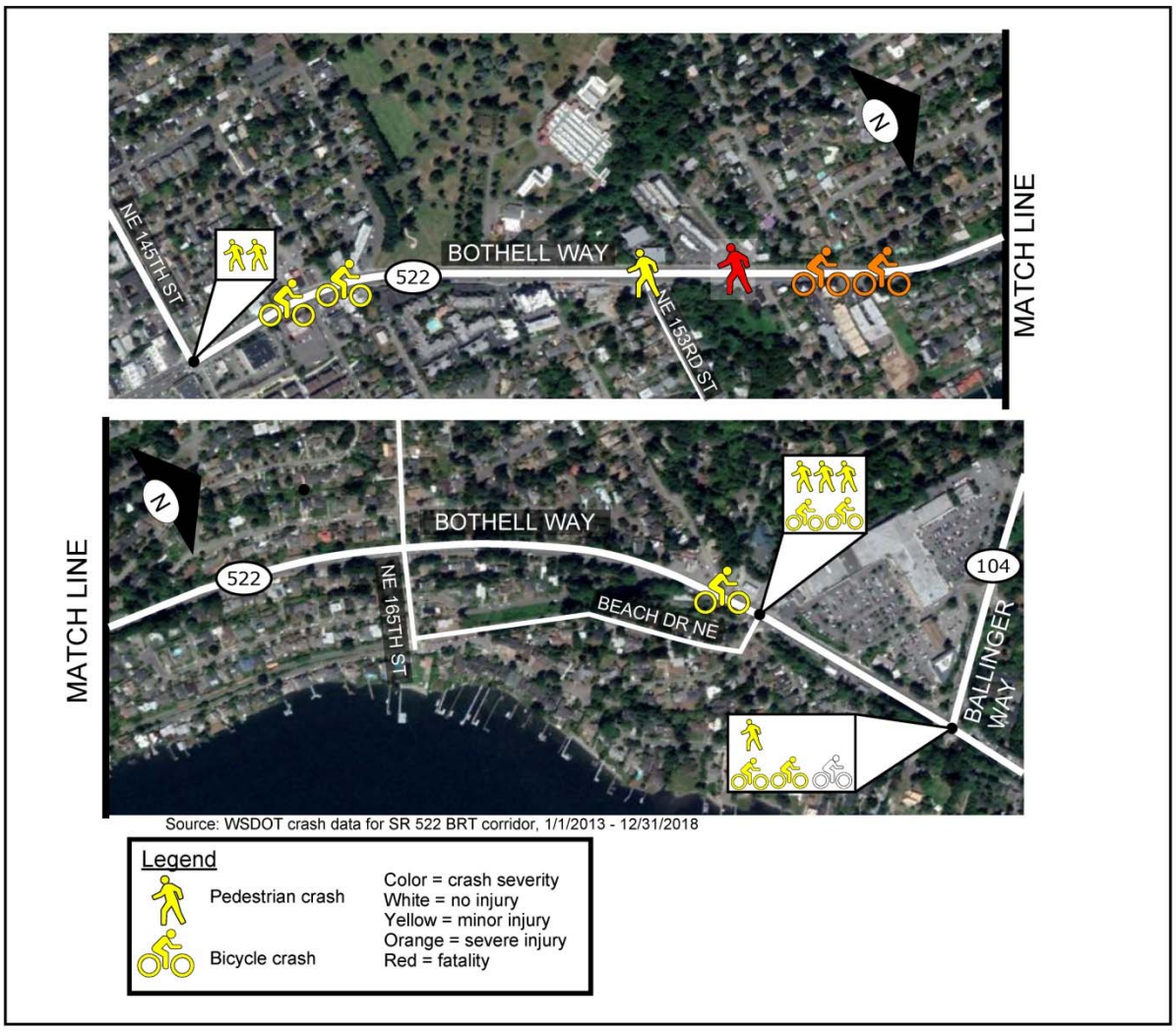

Figure 3-8 Lake Forest Park SR 522 pedestrian and bicycle crash data by location

3.2.5 Nonmotorized transportation

Sidewalks are limited along SR 522 north of NE 155th Street; there is a shoulder along the northbound lanes and no walkway or shoulder along the southbound lanes from 38th Avenue NE to the north. The ADA curb ramps do not meet current standards. There are sidewalks in the town center area and at the westbound platform on the north side of SR 522. There are no existing bicycle facilities. The Burke-Gilman Trail is located east of SR 522 and provides a parallel nonmotorized facility with access to SR 522.

3.3 Segment 3: Kenmore

The Kenmore segment of SR 522 is a principal arterial, and has two general-purpose lanes in each direction as well as BAT lanes in each direction. SR 522 is designated a highway of statewide significance (HSS). The posted speed limit is 40 mph. Land uses adjacent to SR 522 NE are primarily commercial, along with some industrial and multifamily residential. Turn lanes are provided for left turns and U-turns, and there is two-way left-turn lane from 61st Avenue NE to 83rd Avenue NE, except where the distance is too short for a two-way left-turn lane.

Intersection control on SR 522 in Kenmore is signalized at 61st Avenue NE, 68th Avenue NE, 73rd Avenue NE, 77th Court NE, 80th Avenue NE and 83rd Avenue NE.

The Kenmore Park-and-Ride lot is located on the north side of SR 522 just east of the 73rd Avenue NE intersection. Buses access the park-and-ride lot via SR 522 westbound and via NE 181st Street for buses headed eastbound on SR 522. For cars, park-and-ride access is from westbound SR 522, from a driveway on 73rd Avenue NE and from NE 181st Street.

3.3.1 Traffic operations

Figure 3-9 presents existing AM peak hour intersection LOS and delay, and **Figure 3-10** presents existing PM peak hour LOS and delay for study intersections in the Kenmore segment. The intersections operate at LOS D or better during the AM and PM peak hours, except for the intersection of SR 522 and 68th Avenue NE, which operates at LOS E during the PM peak hour due to the high volume of northbound left-turn traffic (approximately 600 vehicles per hour) in a dual left-turn lane with an exclusive left-turn signal phase.

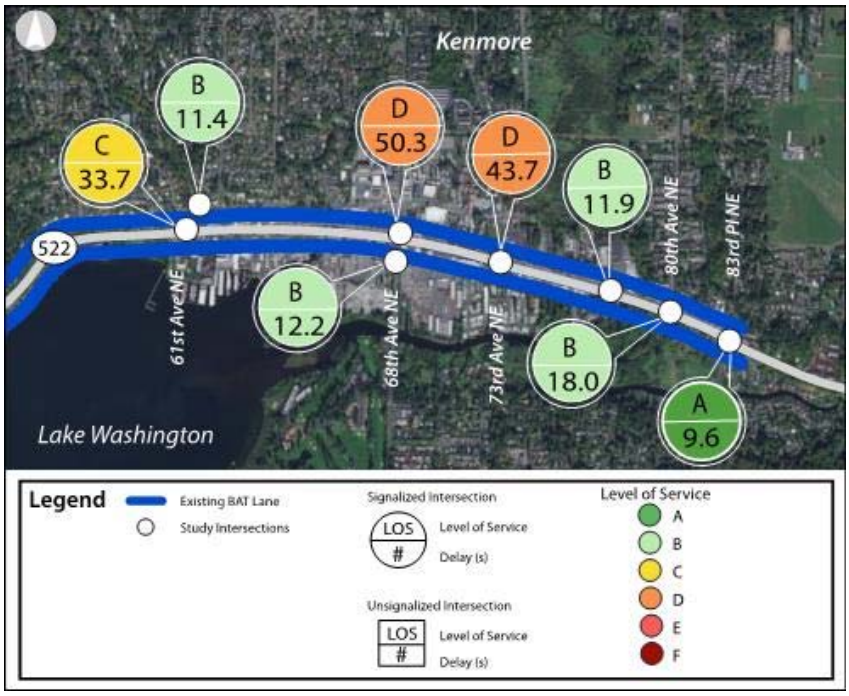

Figure 3-9 Kenmore SR 522 existing AM peak hour LOS and delay

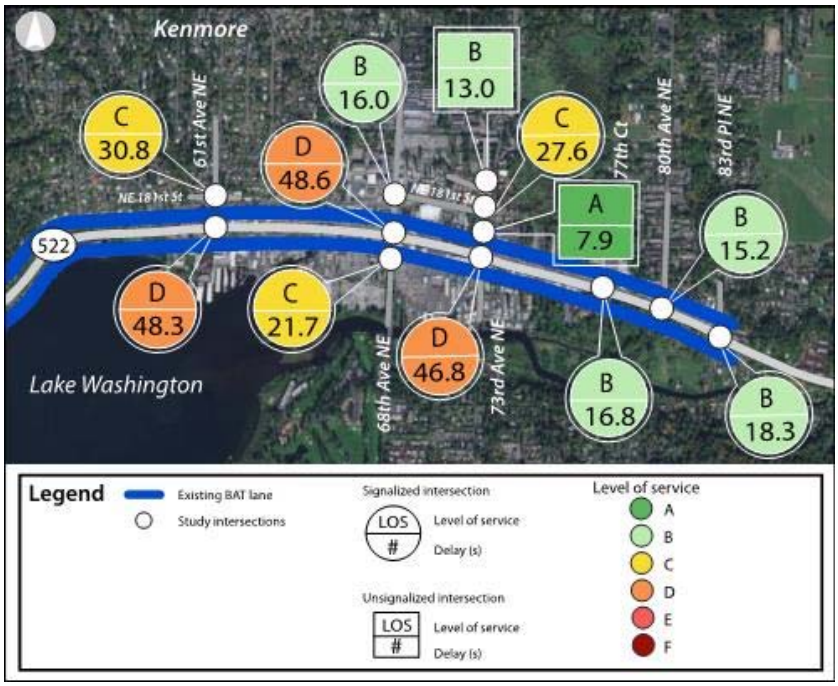

Figure 3-10 Kenmore SR 522 existing PM peak hour LOS and delay

3.3.2 Freight movement

WSDOT classifies SR 522 through this segment as a T-2 freight facility with 4,010,000 annual tonnage on the roadway and 3.9 percent trucks (WSDOT 2017).

3.3.3 Parking

The Metro surface park-and-ride lot is located northeast of SR 522 and 73rd Avenue NE, the location of the project's proposed park-and-ride garage. Metro owns 259 surface parking spaces and leases an additional 347 spaces. Park-and-ride spaces are typically 99 percent utilized (Metro 2017a). There is no on-street parking on SR 522 through this project segment.

3.3.4 Safety

There were a total of 646 crashes in the six years from 2013 to 2018 along SR 522/Bothell Way in the Kenmore segment, which represents 47 crashes per mile per year for Segment 3, about 60% that of Segment 1. The dominant crash types were a combination of rear-end/sideswipe crashes (61 percent) and a combination of right-angle/left-turn crashes (23 percent). The rear-end/sideswipe crashes reflect the highly congested traffic conditions in the corridor. The crashes contribute to the recurring congestion in the corridor. There were 9 crashes involving pedestrians and 12 crashes involving bicyclists. There were no fatal crashes in the Kenmore segment during this time period. **Figure 3-11** shows the location of pedestrian and bicycle crashes. **Table 3-6** presents a summary of the crashes in the Kenmore segment by type, and **Table 3-7** summarizes the severity of those crashes.

Table 3-6 2013–2018 Kenmore SR 522 crash type summary

Segment	Crash Type	Year						Total
		2013	2014	2015	2016	2017	2018	
Kenmore	Other	1	5	6	7	3	1	23
	Fixed Object	6	6	8	8	7	7	42
	Right Angle	13	15	12	12	11	4	67
	Sideswipe	16	16	14	29	13	16	104
	Head On	0	0	0	1	2	0	3
	Left Turn	7	19	16	13	16	12	83
	Rear End	47	55	62	36	50	39	289
	Right Turn	3	2	2	0	2	3	12
	Parked Vehicle	0	0	0	0	0	2	2
	Bicycle	4	2	2	2	1	1	12
	Pedestrian	1	2	2	2	0	2	9
Totals		**98**	**122**	**124**	**110**	**105**	**87**	**646**

Source: WSDOT
Note: Under 23 U.S. Code § 148 and 23 U.S. Code § 409, safety data, reports, surveys, schedules, lists compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential crash sites, hazardous roadway conditions, or railway-highway crossings are not subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

Table 3-7 2013–2018 Kenmore SR 522 crash severity summary

Segment	Crash Severity	Year						Total
		2013	2014	2015	2016	2017	2018	
Kenmore	Dead at Scene	0	0	0	0	0	0	0
	Died in Hospital	0	0	0	0	0	0	0
	No Apparent Injury	68	80	87	82	70	62	449
	Possible Injury	21	30	24	19	27	19	140
	Suspected Minor Injury	7	10	10	6	6	6	45
	Suspected Serious Injury	1	1	1	2	2	0	7
	Unknown	1	1	2	1	0	0	5
Totals		**98**	**122**	**124**	**110**	**105**	**87**	**646**

Figure 3-11 also shows the pedestrian and bicycle crashes by severity and volume. Pedestrian and bicycle icons in the figure indicate the location of pedestrian or bicycle crashes in the Kenmore segment, and the colors of the icons indicate the severity. Green indicates no injury; yellow indicates a minor injury crash; and orange indicates a serious injury crash. Topics of concern for pedestrian and bicycle safety near the proposed BRT stations are the arterial crossing locations and potential conflicts with turning vehicles. High volumes of pedestrians cross SR 522 at the 73rd Avenue NE signal to access the Kenmore Park-and-Ride lot.

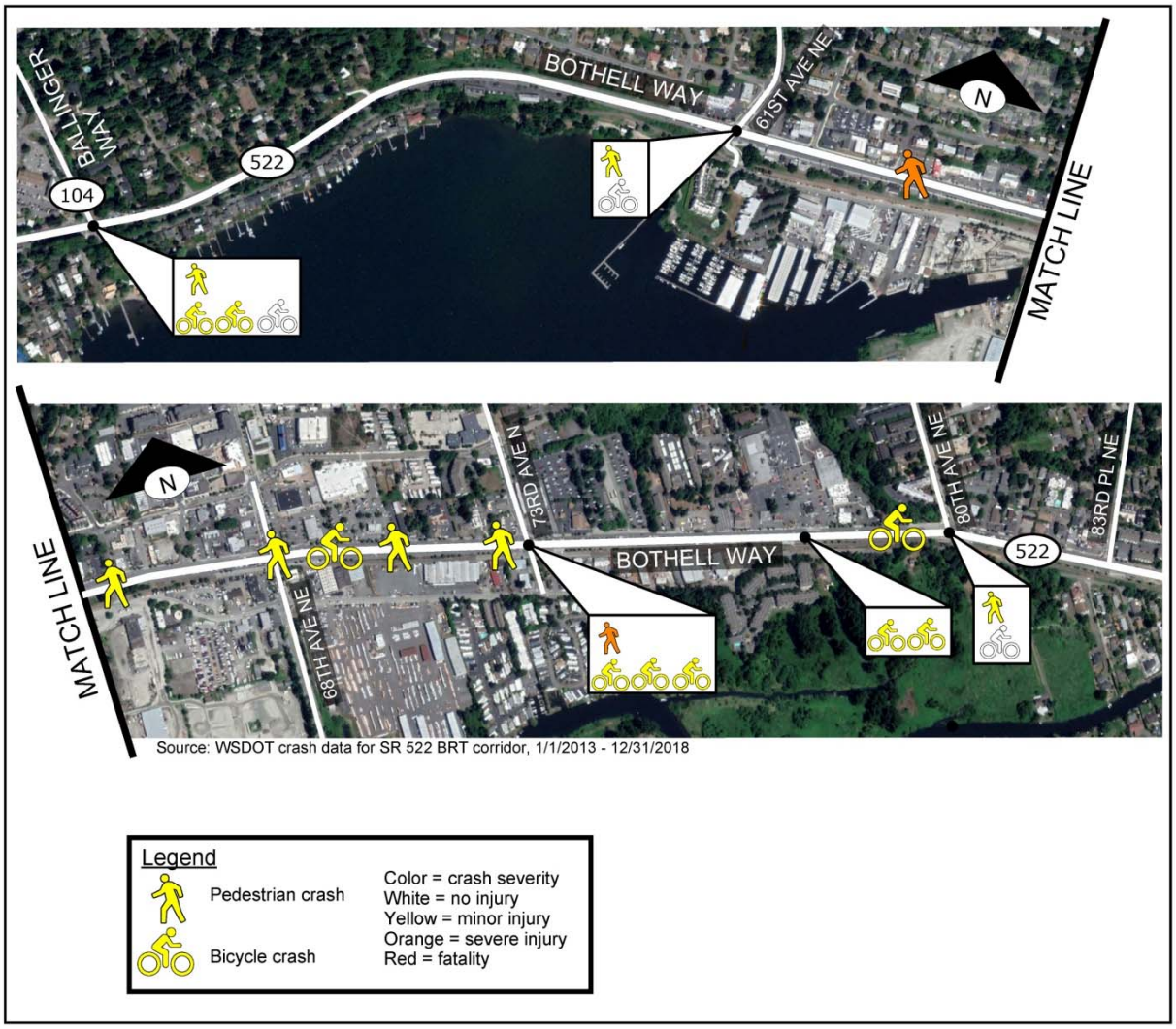

Figure 3-11 Kenmore SR 522 pedestrian and bicycle crash data by location

3.3.5 Nonmotorized transportation

SR 522 generally has continuous sidewalks in the Kenmore segment. There are signalized crossings at 61st Avenue NE, 68th Avenue NE, 73rd Avenue NE, 77th Court NE, 80th Avenue NE and 83rd Avenue NE. Eastbound bus riders returning to the Kenmore Park-and-Ride lot cross SR 522/Bothell Way at the 73rd Avenue NE signal. The Burke-Gilman Trail is located parallel to SR 522 on the south side and provides access to SR 522. There are no bike lanes on SR 522.

3.4 Segment 4: Bothell

The Bothell segment is located on SR 522 between 83rd Avenue NE and 98th Avenue NE, on 98th Avenue NE to NE 185th Street, on NE 185th Street to Beardslee Boulevard, and on Beardslee Boulevard to NE 195th Street.

SR 522 is a principal arterial and designated a highway of statewide significance (HSS). There are two general-purpose lanes in each direction, as well as turn lanes and two-way left-turn lanes in portions. There is an existing BAT lane westbound between approximately 96th Avenue NE and 91st Avenue NE, and an extension of the westbound BAT lane is under construction between 91st Avenue NE and 83rd Place NE. The eastbound BAT lane is under construction from 83rd Place NE to a location at approximately 93rd Avenue NE, and then to an existing BAT lane to just east of 96th Avenue NE. The BAT lanes are shown in **Figure 1-7**. The posted speed limit on SR 522 in Bothell is 35 mph.

North of SR 522, 98th Avenue NE is a two-lane major collector roadway, with sidewalks and on-street parking to the north of NE 183rd Street. NE 183rd Street is all-way stop controlled. The posted speed limit on 98th Avenue NE and on NE 185th Street is 25 mph.

NE 185th Street is a two-lane major collector roadway with sidewalks on both sides and on-street parking (two-hour time limit, Monday through Friday). There is signal control at the intersection of Bothell Way NE and NE 185th Street. Intersections on NE 185th Street are stop-controlled with all-way stop control at 101st Avenue NE, two-way stop control on 102nd Avenue NE and all-way stop control at 104th Avenue NE. NE 185th Street intersects Beardslee Boulevard at an offset intersection, where NE 185th Street has stop control. Beardslee Boulevard is a two- to four-lane minor arterial that extends from the 104th Avenue NE/Main Street intersection to the I-405 interchange at NE 195th Street. Beardslee Boulevard has sidewalks on both sides, on-street parking on one side and marked bike lanes on both sides. The North Creek Trail is adjacent to Beardslee Boulevard on the south side between 110th Avenue NE to NE 195th Street at the I-405 interchange.

Land uses adjacent to SR 522 are commercial and residential. Along Bothell city streets in downtown Bothell, land use is residential and commercial , and along Beardslee Boulevard, land use is the UW Bothell/Cascadia College campus, and residential and commercial.

3.4.1 Traffic operations

Figure 3-12 presents existing AM peak hour LOS and delay for study intersections in the Bothell segment, and **Figure 3-13** presents existing PM peak hour intersection LOS and delay. The intersections in the Bothell segment operate at LOS D or better in the AM and PM peak hours.

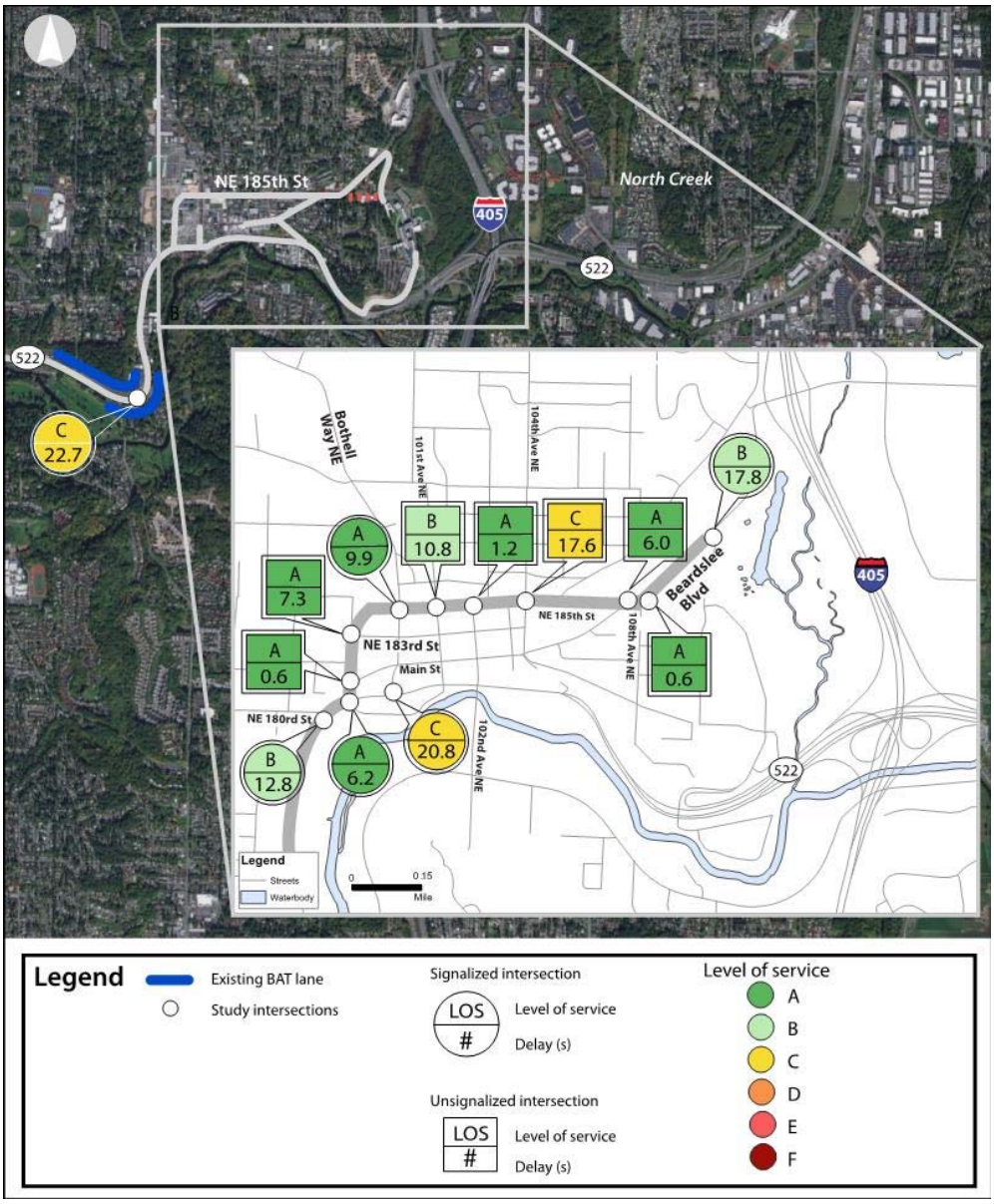

Figure 3-12 Bothell existing AM peak hour LOS and delay

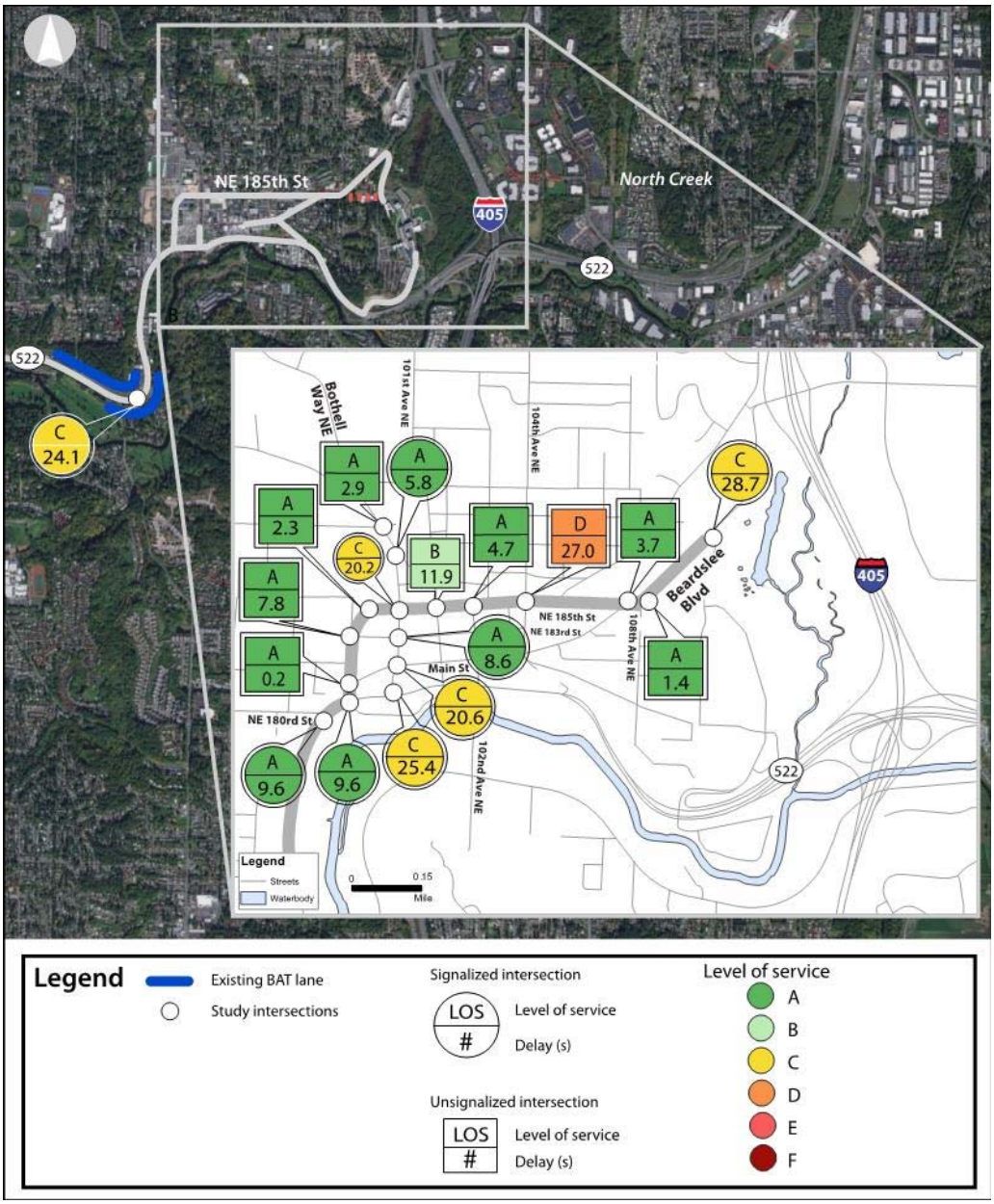

Figure 3-13 Bothell existing PM peak hour LOS and delay

3.4.2 Freight movement

WSDOT classifies SR 522 through this segment as a T-2 freight facility with 4,010,000 annual tonnage on the roadway and 3.9 percent trucks (WSDOT 2017). Principal arterials are intended to be the truck routes through Bothell (City of Bothell 2015). There are no City of Bothell truck route designations along the BRT route on Bothell city streets.

3.4.3 Parking

The Kaysner Way Metro surface park-and-ride lot is approximately 1,100 feet from the proposed BRT station on NE 185th Street at 104th Avenue NE. This park-and-ride lot has 220 spaces and is typically 97 percent full (Metro 2017a). There is no on-street parking along the SR 522 portion of this project segment. Bothell city streets along the BRT route with on-street parking are summarized in **Table 3-8**.

Table 3-8 Existing on-street parking inventory on BRT route in Bothell

Street	From	To	Side	Number spaces
98th Avenue NE	NE 183rd Street	Pop Keeney Way	East	6
NE 185th Street	Pop Keeney Way	Bothell Way NE	South	7
	Bothell Way NE	101st Avenue NE	South	7
	Bothell Way NE	101st Avenue NE	North	2
	101st Avenue NE	102nd Avenue NE	North	10
	102nd Avenue NE	103rd Avenue NE	South	4
	103rd Avenue NE	104th Avenue NE	South	8
	103rd Avenue NE	104th Avenue NE	North	4
	104th Avenue NE	Ross Road	South	8
Beardslee Boulevard	NE 185th Street	NE 195th Street	East	21

3.4.4 Safety

There were 386 crashes in the six years from 2013 to 2018 along the SR 522 BRT route through Bothell, which represents 22 crashes per mile per year for Segment 4, less than a third that of Segment 1. The dominant crash types were rear-end/sideswipe crashes (47 percent) and right-angle/left-turn crashes (29 percent). Right-angle crashes could indicate intersection-related or driveway-related crashes. The rear-end/sideswipe crashes reflect a high level of congestion in the segment. There were three crashes involving pedestrians and four crashes involving bicyclists. There were no fatal crashes in the Bothell segment in this six-year period. **Table 3-9** presents a summary of the crashes in the Bothell segment by type, and **Table 3-10** summarizes the severity of those crashes.

Table 3-9 2013–2018 Bothell SR 522 crash type summary

Segment	Crash Type	Year						Total
		2013	2014	2015	2016	2017	2018	
Bothell	Other	3	4	3	5	3	8	26
	Fixed Object	3	12	4	6	5	4	34
	Right Angle	9	15	16	18	15	9	82
	Sideswipe	7	4	8	5	9	5	38
	Head On	0	1	0	0	0	1	2
	Left Turn	5	5	6	4	7	4	31
	Rear End	24	21	31	23	20	23	142
	Right Turn	2	1	0	0	0	1	4
	Parked Vehicle	1	2	6	4	3	4	20
	Bicycle	0	0	1	1	1	1	4
	Pedestrian	1	2	0	0	0	0	3
Totals		**55**	**67**	**75**	**66**	**63**	**60**	**386**

Source: WSDOT
Note: Under 23 U.S. Code § 148 and 23 U.S. Code § 409, safety data, reports, surveys, schedules, lists compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential crash sites, hazardous roadway conditions, or railway-highway crossings are not subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

Table 3-10 2013–2018 Bothell SR 522 crash severity summary

Segment	Crash Type	Year						Total
		2013	2014	2015	2016	2017	2018	
Bothell	Dead at Scene	0	0	0	0	0	0	0
	Died in Hospital	0	0	0	0	0	0	0
	No Apparent Injury	42	52	54	49	50	42	289
	Possible Injury	10	10	14	10	9	11	64
	Suspected Minor Injury	3	2	6	7	3	5	26
	Suspected Serious Injury	0	1	1	0	1	1	4
	Unknown	0	2	0	0	0	1	3
Totals		**55**	**67**	**75**	**66**	**63**	**60**	**386**

Figure 3-14 shows the locations of pedestrian and bicycle crashes by severity and volume. Pedestrian and bicycle icons in the figure indicate the location of pedestrian or bicycle crashes in the Bothell segment, and the colors of the icons indicate the severity. Green indicates no injury; yellow indicates a minor injury crash; and orange indicates a serious injury crash. Topics of concern for pedestrian and bicycle safety in the Bothell segment are the potential conflicts with turning vehicles.

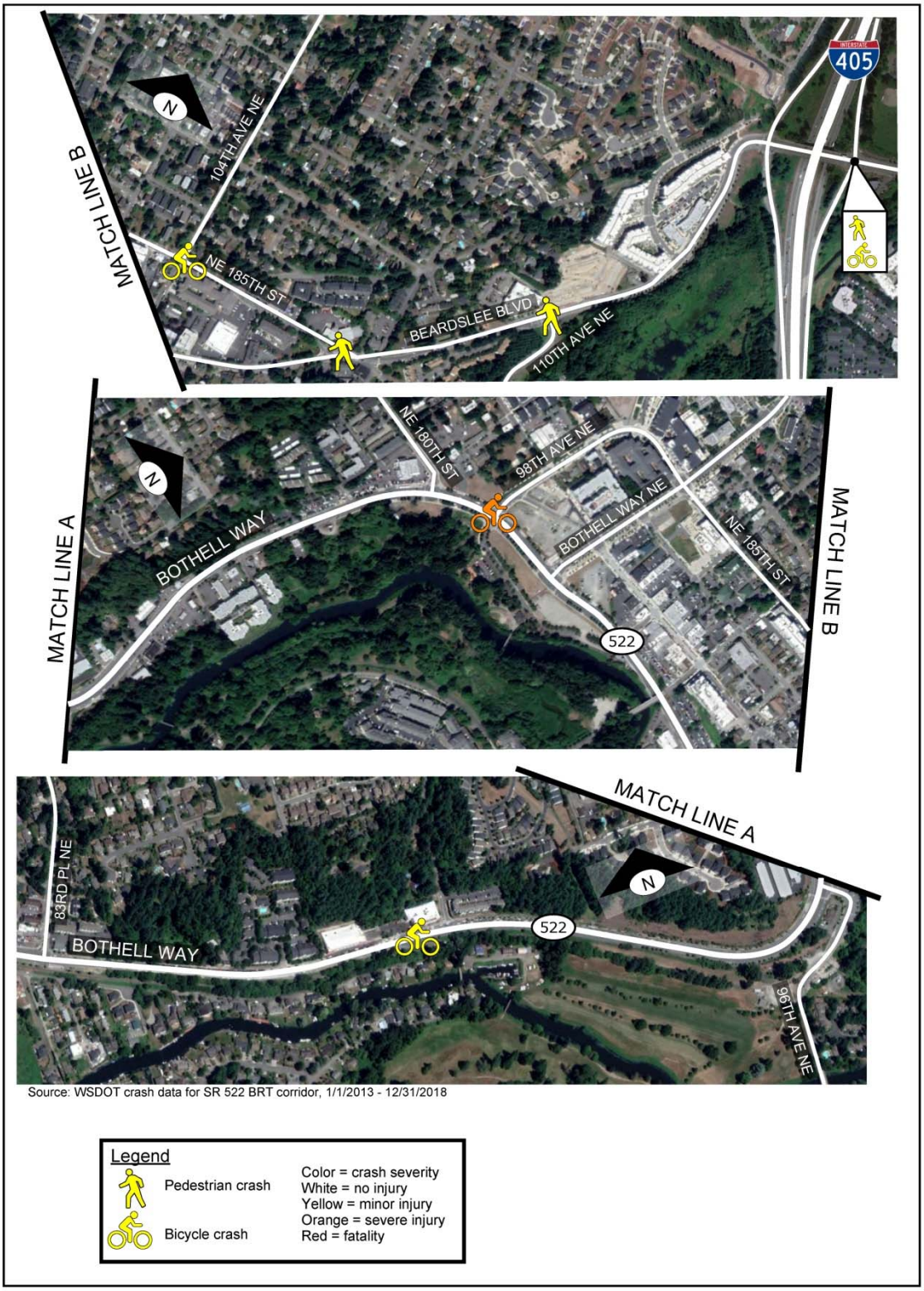

Figure 3-14 Bothell pedestrian and bicycle crash data by location

3.4.5 Nonmotorized transportation

There are missing stretches of sidewalk along SR 522 from east of 83rd Avenue NE to just west of the NE 180th Street intersection. Downtown Bothell has relatively new and continuous sidewalks. Sidewalks along Beardslee Boulevard are relatively new and in generally good condition. There are no existing bicycle facilities on SR 522/Bothell Way, because SR 522 does not have sufficient width to accommodate on-street bike lanes. In general, city arterials in downtown Bothell lack sufficient width to accommodate on-street bike lanes. There are bike lanes on Beardslee Boulevard. The Burke-Gilman Trail is located east of SR 522 and provides a parallel facility for nonmotorized use with access to SR 522. The Burke-Gilman Trail ends in Bothell and connects to the Sammamish River Trail which then continues on the south side of SR 522. The North Creek Trail extends from the Sammamish River Trail, across the east side of the UW Bothell/Cascadia College Campus to Beardslee Boulevard, is parallel to Beardslee Boulevard and crosses over I-405 to where it extends northward into Snohomish County.

3.5 Transit operations – all segments

SR 522 and NE 145th are currently served by three transit agencies: Sound Transit, Metro and Community Transit. On Bothell city streets where BRT service would operate, transit service is currently provided by Sound Transit Express (ST Express) routes, and Metro and Community Transit service.

Existing bus routes are shown in **Table 3-11**, **Table 3-12**, **Table 3-13** and **Table 3-14** for the four project segments. Bus routes are shown by stop locations along the proposed BRT project route as the basis for evaluation of future Build conditions.

Table 3-11 Segment 1: NE 145th Street existing transit stops and service

Stop Location	Transit Service[1]	Routes[2]
5th Avenue NE and I-5 (southbound, unsignalized)	Metro	304 Richmond Beach to Downtown Seattle 308 Horizon View to Downtown Seattle[3]
5th Avenue NE and NE 145th Street (northbound)	Metro	347 Mount Lake Terrace Transit Center to Northgate Transit Center 373 Aurora Village Transit Center to University District
6th Avenue NE (eastbound, unsignalized)	Metro	308 Horizon View to Downtown Seattle 347 Mount Lake Terrace Transit Center to Northgate Transit Center 373 Aurora Village Transit Center to University District
6th Avenue NE (westbound, unsignalized)	Metro	308 Horizon View to Downtown Seattle 347 Mount Lake Terrace Transit Center to Northgate Transit Center
12th Avenue NE (unsignalized)	Metro	308 Horizon View to Downtown Seattle 347 Mount Lake Terrace Transit Center to Northgate Transit Center
15th Avenue NE (eastbound)[4]	Metro	64 Jackson Park to First Hill (peak hour express) 65 Jackson Park to Lake City to University District 73 Jackson Park to University District 308 Horizon View to Downtown Seattle

Stop Location	Transit Service[1]	Routes[2]
15th Avenue NE (westbound)[4]	Metro	64 Jackson Park to First Hill (peak hour express) 308 Horizon View to Downtown Seattle 347 Mount Lake Terrace Transit Center to Northgate Transit Center 373 Aurora Village Transit Center to UW Station
20th Avenue NE (unsignalized)	Metro	64 Jackson Park to First Hill (peak hour express) 65 Jackson Park to Lake City to University District 73 Jackson Park to University District 308 Horizon View to Downtown Seattle
23rd Place NE (unsignalized)	Metro	64 Jackson Park to First Hill (peak hour express) 65 Jackson Park to Lake City to University District 308 Horizon View to Downtown Seattle
25th Avenue NE	Metro	64 Jackson Park to First Hill (peak hour express) 65 Jackson Park to Lake City to University District 308 Horizon View to Downtown Seattle 330 Shoreline Community College to Lake City Way (eastbound only)
27th Avenue NE (unsignalized)	Metro	64 Jackson Park to First Hill (peak hour express) 65 Jackson Park to Lake City to University District 308 Horizon View to Downtown Seattle 330 Shoreline Community College to Lake City Way
30th Avenue NE (eastbound)	Metro	308 Horizon View to Downtown Seattle 330 Shoreline Community College to Lake City Way
30th Avenue NE (westbound)	Metro	64 Jackson Park to First Hill (peak hour express) 65 Jackson Park to Lake City to University District 308 Horizon View to Downtown Seattle 330 Shoreline Community College to Lake City Way
NE 145th Street (westbound) at SR 522	Metro	308 Horizon View to Downtown Seattle 330 Shoreline Community College to Lake City Way

(1) King County Metro (Metro).

(2) Sources: King County Metro Bus Schedules and Maps, https://kingcounty.gov/depts/transportation/metro/schedules-maps.aspx, Google Earth (accessed November 2020).

(3) Route not operating since fall 2020 due to the pandemic.

(4) Eastbound/westbound directional difference occurs for routes that are primarily north-south and circulate on 5th Avenue NE/NE 14tth Street/Lake City Way.

Table 3-12 Segment 2: SR 522 Lake Forest Park existing transit stops and service

Stop Location	Transit Service[1]	Routes[2]
SR 522 (eastbound) north of NE 145th Street	Metro ST Express	308 Horizon View to Downtown Seattle[3] 309 Kenmore Park-and-Ride to First Hill 312 UW/Cascadia Campus to Downtown Seattle[3] 372 Bothell/Lake City to University District 522 Woodinville to Seattle
NE 153rd Street	Metro ST Express	308 Horizon View to Downtown Seattle 309 Kenmore Park-and-Ride to First Hill 312 UW/Cascadia Campus to Downtown Seattle 372 Bothell/Lake City to University District 522 Woodinville to Seattle
39th Avenue NE (southbound only, unsignalized)	Metro	308 Horizon View to Downtown Seattle 372 Bothell/Lake City to University District
NE 165th Street	Metro ST Express	308 Horizon View to Downtown Seattle 309 Kenmore Park-and-Ride to First Hill 312 UW/Cascadia Campus to Downtown Seattle 372 Bothell/Lake City to University District 522 Woodinville to Seattle
Lake Forest Park Town Center eastbound after 45th Avenue NE	Metro ST Express	308 Horizon View to Downtown Seattle 309 Kenmore Park-and-Ride to First Hill 312 UW/Cascadia Campus to Downtown Seattle 372 Bothell/Lake City to University District 522 Woodinville to Seattle
Lake Forest Park Town Center westbound after Ballinger Way NE	Metro	308 Horizon View to Downtown Seattle 309 Kenmore Park-and-Ride to First Hill 312 UW/Cascadia Campus to Downtown Seattle 372 Bothell/Lake City to University District
Lake Forest Park Town Center eastbound after Ballinger Way NE	Metro ST Express	309 Kenmore Park-and-Ride to First Hill 312 UW/Cascadia Campus to Downtown Seattle 372 Bothell/Lake City to University District 981 Lake Side School to Mercer Island Park-and-Ride 522 Woodinville to Seattle

(1) King County Metro (Metro), Sound Transit Express (ST Express).

(2) Sources: King County Metro Bus schedules and Maps, https://kingcounty.gov/depts/transportation/metro/schedules-maps.aspx, Sound Transit Routes and Schedules, https://www.soundtransit.org/schedules,Google Earth (accessed November 2020).

(3) Routes not operating since fall 2020 due to the pandemic.

Table 3-13 Segment 3: SR 522 Kenmore existing transit stops and service

Stop Location	Transit Service[1]	Routes[2]
61st Avenue NE	Metro ST Express	308 Horizon View to Downtown Seattle[3] 309 Kenmore Park-and-Ride to First Hill 312 UW/Cascadia Campus to Downtown Seattle[3] 331 Shoreline to Kenmore Park-and-Ride 342 Shoreline Park-and-Ride to Renton Transit Center 372 Bothell/Lake City to University District 522 Woodinville to Seattle
68th Avenue NE	Metro ST Express	244 Kenmore Park-and-Ride to Overlake Transit Center (eastbound only) 309 Kenmore Park-and-Ride to First Hill 312 UW/Cascadia Campus to Downtown Seattle 331 Shoreline to Kenmore Park-and-Ride 342 Shoreline Park-and-Ride to Renton Transit Center 372 Bothell/Lake City to University District 522 Woodinville to Seattle
Kenmore Park-and-Ride lot at 73rd Avenue NE (eastbound)	Metro ST Express	244 Kenmore Park-and-Ride to Overlake Transit Center 312 UW/Cascadia Campus to Downtown Seattle 342 Shoreline Park-and-Ride to Renton Transit Center 372 Bothell/Lake City to University District 522 Woodinville to Seattle
Kenmore Park-and-Ride lot at park-and-ride entrance (westbound)	Metro ST Express	234 Kenmore to Kirkland Transit Center to Bellevue Transit Center 244 Kenmore Park-and-Ride to Overlake Transit Center 309 Kenmore Park-and-Ride to First Hill 312 UW/Cascadia Campus to Downtown Seattle 331 Shoreline to Kenmore Park-and-Ride 342 Shoreline Park-and-Ride to Renton Transit Center 372 Bothell/Lake City to University District 522 Woodinville to Seattle
Kenmore Park-and-Ride lot (internal)	Metro	312 UW/Cascadia Campus to Downtown Seattle 331 Shoreline to Kenmore Park-and-Ride
77th Court NE	Metro	312 UW/Cascadia Campus to Downtown Seattle 342 Shoreline Park-and-Ride to Renton Transit Center 372 Bothell/Lake City to University District
80th Avenue NE	Metro ST Express	312 UW/Cascadia Campus to Downtown Seattle 342 Shoreline Park-and-Ride to Renton Transit Center 372 Bothell/Lake City to University District 522 Woodinville to Seattle

(1) King County Metro (Metro), Sound Transit Express (ST Express).

(2) Sources: King County Metro Bus schedules and Maps, https://kingcounty.gov/depts/transportation/metro/schedules-maps.aspx. Sound Transit Routes and Schedules, https://www.soundtransit.org/schedules,Google Earth (accessed November 2020).

(3) Routes not operating since fall 2020 due to the pandemic.

Table 3-14 Segment 4: SR 522 and Bothell city streets existing transit stops and service

Stop Location	Transit Service[1]	Routes[2]
SR 522/Bothell Way NE		
83rd Place NE	Metro	312 UW/Cascadia Campus to Downtown Seattle[3] 342 Shoreline Park-and-Ride to Renton Transit Center 372 Bothell/Lake City to University District
91st Avenue NE (westbound only) (unsignalized)	Metro	312 UW/Cascadia Campus to Downtown Seattle 342 Shoreline Park-and-Ride to Renton Transit Center 372 Bothell/Lake City to University District
96th Avenue NE	Metro	312 UW/Cascadia Campus to Downtown Seattle 342 Shoreline Park-and-Ride to Renton Transit Center 372 Bothell/Lake City to University District
NE 180th Street (westbound only)	Metro ST Express	230 Monte Villa Parkway to Downtown Kirkland Transit Center 312 UW/Cascadia Campus to Downtown Seattle 342 Shoreline Park-and-Ride to Renton Transit Center 372 Bothell/Lake City to University District 522 Woodinville to Seattle
98th Avenue NE		
South of 183rd Street	Metro	230 Monte Villa Parkway to Downtown Kirkland Transit Center
Local Access Road (eastbound, east of NE 183rd Street)	Metro ST Express	312 UW/Cascadia Campus to Downtown Seattle 372 Bothell/Lake City to University District 522 Woodinville to Seattle
Main Street (east of 98th Avenue NE)	Metro ST Express	312 UW/Cascadia Campus to Downtown Seattle 372 Bothell/Lake City to University District 522 Woodinville to Seattle (eastbound)
NE 185th Street		
101st Avenue NE	Metro Community Transit	230 Monte Villa Parkway to Downtown Kirkland Transit Center 238 Woodinville P&R, UW/CCC Campus to Totem Lake TC to Kirkland TC 105 Hardeson Road to Bothell
103rd Avenue NE (westbound only)	Metro Community Transit	230 Monte Villa Parkway to Downtown Kirkland Transit Center 238 Woodinville P&R, UW/CCC Campus to Totem Lake TC to Kirkland TC 105 Hardeson Road to Bothell
104th Avenue NE	Metro Community Transit	230 Monte Villa Parkway to Downtown Kirkland Transit Center 238 Woodinville P&R, UW/CCC Campus to Totem Lake TC to Kirkland TC 105 Hardeson Road to Bothell

Stop Location	Transit Service[1]	Routes[2]
Beardslee Boulevard	Metro Community Transit	230 Monte Villa Parkway to Downtown Kirkland Transit Center 312 UW/Cascadia Campus to Downtown Seattle 372 Bothell/Lake City to University District 105 Hardeson Road to Bothell (eastbound)
Beardslee Boulevard		
110th Avenue NE/UW Bothell/Cascadia College (eastbound)	Metro	312 UW/Cascadia Campus to Downtown Seattle 372 Bothell/Lake City to University District 238 Woodinville P&R, UW/CCC Campus to Totem Lake TC to Kirkland TC
NE 195th Street southbound)	Metro CT	372 Bothell/Lake City to University District 522 Woodinville to Seattle 535 Lynnwood to Bellevue 931 UW/Cascadia College to Redmond Transit Center CT 106 Bothell to Mariner Park-and-Ride
NE 195th Street/I-405 southbound on-ramp	ST Express	522 Woodinville to Seattle

(1) King County Metro (Metro), Sound Transit Express (ST Express), Community Transit (CT).

(2) Sources: King County Metro Bus schedules and Maps, https://kingcounty.gov/depts/transportation/metro/schedules-maps.aspx, Sound Transit Routes and Schedules, https://www.soundtransit.org/schedules, Community Transit routes and schedules, https://www.communitytransit.org/busservice/schedules, Google Earth (accessed November 2020).

(3) Route not operating since fall 2020 due to the pandemic.

4 FUTURE NO-BUILD CONDITIONS

Future No-Build conditions were evaluated with programmed and reasonably foreseeable roadway and intersection improvements that would occur without the SR 522/NE 145th Street BRT project, to establish baseline conditions for 2042. These assumed improvements are listed as part of the future No-Build conditions and described by segment in the following sections.

Future No-Build 2042 traffic forecasts were developed using the PSRC 4k trip-based travel demand model. The PSRC 4k trip-based travel demand model reflects the PSRC's adopted Regional Transportation Plan. Base year and future year PSRC model outputs were used to develop Future No-Build traffic volumes relative to existing traffic data. Adjustments to the Future No-Build traffic volumes were prepared for Segment 1 and for Bothell, based on the City of Shoreline and City of Bothell requests to use revised land use data.

Truck traffic volumes would be expected to increase in proportion to increasing traffic volumes. There are no changes in land use in the cities' comprehensive plans that would cause changes in truck traffic volumes.

Corridor safety concerns would be expected to remain approximately the same as existing, with some minor changes in crashes in proportion to the changes in traffic volumes.

Future No-Build transit, without BRT in place, would include the continuation of existing ST Express service, using the existing bus stops. Metro service would include an increase in service based on the *METRO CONNECTS, Long-Range Plan* (Metro 2017b), and Metro would be expected to continue using the same bus stops as today.

4.1 Segment 1: Seattle/Shoreline

The Sound Transit Lynnwood Link Extension project will construct improvements along 5th Avenue NE as part of the South Shoreline/148th Link station. These improvements are near term as the project is currently under construction and include:

- Signal at 5th Avenue NE and 148th Street NE
- Signal at 5th Avenue NE and the I-5 northbound on-ramp
- A westbound right-turn pocket and a westbound right overlap signal phase at the intersection of NE 145th Street and 5th Avenue NE

The 2042 Future No-Build condition includes a planned two-lane roundabout at NE 145th Street and 5th Avenue NE, proposed by the City of Shoreline, to improve traffic flow at the intersection. The City of Shoreline, City of Seattle, WSDOT, Metro and Sound Transit are partnering to secure funding for, design and construct the planned roundabout.

4.1.1 Traffic operations

Along the NE 145th Street corridor, adjustments to the PSRC traffic forecast data were made to accommodate additional growth projected by zoning changes in the city of Shoreline as part of the *145th Street Station Subarea Plan,* (City of Shoreline 2016b). The methodology was jointly approved by PSRC, the City of Shoreline, SDOT and WSDOT.

Traffic operations for NE 145th Street were analyzed in Vissim to evaluate corridor performance for transit operations. Vissim is a conservative tool for analyzing roundabout operations compared to the WSDOT standard tool, SIDRA. The Traffic Forecasting and Simulation Modeling Methods and Assumptions Technical Memorandum (Attachment A), which was shared with jurisdictions for review, identified this Vissim tool for application on NE 145th Street. Error! Reference source not found. presents Future No-Build AM peak hour intersection LOS and delay, and **Figure 4-2** presents Future No-Build PM peak hour intersection LOS and delay along NE 145th Street.

Traffic operations along NE 145th Street are dominated by the heavy westbound traffic during the AM peak hour that is traveling to southbound I-5. The Future No-Build condition, with the roundabout, would improve flow and reduce delay at some intersections, because the westbound delay through the interchange would be reduced and there would no longer be queues influencing intersections to the east on NE 145th Street. During the AM peak hour, the roundabout intersection at NE 145th Street and 5th Avenue NE would operate at LOS F in the Future No-Build condition, but with a reduction in delay of approximately 49 seconds per vehicle compared to existing conditions. The intersection of NE 145th Street and SR 522 would operate at LOS E for the Future No-Build and LOS F for the existing condition with a decrease in delay of approximately 89 seconds per vehicle compared to existing conditions. All other intersections would operate at LOS D or better during the AM peak hour in the Future No-Build condition.

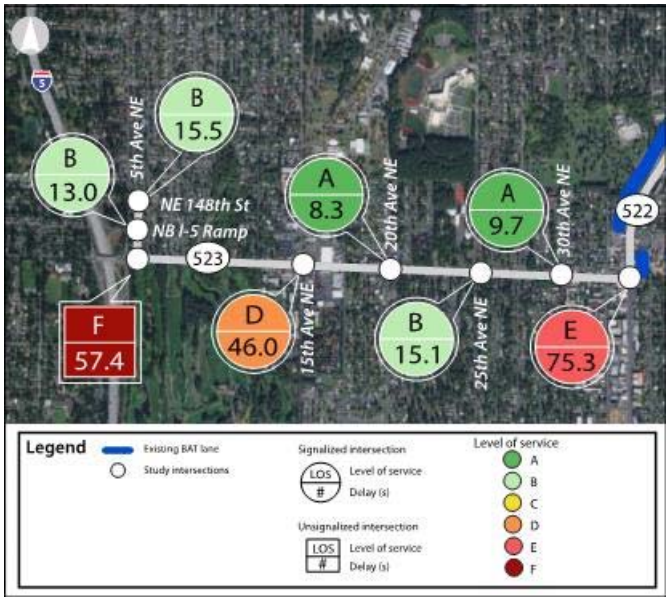

Figure 4-1 NE 145th Street 2042 No-Build AM peak hour LOS and delay

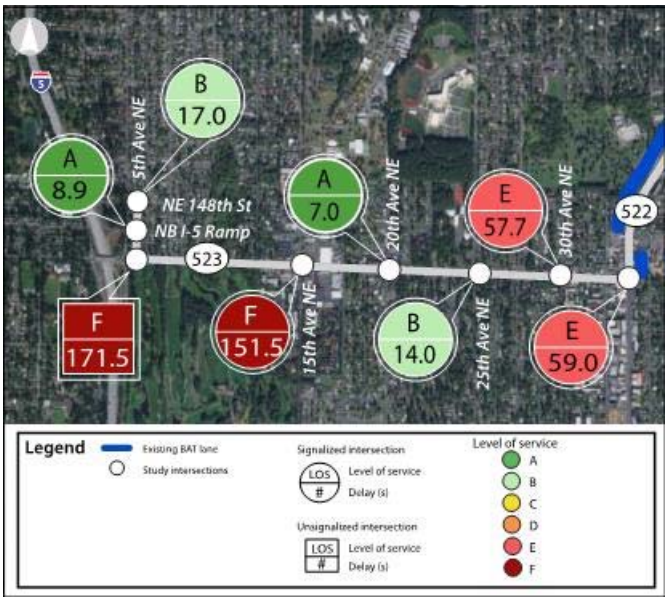

Figure 4-2 NE 145th Street 2042 No-Build PM peak hour LOS and delay

During the PM peak hour, the roundabout intersection of NE 145th Street and 5th Avenue NE would operate at LOS F in the existing and Future No-Build condition with an increased in delay of approximately 83.5 seconds of delay. Vissim is a conservative tool for analyzing roundabout operations that was utilized to evaluate corridor-wide transit operations; it shows minimal project impact at this intersection. The City of Shoreline has conducted its own analysis of this intersection through the WSDOT process, utilizing the roundabout tool Sidra, to further its design project.

During the PM peak hour the intersection of NE 145th Street and 15th Avenue NE is estimated to operate at LOS F in the Future No-Build condition. The intersections of NE 145th Street and 30th Avenue NE and NE 145th Street and SR 522 are estimated to operate at LOS E in the Future No-Build condition. The other intersections are estimated to operate at LOS B or better during the PM peak hour in the future No-Build condition.

The Future No-Build improvement in LOS at NE 145th Street and 30th Avenue NE and NE 145th Street and SR 522, compared to existing conditions, result from the planned roundabout at NE 145th Street and 5th Avenue NE. Without the roundabout, westbound queues from the I-5 interchange at NE 145th Street, spill over between intersections between 5th Avenue NE and SR 522. These queues are reduced with the roundabout.

4.1.2 Freight movement

Under the Future No-Build conditions, the AM peak period and PM peak period congested conditions would extend for a longer period of time than existing conditions. The result would be a degradation in truck travel time and reliability for more hours of the day.

4.1.3 Parking

There is no existing on-street parking in this project segment, and the Future No-Build conditions would remain the same as existing conditions.

4.1.4 Safety

For the Future No-Build conditions in this segment, the crash data would be expected to stay the same or increase as traffic volumes and congestion increase.

4.1.5 Nonmotorized transportation

The City of Seattle *Pedestrian Master Plan* (City of Seattle 2017) guides programs such as Safe Routes to School, Vision Zero, SDOT capital improvement and maintenance projects, and public education and outreach programs. The *Pedestrian Master Plan* identifies NE 145th Street as a high-priority area for pedestrian safety investments.

The City of Seattle *Bicycle Master Plan* (City of Seattle 2014) identifies the area immediately south of NE 145th Street and east of I-5 as having a low level of bicycle service, and recommends investment in several protected bike lanes and neighborhood greenways throughout this area.

The *130th and 145th Street Light Rail Stations: Multimodal Access Plan*, Draft (City of Seattle 2020) shows proposed projects on the south side of NE 145th Street between I-5 and SR 522, and priority locations for crossing improvements in coordination with proposed BRT station locations.

The *Shoreline Transportation Master Plan* (City of Shoreline 2011) includes a Bike Plan and a Pedestrian Plan, which provide an inventory of existing bicycle and pedestrian facilities. The plans recommend installation of bicycle and pedestrian facilities in strategic locations, and demonstrates how they would create connectivity with the existing and planned networks within the city and with planned and existing networks in the five cities with which it shares borders: Seattle, Lake Forest Park, Mountain Terrace, Edmonds and Woodway. The plan recommends installing designated bike lanes along 5th Avenue NE and 25th Avenue NE, which would provide direct connections to the Shoreline South/148th Link light rail station and to the BRT on NE 145th Street. The Pedestrian Plan identifies existing sidewalks that connect all of the Shoreline/Seattle station and parking locations to the rest of the regional pedestrian network.

The *145th Street Multimodal Corridor Study* (City of Shoreline 2016a) describes the city's vision for NE 145th Street. The study shows a preferred design concept for NE 145th Street between I-5 and SR 522 that includes two 11-foot travel lanes in each direction, one 12-foot bus lane in each direction, a 5-foot planted buffer and 8-foot sidewalks in each direction. Appendix G, Off Corridor Bike Network, of the study shows the bicycle network north of NE 145th Street.

There are no programmed improvement projects for sidewalk improvements or ADA curb ramp upgrades specific to NE 145th Street. NE 145th Street and other key intersecting arterials lack sufficient width to accommodate on-street bike lanes. There are no plans for bicycle facilities for NE 145th Street.

4.2 Segment 2: Lake Forest Park

No roadway projects are programmed for SR 522 in the Lake Forest Park segment.

4.2.1 Traffic operations

Figure 4-3 presents Future No-Build AM peak hour intersection LOS and delay, and **Figure 4-4** presents Future No-Build PM peak hour intersection LOS and delay for SR 522 intersections in the Lake Forest Park segment. Traffic forecasts show relatively lower growth along SR 522 that would result in small increases in intersection delay. Intersection LOS would remain the same as existing conditions for the Future No-Build conditions for both the AM and PM peak hours.

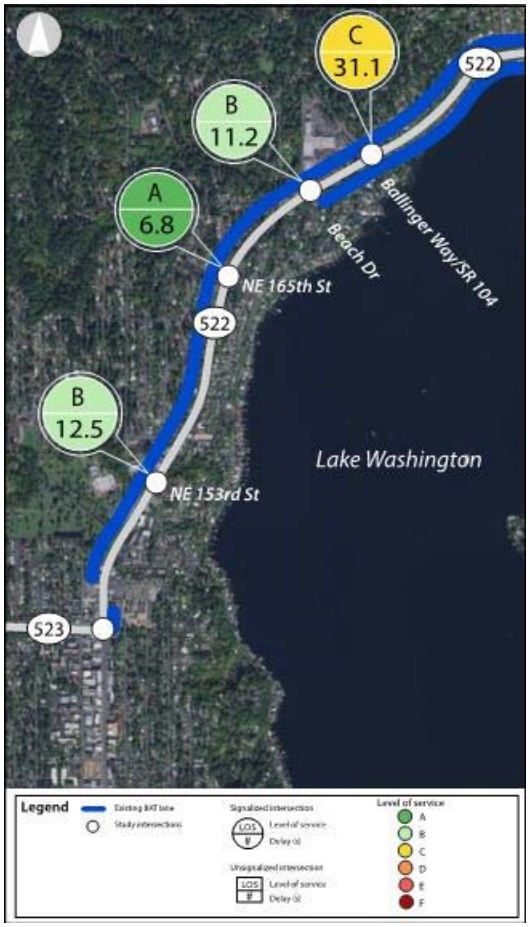

Figure 4-3 Lake Forest Park 2042 No-Build AM peak hour LOS and delay

Figure 4-4 Lake Forest Park 2042 No-Build PM peak hour LOS and delay

4.2.2 Freight movement

Under the future No-Build conditions, the AM and PM peak period congested conditions would extend for a longer period of time than existing conditions. The result would be a degradation in truck travel time and reliability for more hours of the day.

4.2.3 Parking

There is no existing on-street parking in this project segment, and Future No-Build conditions would remain the same as existing conditions. Changes to future No-Build parking conditions for off-street parking could result from future changes in land use and development.

4.2.4 Safety

For the Future No-Build conditions in this segment, the crash data would be expected to stay the same or increase as traffic volumes and congestion increase.

4.2.5 Nonmotorized transportation

Lake Forest Park's *Safe Streets Plan* (City of Lake Forest Park 2017) identifies recommended projects to enhance safety of pedestrians and cyclists traveling on the city's local street network and prioritizes them. The plan's goals include improving nonmotorized connections to transit service and reducing conflicts between bicycles, pedestrians and motorists.

Lake Forest Park's *Safe Highways Plan* (City of Lake Forest Park 2018) recommends projects that would enhance safety for nonmotorized users on SR 522 and SR 104. The plan identifies a sidewalk gap along SR 522, between 38th Avenue NE and the Lake Forest Park Town Center. The plan notes that nonmotorized traffic may use the Burke-Gilman Trail parallel to the corridor, but access to the corridor from the trail is limited due in part to the spacing of signalized intersections. The plan recommends improving several intersections and bicycle and pedestrian crossing locations along the SR 522 to provide safety upgrades for nonmotorized access to BRT stations. There are no bicycle facility plans for SR 522.

4.3 Segment 3: Kenmore

The Future No-Build conditions include the City of Kenmore SR 522 West Segment B Improvements (57th to 61st Avenues) project, which is funded for design and permitting in 2019–2020 and completion by 2025–2026, and has Connecting Washington State grant funding. The project has an approved channelization plan, and the components include:

- widened BAT and vehicle travel lanes
- an additional eastbound-to-northbound left-turn lane at the intersection of 61st Avenue NE and SR 522
- eastbound-to-westbound U-turn capability
- street illumination, access management, retaining walls, center median, sidewalks, drainage improvements and landscaping

The current channelization plan at 61st Avenue NE shows widening that moves the north-side curb line farther north.

4.3.1 Traffic operations

Figure 4-5 presents Future No-Build AM peak hour intersection LOS and delay, and **Figure 4-6** presents future No-Build PM peak hour intersection LOS and delay for the Kenmore segment. During the AM peak hour, the delay would increase slightly at all intersections, with a change to LOS E, resulting from approximately 5.4 additional seconds of delay, at 68th Avenue NE and SR 522. During the PM peak hour, the delay would increase slightly at all intersections with a slight decrease in delay of approximately 4.1 seconds per vehicle at 61st Avenue NE due to the eastbound dual left-turn lanes providing more capacity for left-turning vehicles. The intersection of 68th Avenue NE would operate at LOS E during the PM peak hour. PM peak hour operation at 83rd Avenue NE would degrade to LOS D due to increased corridor traffic volume and no coordination for westbound traffic with the upstream intersection at 96th Avenue NE.

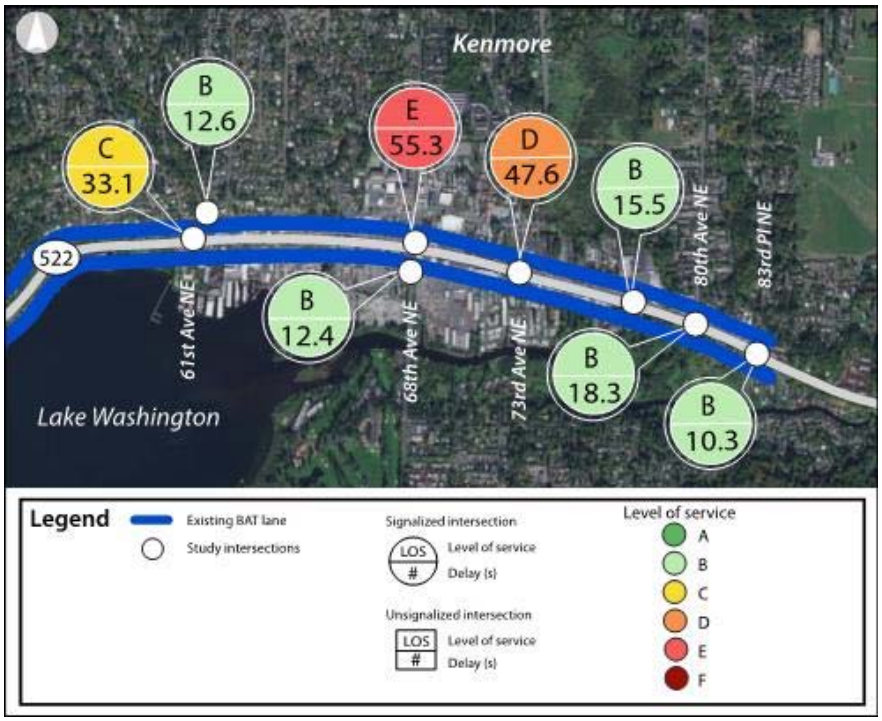

Figure 4-5 Kenmore 2042 No-Build AM peak hour LOS and delay

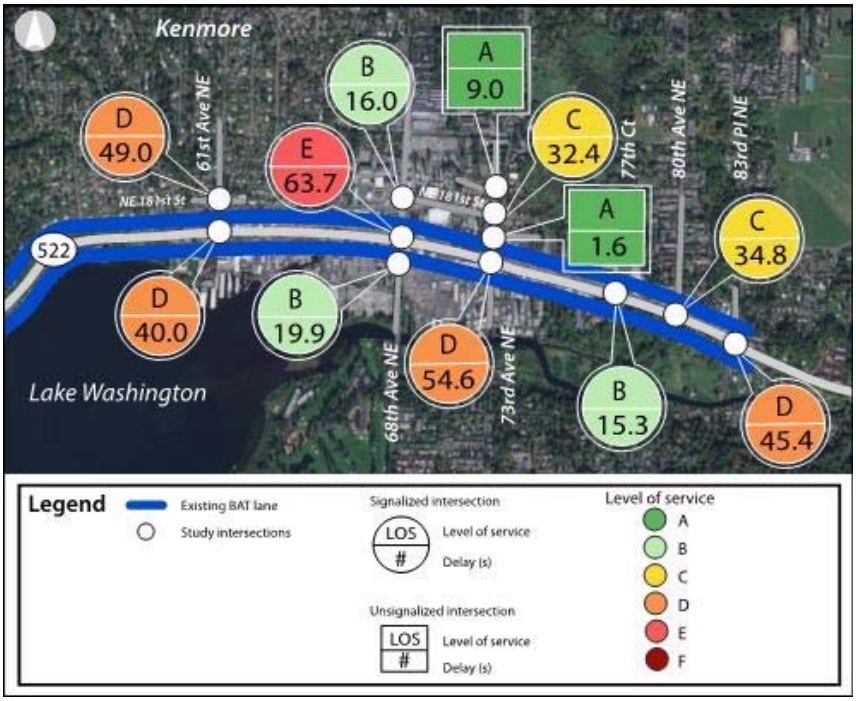

Figure 4-6 Kenmore 2042 No-Build PM peak hour LOS and delay

4.3.2 Freight movement

Under the future No-Build conditions, the AM and PM peak period congested conditions would extend for a longer period of time than existing conditions. The result would be a degradation in truck travel time and reliability for more hours of the day.

4.3.3 Parking

There is no existing on-street parking along SR 522 in this project segment. ST Express service would remain at approximately the same service levels and would not result in increased parking demand at the Kenmore Park-and-Ride lot.

4.3.4 Safety

Similar to other segments, for the Future No-Build conditions in this segment, the crash data would be expected to stay the same or increase with increasing traffic volumes.

4.3.5 Nonmotorized transportation

The transportation element of the *Kenmore Comprehensive Plan* (City of Kenmore 2015) identifies priority bicycle and pedestrian networks that include the areas at BRT stations and the Kenmore Park-and-Ride lot. The plan includes a list of recommended projects for safety upgrades for nonmotorized travel around the stations. There are no plans for bicycle facilities on SR 522 given that the Burke-Gilman Trail is adjacent to SR 522.

4.4 Segment 4: Bothell

The Future No-Build conditions in the Bothell segment include the three projects described below.

- As shown in **Figure 1-7**, SR 522/Bothell Way BAT lanes in each direction are currently under construction from 83rd Avenue NE to 96th Avenue NE (Wayne Curve).
- The Main Street extension project is under construction to complete the two-lane minor arterial between Bothell Way NE and 98th Avenue NE. A northbound right-turn pocket on 98th Avenue NE at Main Street is included with this project. The intersection will be implemented with stop control on Main Street.
- NE 185th St improvements are identified in the *City of Bothell Transportation Improvement Plan, 2020–2025* as; reconstruction including widening, drainage, sidewalks, curb and gutter, urban elements, and intersection improvements. The Bothell Comprehensive plan identifies NE 185th Street as a Transit Priority Corridor (Bothell 2015).

The Beardslee Boulevard widening project is identified in the *City of Bothell Transportation Improvement Plan, 2020–2025*, and will add an eastbound lane between 110th Avenue NE/UW Bothell campus and I-405. The intersection of Beardslee Boulevard and NE 185th Street is identified as a signalized intersection or roundabout. The *City of Bothell Comprehensive Plan* shows additional Beardslee Boulevard widening between NE 185th Street and 110th Avenue NE. Implementation would occur with adjacent development.The 2042 Future No-Build condition also includes a traffic signal at the intersection of 98th Avenue NE and Main Street

due to the high level of traffic in 2042 and level of delay for side street traffic. As an unsignalized intersection 98th Avenue NE and Main Street would operate at LOS F with approximately 181 seconds of delay during the PM peak hour by 2042. The LOS F threshold for unsignalized intersections is greater than 50 seconds of delay, meaning LOS F would occur before 2042. Future implementation of the traffic signal would be determined by the City of Bothell with an analysis of the *Manual of Uniform Traffic Control Devices* (FHWA 2009) traffic signal warrants.

4.4.1 Traffic operations

At the request of the City of Bothell, the Future No-Build 2042 PM peak hour traffic volumes for Bothell intersections were increased relative to the PSRC traffic forecasts, using PM peak hour future traffic volumes from the City of Bothell (City of Bothell 2008). The increase reflects a worst-case (i.e., more conservative) scenario. The City of Bothell did not request adjustments to the AM peak hour volumes, because the AM peak hour is not the worst-case scenario. **Figure 4-7** presents the resulting Future No-Build AM peak hour intersection LOS and delay, and **Figure 4-8** presents Future No-Build PM peak hour intersection LOS and delay for the Bothell segment. The PM peak hour analysis includes additional study intersections for traffic analysis of the proposed park-and-ride garage.

In Bothell, there would be some degradation in intersection operations from the existing conditions to Future No-Build conditions due to traffic growth. No-Build 2042 AM intersection operation would be LOS C or better at study area intersections.

Future No-Build 2042 PM intersection operation would be LOS E or F at the following signalized intersections:

- SR 522/Woodinville Drive and Bothell Way NE
- NE 185th Street and Bothell Way NE
- Bothell Way NE and Main Street

With traffic growth, the unsignalized intersections would experience more delays and a lower LOS. Future No-Build 2042 PM intersection operation would be LOS F at the following unsignalized intersections:

- NE 185th Street and 101st Avenue NE (all-way stop control)
- NE 185th Street and 104th Avenue NE (all-way stop control)
- NE 188th Street and Bothell Way NE (two-way stop control)

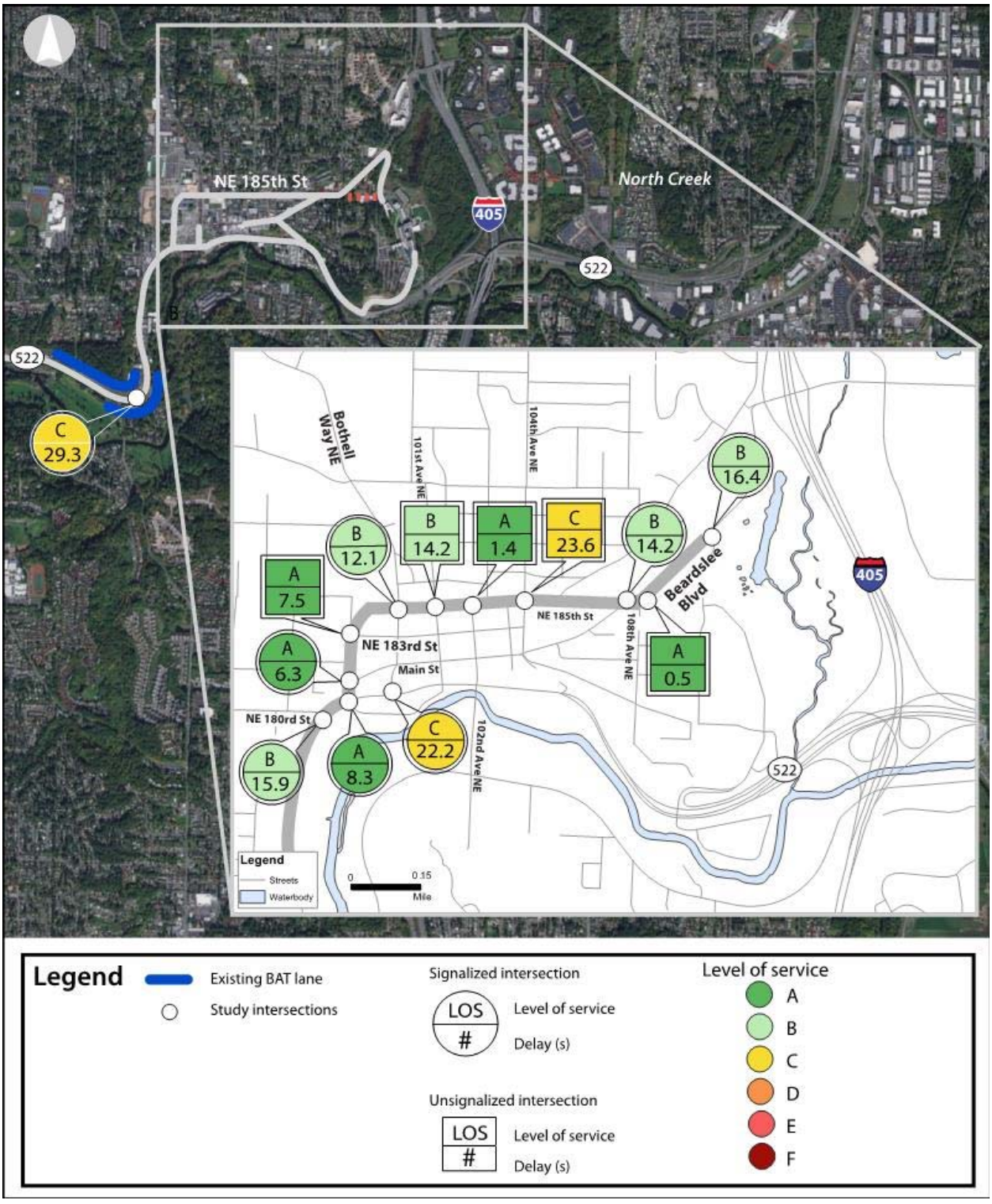

Figure 4-7 Bothell 2042 No-Build AM peak hour LOS and delay

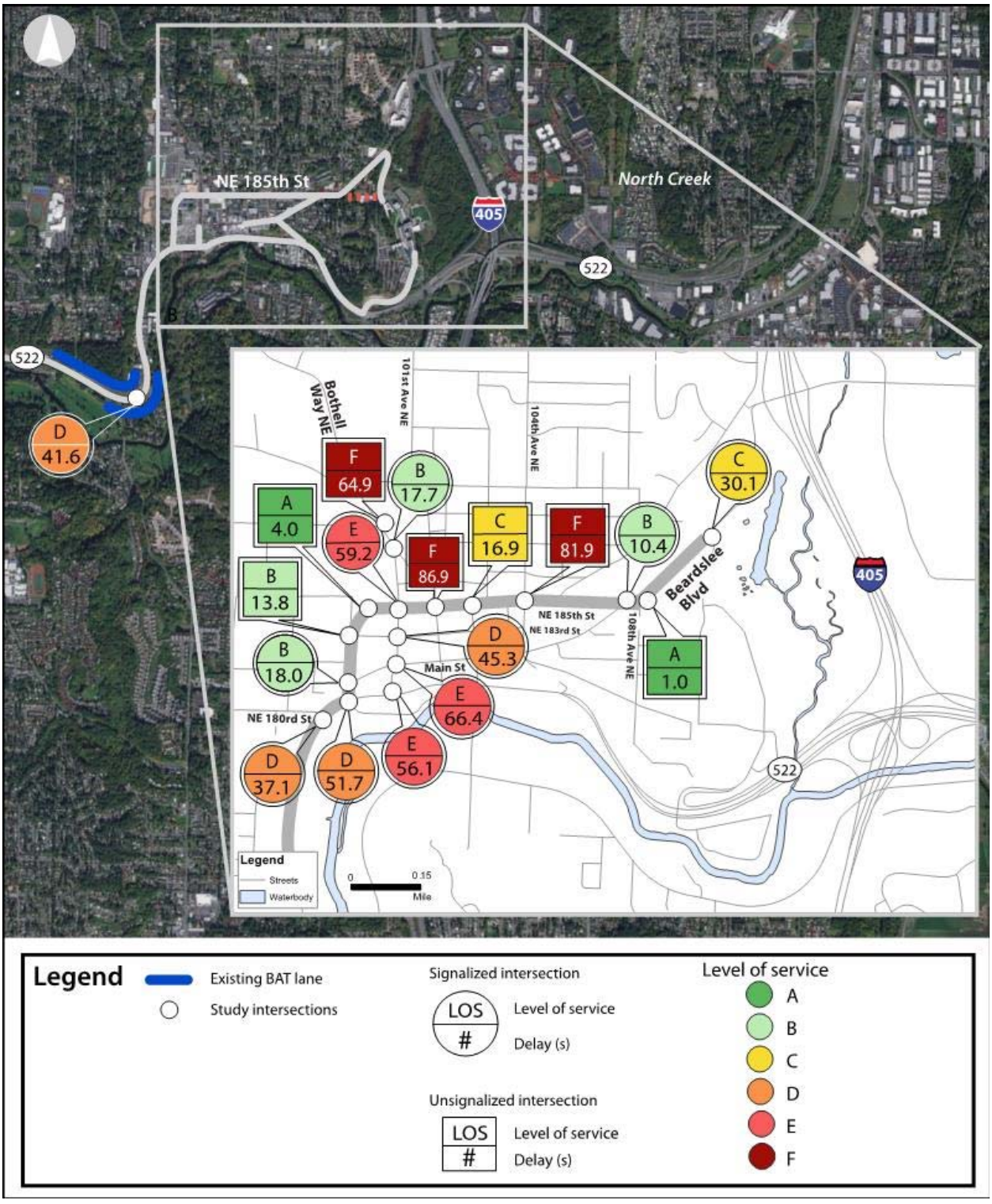

Figure 4-8 Bothell 2042 No-Build PM peak hour LOS and delay

4.4.2 Freight movement

With the Future No-Build conditions the AM and PM peak period congested conditions would extend for a longer period of time than existing conditions. The result would be a degradation in truck travel time and reliability for more hours of the day.

4.4.3 Parking

On-street parking utilization on 98th Avenue NE and NE 185th Street could increase as new development occurs consistent with the city's comprehensive plan.

The UW Bothell/Cascadia College Husky Village project would result in the removal of up to 21 on-street parking spaces on Beardslee Boulevard in the vicinity of the eastbound platform for the proposed Beardslee Boulevard BRT station.

Parking demand at the Bothell Way Metro park-and-ride lot (also referred to as the Kaysner Way park-and-ride) could increase in the Future No-Build.

4.4.4 Safety

For the Future No-Build conditions on SR 522 in this segment, the crash data would be expected to stay the same or increase as traffic volumes and congestion increase. Programmed improvements on Bothell city streets could result in improved safety conditions.

4.4.5 Nonmotorized transportation

The transportation element of the *Bothell Comprehensive Pl*an (City of Bothell 2015) lists policies and actions to achieve a more connected bicycle and pedestrian network and promote transit. The plan identifies existing sidewalks or separated multi-use trails in the vicinity of BRT stations and connections to the broader regional trail network. The plan identifies gaps in pedestrian facilities and proposes improvements in these locations. The Bothell Sidewalk and Crosswalk Program is administered by city engineering staff. The City of Bothell maintains an inventory of missing sidewalks, ADA curb ramps, and crosswalks and a list of potential improvement projects. A map of high-ranking missing sidewalks shows the missing sidewalk on NE 185th Street between 104th Avenue NE and 110th Avenue NE (City of Bothell 2019a).

The City of Bothell has a draft *Bothell Citywide Bicycle Plan* in map form (City of Bothell 2019b). There are no planned bicycle improvements along the BRT route on 98th Avenue NE or NE 185th Street.

The *University of Washington (UW) Bothell/Cascadia College Campus Master Plan* (University of Washington 2017) states that one of its guiding principles is to provide sufficient and appropriately located transit connectivity, which it notes will require close coordination with local transit agencies. Pedestrian pathways in the Beardslee Commons planning area, and associated with the Husky Village project, reach Beardslee Boulevard in the vicinity of the Beardslee Boulevard BRT station.

4.5 Transit operations – all segments

Sound Transit, Metro and Community Transit would all continue to provide transit service in the corridor in the Future No-Build conditions. Future No-Build and Build bus volumes obtained from all three agencies were included in the traffic analysis. Transit service along SR 522 and on Bothell city streets would continue to operate with existing bus stops.

Future No-Build and Build transit service would incorporate Metro's plans for transit service included in *METRO CONNECTS, Long-Range Plan* (Metro 2017b), as well as the North Eastside Mobility Project (which supersedes *METRO CONNECTS* in those areas) and updated information from Metro staff during transit integration work on this BRT project. Metro Route 372 is planned to convert to RapidRide (BRT) sometime after 2025 and before 2042.

Metro's future transit service assumptions are currently being revised as part of the proposed North Link Connections Mobility Project and an update to *METRO CONNECTS*. The revisions being considered under the update to *METRO CONNECTS* would not be adopted by the King County Council until summer/fall 2021. Affected routes include: 64, 65, 73, 304, 308, 309, 312, 330, 347, 372, 373, and ST Express 522. (Metro 2021)

Community Transit operates only in the Bothell vicinity. With the Future No-Build conditions, increases in transit service would be expected to occur as funding becomes available. Community Transit is planning the Swift Green Line extension, from Canyon Park to UW Bothell/Cascadia College, when infrastructure improvements along SR 527 are complete. . This extension is contingent on the City of Bothell's implementation of the widening of Bothell Way, which is scheduled for completion by 2030 but is not fully funded.

5 FUTURE BUILD CONDITIONS

This section presents Future Build conditions for traffic operations, freight movement, parking, safety and nonmotorized transportation by segment. Additional description of the proposed project components is provided by segment to support the analysis of Future Build conditions.

5.1 Segment 1: Seattle/Shoreline

The proposed project in the Seattle/Shoreline segment, along NE 145th Street, includes two transit queue bypass lanes in the westbound direction and a transit queue bypass lane in the eastbound direction to improve transit travel time and reliability. There would be BRT stations at 30th Avenue NE and at 15th Avenue NE. The design includes a c-curb on NE 145th Street in the vicinity of the 32nd Avenue NE intersection that results in 32nd Avenue NE movements as right-in/right-out only. An additional eastbound left-turn lane to northbound SR 522 would provide additional capacity and reduce delay through the intersection. The bus eastbound to northbound bus movement would occur in the eastbound through lane where the eastbound through is shared with left-turning buses. The additional eastbound left-turn lane is designed by reducing the east leg (westbound approach) to SR 522 from three lanes to two lanes, and the far side westbound lanes (on the east leg) are reduced from two lanes to one lane. Nonmotorized improvements would be included along segments with roadway construction. **Table 5-1** provides a list and description of the project components in this segment.

Table 5-1 NE 145th Street project transportation components

SEPA checklist project component number	Component[1]	Project component description
1	Westbound transit queue bypass lanes in the vicinity of 8th Avenue NE	Westbound transit queue bypass lane beginning about 300 feet east of 8th Avenue NE and extending to 5th Avenue NE (ties into right-turn lane provided by the Lynnwood Link Extension project). Landscape buffers and an 8-foot sidewalk. A 12-foot shared-use pedestrian and bicycle facility is evaluated as a worst-case scenario.
2	Eastbound transit queue bypass lanes in the vicinity of 15th Avenue NE	Eastbound transit queue bypass lanes on NE 145th Street from east of 12th Avenue NE to 17th Avenue NE. Sidewalk and landscaping improvements along the length of the transit queue bypass lane.
2	Westbound transit queue bypass lane in the vicinity of 15th Avenue NE	Westbound transit queue bypass lane from 17th Avenue NE to east of 12th Avenue NE. Landscape buffers and a 12-foot shared-use pedestrian and bicycle facility would be constructed with the transit queue bypass lane.
2	BRT station at 15th Avenue NE	Eastbound far-side platform and westbound near-side bus platform. Both platforms would be double-bus-length platforms.
3	BRT station at 30th Avenue NE	Eastbound near-side platform and far-side westbound platform. Both platforms would be double-bus-length platforms. Pedestrian improvements between 29th Avenue NE and 30th Avenue NE combined with the platform construction.
4	Intersection improvements NE 145th Street and SR 522	A second eastbound left-turn lane on NE 145th Street approaching SR 522. Westbound lanes reduced from three to two lanes, and westbound on NE 145th Street west of SR 522 reduced from two lanes to one lane.
1,2,3,4	Transit signal priority	At signalized intersections where BRT coaches travel through the intersection.
2,3,4	Leading pedestrian interval[2]	Recommended on NE 145th Street at: 15th Avenue NE, 30th Avenue NE and SR 522.

(1) Figure of project components provided in chapter 1, Project Description
(2) Leading pedestrian interval (LPI). An LPI gives pedestrians an advance walk signal before the motorists get a green light, giving the pedestrian several seconds to start in the crosswalk where there is a concurrent signal

5.1.1 Traffic operations

Future Build traffic operations in Segment 1 are anticipated to improve with the intersection modifications associated with the project's westbound transit queue bypass lanes from west of 17th Avenue NE to 12th Avenue NE and from east of 8th Avenue NE to 5th Avenue NE, and with the eastbound transit queue bypass lane from 12th Avenue NE to 17th Avenue NE.

Figure 5-1 and **Figure 5-2** present the AM and PM peak hour intersection delay and LOS expected with the project in this segment, and **Table 5-2** compares the Future No-Build and Future Build conditions.

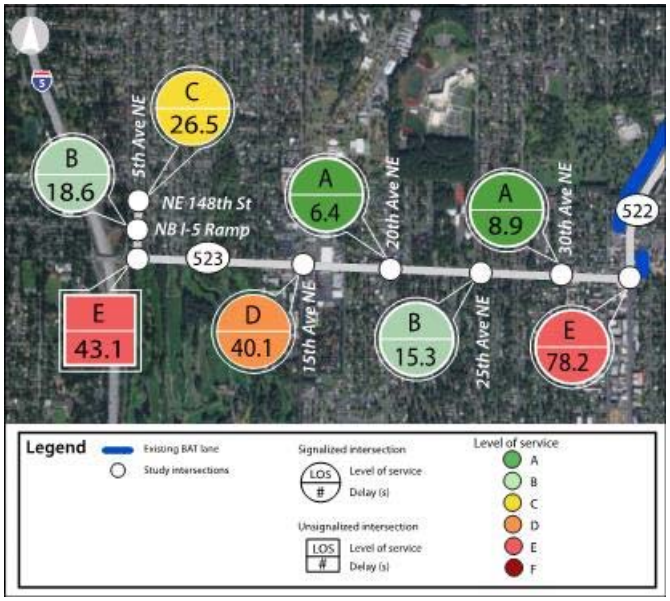

Figure 5-1 NE 145th Street 2042 Build AM peak hour LOS and delay

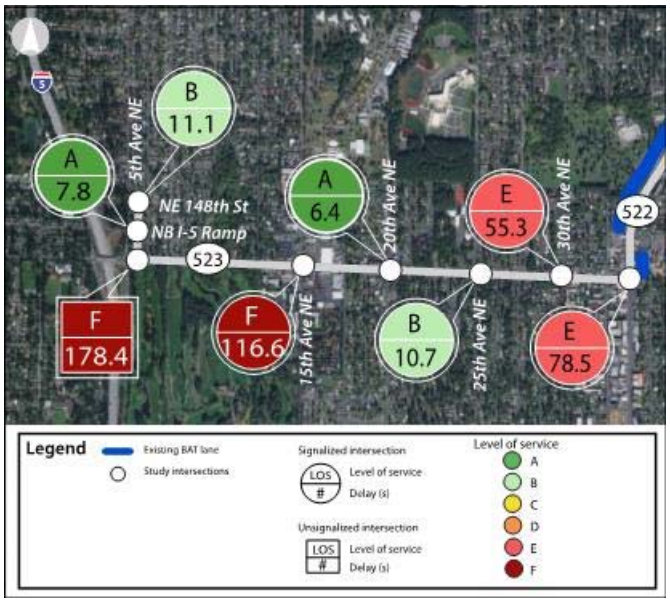

Figure 5-2 NE 145th Street 2042 Build PM peak hour LOS and delay

Table 5-2 NE 145th Street 2042 peak hour intersection delay and LOS

Intersection	AM Peak Hour				PM Peak Hour			
	No-Build		Build		No-Build		Build	
	Delay[1]	LOS	Delay[1]	LOS	Delay	LOS	Delay[1]	LOS
NE 148th Street and 5th Avenue NE	15.5	B	26.5	C	17.0	B	11.1	B
I-5 Northbound On-ramp and 5th Avenue NE	13.0	B	18.6	B	8.9	A	7.8	A
NE 145th Street and 5th Ave NE[2]	57.4	F	43.1	E	171.5	F	178.4	F
NE 145th Street and 15th Avenue NE	46.0	D	40.1	D	151.5	F	116.6	F
NE 145th Street and 20th Avenue NE	8.3	A	6.4	A	7.0	A	6.4	A
NE 145th Street and 25th Avenue NE	15.1	B	15.3	B	14.0	B	10.7	B
NE 145th Street and 30th Avenue NE	9.7	A	8.9	A	57.7	E	55.3	E
NE 145th Street and SR 522	75.3	E	78.2	E	59.0	E	78.5	E

(1) Seconds of delay (wait times) that vehicles would experience at intersections.
(2) Roundabout intersection control.

The proposed project would result in an overall decrease in average vehicle delay at most intersections and minor increases in delay for some intersections for the Future Build condition relative to the Future No-Build condition. There would be an overall improvement in traffic conditions with the proposed project in the Seattle/Shoreline segment. Intersections at LOS E and LOS F conditions are described below.

At the intersection of NE 145th Street and 5th Avenue NE, the proposed project component would result in a modest improvement for the AM peak hour Future Build condition—a modest improvement from LOS F in the Future No-Build condition to LOS E in the Future Build Condition. The PM peak hour condition at the roundabout intersection of NE 145th Street and 5th Avenue NE would be at LOS F in both the Future No-Build condition and the Build condition, with approximately the same amount of average delay per vehicle. Shoreline and WSDOT continue to design and analyze the roundabout. However, the results show a Vissim analysis of a design in progress. Vissim is a conservative tool for analyzing roundabout operations but was utilized to evaluate corridor-wide transit operations and shows minimal project impact at this intersection. The City of Shoreline has conducted their own analysis through the WSDOT process with the roundabout tool Sidra to further their design project. The City of Shoreline will be responsible for the final design of the roundabout.

At the intersection of NE 145th Street and 15th Avenue NE, the PM peak hour condition would be at LOS F for both the Future No-Build condition and the Build condition, with a reduction in delay of approximately 35 seconds per vehicle.

At the intersection of NE 145th Street and 30th Avenue NE, the PM peak hour Future Build condition would be at LOS E for both the Future No-Build condition and the Build condition, with approximately the same delay per vehicle.

At NE 145th Street and SR 522, the AM peak hour conditions would be at LOS E in both the Future No-Build condition and the Build condition, with approximately the same average vehicle delay. The PM peak hour condition would be at LOS E for both the Future No-Build condition and the Build condition, with an increase in delay of approximately 19 seconds. The increase in PM peak hour delay is due to the higher westbound through and westbound right-turn volume sharing a single lane rather than having their own lanes.

The project would result in a benefit to transit at the intersection of NE 145th Street and SR 522 for the eastbound to northbound left-turn in the AM and PM peak hour. The Future Build analysis shows an increase in the north-south movement delay that would affect Metro bus movements. The amount of transit priority and signal timing will be refined in coordination with the local jurisdictions during the design process. In addition, signal timing and transit signal priority would be adjusted numerous times between the completion of the project improvements and the estimated 2042 Build condition.

5.1.2 Freight movement

Existing general-purpose traffic capacity, lane widths and curb return radii would be maintained with the project design. The BRT project components, including signalized intersection improvements, would result in decreases in delay along the SR 523 corridor with the proposed project, except for the two locations described above. There would be a net benefit to travel time along SR 523 that also would benefit truck movement. There would be no impacts to truck mobility expected along the SR 523/NE 145th Street corridor.

5.1.3 Parking

With no on-street parking and no changes to private parking lots in this project segment, no parking impacts would occur.

5.1.4 Safety

With comparable roadway characteristics for general-purpose travel, vehicle crashes are expected to continue to reflect the traffic volumes and congestion in the corridor, where vehicle crashes would increase roughly in proportion to the increase in vehicle traffic. Without significant changes to the general-purpose roadway network, the safety concerns in Segment 1 would remain the same as those identified for the existing conditions and Future No-Build conditions.

An increase in transit ridership with the project's Stride service and ongoing Metro service would increase the number of pedestrians and bicycle movements on the corridor, especially near stations. The pedestrian crossing distance would also increase across NE 145th Street at the intersections with proposed transit queue bypass lanes, increasing a pedestrian's exposure to traffic. A summary of the change in crossing distances and the change in walk time with widening on NE 145th Street is presented in **Table 5-3**.

Table 5-3 NE 145th Street crossing distance and walk time

	Existing	Build	Increase (decrease) in distance	Increase (decrease) in walk time (seconds)	
				For a walk speed of:	
Intersection	Distance[1] (feet)			3.5 feet/second[2]	3.0 feet/second[3]
15th Avenue NE					
West leg	63	81	18	5	6
East leg	56	80	24	7	8
South leg	59	60	1	<1	<1
North leg	73	62	(11)	(3)	(4)
30th Avenue NE					
West leg	45	45	0	0	0
East leg	51	48	(3)	(<1)	(1)
South leg	45	38	(7)	(2)	(2)
North leg	37	38	1	<1	<1
SR 522 (Bothell Way NE)					
West leg	69	65	(4)	1	1
East leg	50	52	2	1	1
South leg	71	71	0	0	0
North leg	81	93	12	3	4

(1) Source: NE 145th Street Civil Roadway draft conceptual design plan, 10/09/2020.
(2) Pedestrian walk speed, Manual of Uniform Traffic Control Devices (MUTCD) (USDOT 2009).
(3) Walk speed for slower pedestrians (USDOT 2009).

At the intersection of NE 145th Street and 15th Avenue NE, the walk distance and walk time would change with the implementation of the transit queue bypass lane. On the west leg, the walk distance would increase by 18 feet, resulting in approximately five to six seconds of increased walk time. On the east leg, the walk distance would increase by 24 feet, resulting in an increase of approximately seven to eight seconds in walk time. On the south leg of 15th Avenue NE, the increased crossing distance would be approximately 1 foot, resulting in less than one second of increased walk time. The walk distance on the north leg would be reduced by approximately 11 feet, resulting in approximately three to four fewer seconds of walk time, which is due to the realignment of the crosswalks with the intersection reconstruction.

At the intersection of NE 145th Street and 30th Avenue NE, the walk distance and walk time would change with implementation of the BRT station. The west leg crossing distance would remain the same, and the east leg would be 4 feet shorter, resulting in a decrease of approximately one second in walk time. The south leg walk distance would decrease by 7 feet, resulting in a decrease of approximately two seconds in walk time, and the north leg walk distance would increase by 1 foot, resulting in less than one second of increased walk time. These changes are due to the realignment of crosswalks with the intersection reconstruction.

At the intersection of NE 145th Street and SR 522, the walk distance and walk time would change with implementation of the eastbound bus-only left-turn lane and the westbound lane reduction on the west leg of NE 145th Street. The west leg crossing distance would be reduced by 4 feet, resulting in a decrease of approximately one second in walk time, and the east leg walk distance would increase by 2 feet, resulting in an increase of approximately one second in walk time. The south leg would be unchanged. The north leg walk distance would increase by approximately 12 feet, resulting in an increase of approximately three to four seconds in walk time. The increased walk distance results from pulling the curb back in the northwest quadrant to accommodate the right-turning radius for buses and constructing two ADA curb ramps where there is currently only one ADA curb ramp at that corner. The two curb ramps result in a reduction of the walk distance across the west leg.

Pedestrian/vehicle crashes have occurred at the intersections adjacent to the proposed BRT stations, indicating a safety issue for pedestrians crossing NE 145th Street, where conflicts occur with both vehicles turning right and vehicles moving straight.

Implementation of a leading pedestrian interval, or LPI, at signalized intersections was considered to enhance pedestrian safety. An LPI at a signalized intersection would give pedestrians an advance walk signal before the motorist gets a green light, giving the pedestrian several seconds to start in the crosswalk where there is a concurrent green phase for the motorist. This earlier start for pedestrians crossing improves pedestrian visibility to drivers making a right turn, and drivers are more likely to yield to the pedestrian.

Proposed locations for implementing LPIs as a safety enhancement are based on details of the crash history, the BRT stations where pedestrian crossing volumes would increase, and/or locations where the crossing distance would be wider with the proposed BRT project. Crash history is an important factor in a safety assessment but does not necessarily reveal changes in risk to nonmotorized movement that could occur with changes in street geometry and operations. A list of recommended LPI locations is provided in **Table 5-4**. Implementation of LPI would occur with approval of and in coordination with the cities of Seattle and Shoreline. With proposed project improvements, there would be no safety impacts anticipated.

Table 5-4 Proposed leading pedestrian interval locations – NE 145th Street

Location	Crossing	Safety review
NE 145th Street and 15th Avenue NE	To/from BRT station	Right-turn crash history for pedestrians crossing both east and west legs. Crossing distance is longer for east and west legs with project.
NE 145th Street and 30th Avenue NE	To/from BRT station	Increase in pedestrian crossings with station
NE 145th Street and SR 522 (Bothell Way NE)	Pedestrians at intersection to and from BRT station	Two pedestrian crashes on west leg with southbound right-turning vehicle. Crossing distance is longer for west leg.

5.1.5 Nonmotorized transportation

Nonmotorized improvements in the segment are shown in **Figure 1-2**. These improvements and their potential effect on pedestrians and bicycles are described below. The proposed project improvements would result in a net benefit to nonmotorized transportation, and no impacts are anticipated.

Westbound, between SR 522 (Bothell Way NE) and 5th Avenue NE:

- The far-side BRT platform at 30th Avenue NE would include a sidewalk improvement between 30th Avenue NE and 28th Avenue NE. Pedestrians and bicyclists would pass behind the platform on a 6-foot facility.
- ADA curb ramps would be reconstructed to current standards at each corner of the intersection of NE 145th Street and 30th Avenue NE and on the north side of NE 145th Street at 28th Avenue NE.
- From 17th Avenue NE westbound, there would be a new 8-foot sidewalk that would transition to a shared-use pedestrian/bicycle path, with a landscape buffer in advance of 15th Avenue NE.
- A near-side platform would be located at 15th Avenue NE westbound. Pedestrians and bicyclists on the shared-use path would travel behind the station platform on an 8-foot facility.
- ADA curb ramps would be reconstructed on all four quadrants at 15th Avenue NE.
- At the westbound transit queue bypass lane from 8th Avenue NE to just east of 5th Avenue NE, there would be an 8-foot sidewalk along the length of the transit queue bypass lane.

Eastbound between 5th Avenue NE and SR 522 (Bothell Way NE):

- A new sidewalk would be constructed along NE 145th Street starting east of 12th Avenue NE and would be widened to a 10-foot sidewalk with a 4-foot buffer to the intersection with 15th Avenue NE. The sidewalk with landscape buffer would transition to the existing sidewalk in advance of 17th Avenue NE.

- A far-side BRT platform would be located at 15th Avenue NE. Pedestrians and bicyclists would travel behind the station platform on a 6-foot path. These improvements would replace the existing 5-foot sidewalk that is adjacent to the travel lane.
- ADA curb ramps would be reconstructed in the southwest and southeast corners of NE 145th Street at 15th Avenue NE.
- A new sidewalk would be constructed with the near-side eastbound BRT platform on the south side of NE 145th Street, between 28th Avenue NE and 30th Avenue NE. Pedestrians and bicyclists would pass behind the platform on a 6-foot facility.
- ADA curb ramps would be reconstructed at the southwest and southeast corners of NE 145th Street and 30th Avenue NE.
- Reconstructed signalized intersections would result in upgrading the signal equipment to current pedestrian and accessibility standards, and an improvement of pedestrian conditions.

There could be an increase in bicycle volumes to and from the BRT stations with increased ridership. The station length is designed to allow for bike racks on the front of the bus. Stride BRT and Metro buses will both accommodate bicycles on the bus, providing options for passengers to combine biking and transit for their trips. Bike lockers would be available at the Shoreline South/148th Link light rail station.

Bicycle access to the station platforms would primarily use the street network on the north and south sides of NE 145th Street. For each approach to the platform, bicyclists would ultimately dismount and walk their bicycles to the platform to park or load the bicycle on the bus. The Draft Station Design Guidelines identify bike hoops for bike parking at BRT platforms. Confident riders could be expected to stay on their bicycles until arriving to the station platform. More conservative bicycle riders could be expected to dismount before reaching the platform and walk their bicycles using pedestrian crosswalks to arrive at the station platform. Bicyclists leaving the platform would walk their bicycles and use crosswalks until they reach the location where they choose to mount their bicycles and begin riding.

5.2 Segment 2: Lake Forest Park

Table 5-1 presents a list and description of the proposed project components in the Lake Forest Park segment. The proposed northbound BAT lane on SR 522 would extend from the existing bus stop just north of NE 145th Street to NE 170th Street/Beach Drive. The center two-way left-turn lane would be replaced with a narrower raised median between NE 155th Street and NE 165th Street, and property access would be right-in/right-out only. The existing northbound-to-southbound U-turn would be maintained at NE 153rd Street, and a northbound-to-southbound U-turn would be provided at NE 165th Street. The U-turns would accommodate passenger vehicles.

Table 5-5 Lake Forest Park proposed transportation components

SEPA checklist project component number	Component[1]	Project component description
5	SR 522 (Bothell Way NE) northbound/eastbound BAT lane	BAT lane northbound on SR 522 from approximately 350 feet north of NE 145th Street to approximately 200 feet south of 41st Avenue NE; sidewalk and buffer strip along BAT lane. Extended sidewalk and buffer strip from approximately 200 feet south of 41st Avenue NE to Beach Drive NE to meet existing sidewalk near the town center. Reconfiguration of two-way left-turn lane to median from NE 155th street north to NE 165th Street.
5	SR 522 southbound/westbound BAT lane	Reconstructed BAT lane between Beach Drive and 38th Avenue NE. New sidewalk extending beyond north end of BAT lane between 38th Avenue NE to NE 155th Street
5	BRT station on SR 522 at NE 153rd Street	Far-side eastbound platform and far-side westbound platform—both double-bus-length platforms.
5	BRT station on SR 522 at NE 165th Street	Far-side eastbound platform and far-side westbound platform—both double-bus-length platforms.
6	BRT station on SR 522 at SR 104 (Ballinger Way NE); Lake Forest Park Town Center	Near-side eastbound platform and far-side westbound platform—both double-bus-length platforms.
6	Lake Forest Park park-and-ride garage	300-stall garage with four levels in Lake Forest Park Town Center.
5,6	Transit signal priority	At signalized intersections where BRT coaches travel through the intersection.
5,6	Leading pedestrian interval[2]	Recommended on SR 522 at: NE 153rd Street, NE 165th Street, Beach Drive NE, and Ballinger Way NE.

(1) Figure of project components provided in chapter 1, Project Description
(2) Leading pedestrian interval (LPI). An LPI gives pedestrians an advance walk signal before the motorists get a green light, giving the pedestrian several seconds to start in the crosswalk where there is a concurrent signal

5.2.1 Traffic operations

Traffic operations for the Lake Forest Park segment used the Synchro AM and PM peak hour model prepared for the project. The Future Build conditions would be approximately the same as, or slightly improve upon, the Future No-Build conditions.

The 300-stall park-and-ride garage in the Lake Forest Park Town Center would have access to SR 104/Ballinger Way at NE 175th Street and to SR 522 with a right-in/right-out only driveway. PM peak hour analysis was prepared for the park-and-ride garage. The site is currently used as surface parking to support the Lake Forest Park Town Center retail and commercial businesses, as a landscaped area, and for a Bank of America branch building. Construction of the 300-

space garage would displace surface parking for those uses, which would be removed with the garage.

Trip generation is estimated based on the existing Kenmore Park-and-Ride lot, where each stall generates 0.41 vehicle trips in the PM peak hour, or 41 percent of total park-and-ride capacity exits during the PM peak hour. At the Kenmore Park-and-Ride lot, each stall generates 0.06 vehicle trips entering the lot during the PM peak hour. An estimated 123 vehicle trips exiting and 19 trips entering would be generated from the park-and-ride garage during the PM peak hour. PM peak hour trip generation for the proposed park-and-ride garage is presented in **Table 5-6**.

Table 5-6 Lake Forest Park Park-and-Ride garage PM peak hour trip generation

	Trip Generation Rate[1]		Number of Trips	
New parking stalls	Entering	Exiting	Entering	Exiting
300	0.06	0.41	18	123

(1) Parking Garage Traffic Impacts Methodology (Sound Transit 2019).

The ST Model forecasts the number of trips from the future proposed park-and-ride garages to their destinations, aggregated into TAZs. The distribution of trips to the TAZs is shown in **Figure 5-3**.

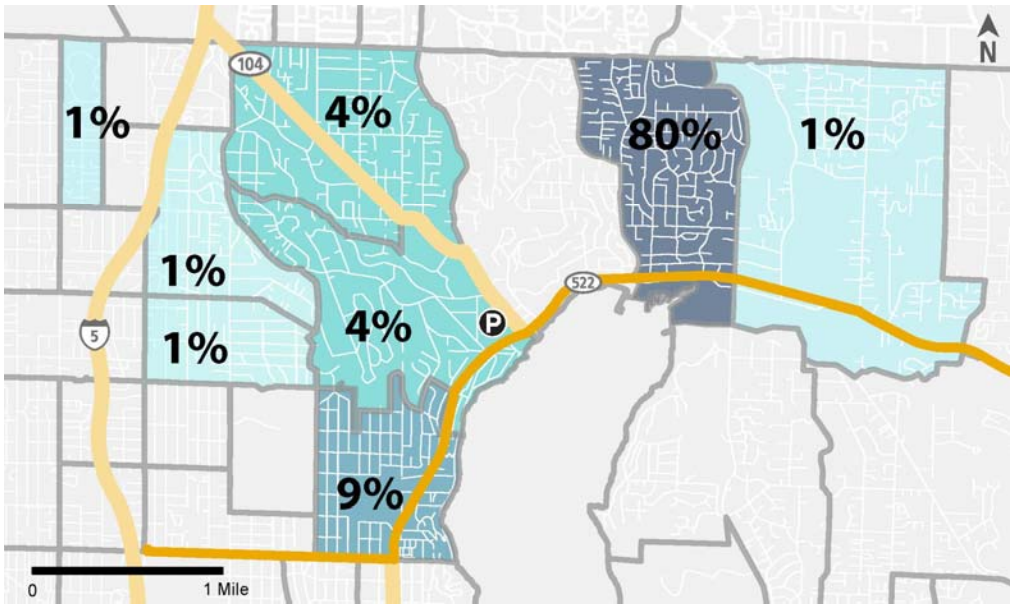

Figure 5-3 Lake Forest Park distribution of park-and-ride garage trips

The PM peak hour vehicle trips were assigned to specific routes on the street network based on the trip distribution. The results of the model are as follows: 10 new trips would exit to the west along SR 522, 99 new trips along SR 522 to the east, and 14 new trips to the north on SR 104, as shown in **Figure 5-4**. Additionally, 17 new trips to the garage would enter from the east along SR 522, one new trip from the west on SR 522, and one new trip from the north on SR 104.

Figure 5-4 Lake Forest Park Park-and-Ride garage traffic assignment

Figure 5-5 shows the AM peak hour intersection delay, and **Figure 5-6** shows the PM intersection operations for the Lake Forest Park segment for the Future Build conditions with proposed intersection improvements, proposed signal modifications, the new BAT lane segment and the garage traffic. All intersections would operate at an acceptable LOS, and the project would result in the same or somewhat improved operations at the intersections.

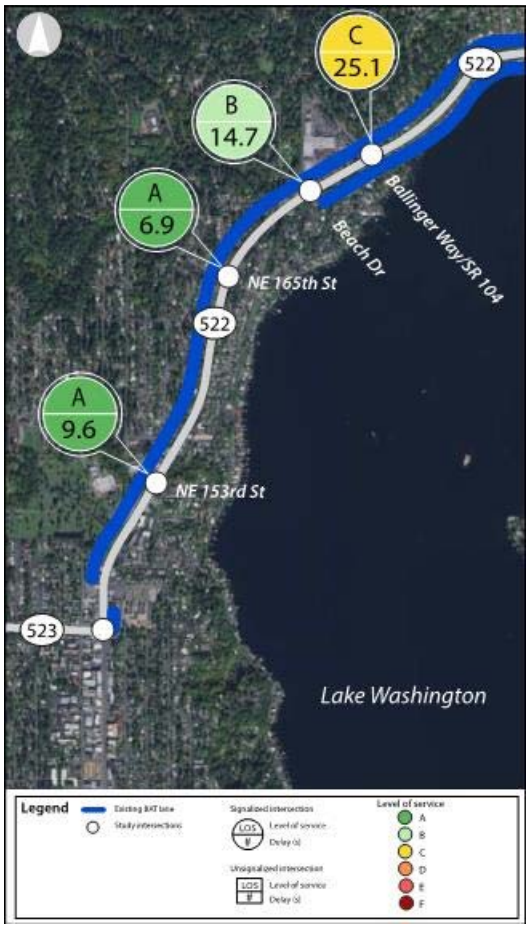

Figure 5-5 Lake Forest Park 2042 Build AM peak hour LOS and delay

Figure 5-6 Lake Forest Park 2042 Build PM peak hour LOS and delay

Table 5-7 presents the future AM and PM peak hour delay and LOS in this segment, and compares the Future No-Build and Build conditions. All intersections would operate at an acceptable LOS, and the project would result in the same or improved traffic operations at intersections in the AM peak hour.

Table 5-7 Lake Forest Park 2042 peak hour intersection delay and LOS

Intersection	AM Peak Hour				PM Peak Hour			
	No-Build		Build		No-Build		Build	
	Delay[1]	LOS	Delay[1]	LOS	Delay[1]	LOS	Delay[1]	LOS
NE 149th Street and SR 522	N/A[2]	N/A	N/A	N/A	0.1	A	0.1	A
SR 522 and NE 153rd Street	12.5	B	9.6	A	23.8	C	29.4	C
SR 522 and 39th Avenue NE	N/A	N/A	N/A	N/A	3.1	A	0.2	A
SR 522 and NE 165th Street	6.8	A	6.9	A	12.7	B	5.8	A
SR 522 and NE 170th Street	11.2	B	14.7	B	18.9	B	17.7	B
SR 522 and Lake Forest Park Town Center	N/A	N/A	N/A	N/A	0.3	A	0.3	A
SR 522 and SR 104/Ballinger Way	31.1	C	25.1	C	30.6	C	34.3	C
SR 104/Ballinger Way and NE 175th Street	N/A	N/A	N/A	N/A	22.7	C	21.0	C

(1) Seconds of delay (wait times) that vehicles would experience at intersections.
(2) N/A (not applicable) refers to intersections not analyzed during the AM peak hour. These intersections were analyzed for the park-and-ride garage during the PM peak hour as described in Section 2.

The study intersections are estimated to operate at LOS C or better with the Future Build conditions. There would be decreases in delay at nearly all intersections in both AM and PM peak hours and a few relatively small increases in delay. There would be an overall improvement in traffic conditions with the proposed project in the Lake Forest Park segment.

5.2.2 Freight movement

The project design maintains the existing general-purpose traffic capacity, lane widths and curb return radii. The BRT project components, including signalized intersection improvements, would result in a decrease in intersection delay and a net benefit to travel time on SR 522 that would also benefit truck movement. The project would result in small changes to local truck delivery patterns in this segment with the removal of the two-way left-turn lane from NE 149th Street to NE 170th Street. Trucks could need to revise their delivery routes. U-turns for passenger vehicles and possibly for single-unit trucks would be accommodated at NE 153rd Street and NE 165th Street.

5.2.3 Parking

The park-and-ride garage in the Lake Forest Park segment would be located within the Lake Forest Park Town Center. The park-and-ride garage would displace an existing commercial building (Chase Bank), which would reduce the overall parking demand, because the commercial use would no longer generate parking demand. The Lake Forest Park Town Center businesses share parking throughout the town center. The parking analysis accounts for each of

these factors. The parking supply was estimated from Google Earth and compared to parking maps for the town center. Google Earth, combined with Street View, provided the ability to count parking stalls to an estimated plus or minus 10 stalls for the total parking supply.

The ITE *Parking Generation Manual*, 5th Edition (ITE 2019) was used to assess the parking demand relative to the parking capacity for the mix of uses sharing parking at the town center. **Table 5-8** presents the overall parking demand estimate for the Existing/No-Build conditions and parking displaced in the Build condition. Parking demand data in the *Parking Generation Manual* are reported as an average demand of all sizes of the same use or with a fitted curve equation for which the demand varies by size. For each demand estimate presented in **Table** 5-8, the higher of the two methods is reported. The day and time period for peak parking demand vary by land use, and the highest demand is reported. Analysis of the first level of the shopping center resulted in a higher demand when the parking for the Albertsons store was estimated independently from the shopping center as a whole, rather than reporting parking demand for all of the first level as one shopping center.

The existing land use identified as the “Chase Bank Pad” is the building that would be displaced with the new park-and-ride garage. The parking demand of uses in the Chase Bank building are counted as the parking displaced by the Chase Bank building. The deficit parking that occurs on a Saturday on the first level (-17 spaces) and for City Hall weekdays (-8 spaces) means that parking from those two sources is spilling over onto the Chase Bank pad. This spillover would no longer be accommodated with the proposed park-and-ride garage and is counted as displaced parking.

Table 5-8 Lake Forest Park Town Center parking demand estimate

	ITE Parking Generation Manual[1]		Area[2]	Existing/No-Build parking conditions				Build conditions
				ITE parking demand		Parking supply		
Existing land use	Land Use Code	Land use	GLA[2]	Peak	Peak parking demand[3]	Parking supply[4]	Surplus/ deficit	Displaced parking spaces
First level shopping center				Saturday 11 a.m. to 5 p.m.[5]				
Albertsons	850	Supermarket	32,554		119			
Remainder first level uses	820	Shopping Center	62,735		214			
Total first level				Saturday 11 a.m. to 5 p.m.	333	316	-17	17
Total second level	820	Shopping Center	54,824	Saturday 11 a.m. to 5 p.m.	192	390	198	
Chase Bank Pad (north side)	630	Medical Clinic	5,783	Weekday 9 a.m. to 3 p.m.	23	59	36	23
Chase Bank Pad (south side)[6]	720	Medical-Dental Office Bldg	5,783	Weekday 9 a.m. to 4 p.m.	19			
Bank of America	912	Drive-in Bank	3,031	Weekday 11 a.m. to 4 p.m.	11			
Total south side					30	102	72	30
Lake Forest Park City Hall	730	Government Office Bldg	19,720[7]	Weekday 9 a.m. to 2 p.m.	59	51	-8	8
Starbucks			N/A[8]		13	13	0	
Total All					650	931	281	

(1) Source: ITE Parking Generation Manual, 5th Edition.
(2) Source: Review of leases, and spreadsheet from Sound Transit received 3/18/2020.
Gross leasable area (GLA) listed in the table is from this source.
Area for Lake Forest Park City Hall is net square footage from King County Assessor data.
(4) Fitted curve typically has slightly higher parking generation than average. The higher result is applied for the worst-case scenario.
(5) Parking supply inventory from Google Earth and leased control area maps.
Signed parking restrictions not inventoried.
(6) The shopping center peak parking demand is Saturdays from 11 a.m. to 5 p.m. (non-December).
The supermarket peak parking demand is Fridays from 1 p.m. to 5 p.m. (resulting in 11 surplus spaces).
The combined parking demand is a higher peak on a Saturday than a Friday.
(7) Lower level made equal to upper level for worst-case scenario, because source (2) results in lower GLA on second level than upper level when Bank of America is removed.
(8) Net square footage.
(9) Starbucks parking is not included in Lake Forest Town Center parking supply. Peak demand is assumed to equal peak supply.

The parking supply and demand analysis shows that there is a total supply of 931 spaces with a demand for 650 spaces accounting for the Albertsons Saturday peak and the weekday peak demand of all other uses as a worse-case scenario. This would be a surplus of approximately 281 spaces.

In the Build condition the park-and-ride garage footprint would displace approximately 53 spaces on a weekday (23 plus 30) and displace the 8 spaces from City Hall parking demand that are estimated to spill over on to the Chase Bank pad. On a Saturday afternoon, the peak demand, results in approximately 17 parking spaces spilling over onto the Chase Bank pad and are considered displaced parking. The net number of displaced parking spaces would be approximately 71 on a weekday. The proposed park-and-ride garage would use approximately 11% of the parking surplus. A parking benefit of the proposed park-and-ride garage would be to reduce or eliminate all-day commuter parking to the extent it is occurring on the lower-level surface parking.

Parking management strategies could be developed to improve parking conditions at the Lake Forest Park Town Center with the proposed park-and-ride garage. There is some existing parking management at the Lake Forest Park Town Center, such as limited parking duration near storefronts. Excess parking supply on the upper level is adequate to address the parking demand that would no longer be accommodated by the Chase Bank Pad parking area. Additional parking management strategies could include:

- Maintain signed 15-minute, time-limited parking spaces nearest storefronts
- Maintain signed restrictions for “No Park-and-Ride” parking on surface lots
- Limit employee all-day parking to north side of upper lot
- Provide employer education of employees requesting them to park in the upper level

There is no on-street parking on SR 522 with the proposed project improvements; therefore, there would be no displacement of on-street parking in this segment of the project.

5.2.4 Safety

The proposed replacement of the center turn lane with construction of the northbound BAT lane in Segment 2 could be expected to result in a reduction in vehicle crashes, because midblock left-turn movements would be replaced with right-turn property access. The safety concerns associated with traffic volumes and congestion in Segment 2 would remain the same as those identified for the existing conditions and future No-Build conditions.

An increase in ridership with BRT Stride service and increases in Metro service would result in an increase in the number of pedestrians and bicyclists near the stations. The project would construct new sidewalks along the BAT lane that would provide walkways for pedestrians for access to transit and properties along SR 522, thereby improving the safety for pedestrians in the segment.

The new sidewalks would include new curbs and ADA curb ramps and result in a change in pedestrian walk distance across SR 522. The increased walk time would increase pedestrians’ exposure to traffic. A summary of the change in crossing distances and the change in walk time with widening of SR 522 is presented in **Table 5-9**.

Table 5-9 Lake Forest Park crossing distance and walk time

Intersection (south to north)	Existing	Build	Increase (decrease) in distance	Increase (decrease) in walk time (seconds)	
	Distance[1] (feet)			For a walking speed of:	
				3.5 feet/second[2]	3.0 feet/second[3]
NE 147th Street[4]					
East leg	56	63	7	2	2
NE 153rd Street[5]					
East leg	65	59	(6)	(2)	(2)
South leg	(no crosswalk)	97	0	0	0
North leg	88	99	11	3	3
NE 155th Street[4]					
East leg	83	47	(36)	(10)	(12)
39th Avenue NE[4]					
North leg	70	49	(51)	(15)	(17)
NE 165th Street[5]					
West leg	32	42	10	3	3
East leg	38	42	4	1	1
South leg	(no crosswalk)	90	0	0	0
North leg	82	87	5	1	2
41st Avenue NE[4]					
East leg	123	123	0	0	0

(1) Source: Lake Forest Park Civil Roadway draft conceptual design plan, 9/11/2020.
(2) Pedestrian walking speed, Manual of Uniform Traffic Control Devices (MUTCD) (USDOT 2009).
(3) Walk speed for slower pedestrians (USDOT 2009).
(4) Unsignalized, no existing ADA curb ramps.
(5) Signalized.

At the unsignalized intersections, there would be either a small change or no change in crossing distance, or a large decrease in crossing distance. The decrease would occur because a curb is defined and the roadway connection to SR 522 is redesigned with the widening for the BAT lane. The result would be a decrease in walk time to cross NE 155th Street of between 10 and 12 seconds, and a decrease in walk time across 39th Avenue NE of between 15 and 17 seconds.

At the signalized intersection of NE 153rd Street, the walk time across the east leg would decrease by approximately two seconds due to the relocated curb return and new ADA curb ramps. Across the south leg there is no existing crosswalk, and a crosswalk would be provided with the project. Across the north leg the walk time would increase by approximately three seconds due to the widening for the BAT lane.

At the signalized intersection of NE 165th Street, the walk time across the west leg would increase by approximately three seconds, and the walk time across the east leg would increase by approximately one second due to the widening of the BAT lane and redesign of the intersection. The south leg has no existing crosswalk, and a crosswalk would be provided with the project. The walk time across the north leg would increase by approximately one to two seconds.

Crossing SR 522 would continue to be accommodated at signalized intersections. Reconstructed signalized intersections would result in an upgrade of the signal equipment to current pedestrian and accessibility standards, and an improvement of pedestrian conditions.

Implementation of a leading pedestrian interval, or LPI, at signalized intersections was considered to enhance pedestrian safety. An LPI at a signalized intersection would give pedestrians an advance walk signal before the motorist gets a green light, giving the pedestrian several seconds to start in the crosswalk where there is a concurrent green phase for the motorist. This earlier start for pedestrians crossing improves pedestrian visibility to drivers making a right turn, and drivers are more likely to yield to the pedestrian.

Proposed locations for implementing LPIs as a safety enhancement are based on details of the crash history, at BRT stations where pedestrian crossing volumes would increase, and/or at locations where the crossing distance would be wider with the proposed BRT project. Crash history is an important factor in a safety assessment but does not necessarily reveal changes in risk to nonmotorized movement that could occur with changes in street geometry and operations. A list of recommended LPI locations in the Lake Forest Park segment is provided in **Table 5-10**. Implementation of LPI would occur with approval of and in coordination with the City of Lake Forest Park. With proposed project improvements, there would be no safety impacts anticipated.

Table 5-10 Proposed leading pedestrian interval locations – Lake Forest Park

Location	Crossing	Safety review
SR 522 (Bothell Way NE) and NE 153rd Street	To/from BRT station	Right-turn crash history at east leg. Crossing distance is wider with new BAT lane.
SR 522 (Bothell Way NE) and NE 165th Street	To/from BRT station	Crossing distance is wider with new BAT lane.
SR 522 (Bothell Way NE) and Beach Drive NE	SR 522 between neighborhoods and shopping center to the Burke-Gilman Trail for access to the eastbound platform.	Crash history indicates conflict with pedestrians and side-street left turns (unprotected left turns).
SR 522 (Bothell Way NE) and Ballinger Way NE (SR 104)	To/from BRT station	Crash history reflects high volume of pedestrians and bicyclists on the west and south leg, the only two crosswalks at the intersection.

5.2.5 Nonmotorized transportation

Nonmotorized improvements are shown in **Figure 1-3**. These improvements and their potential effect on pedestrians and bicycles are described below. The proposed project improvements would result in a net benefit to nonmotorized transportation, and no impacts are anticipated.

The new sidewalk segments and additional sidewalk widths would improve access to the BRT stations.

The following describes the improvements on SR 522 and their potential effect on pedestrians and bicyclists:

- A new 6-foot sidewalk with 4-foot landscape buffer would be constructed along the east side of SR 522 from the far side of NE 145th Street to Beach Drive NE.
- A segment of sidewalk would be constructed on the west side of SR 522 between NE 155th Street and 38th Ave NE.
- ADA curb ramps would be reconstructed and improved to current standards on the east side at the two corners of NE 147th Street, the two corners of NE 153rd Street on the north side at the westbound BRT platform, the four corners of NE 165th Street at the BRT station, and the two corners of 41st Avenue NE.
- Reconstructed signalized intersections would result in upgrading the signal equipment to current pedestrian and accessibility standards, and an improvement of pedestrian conditions.

The NE 153rd Street Station platforms would be 12 feet deep in the westbound direction and 10 feet deep in the eastbound direction. The sidewalk facility would continue along the station platform.

The NE 165th Street Station platforms would be 10 feet deep for the westbound and eastbound platforms. The sidewalk facility would continue along the station platform.

There could be an increase in bicycle volumes to and from the BRT stations with increased ridership. The station length is designed to accommodate bike racks on the front of the buses. Bike lockers would be available at the Lake Forest Park Park-and-Ride garage. Bicycle access to the station platforms would primarily use the Burke-Gilman Trail that is parallel to SR 522 on the east side. The Burke-Gilman Trail is accessible from NE 153rd Street and NE 165th Street. Sidewalk travel by bicycles could be expected in this segment for bicyclists coming from other side streets.

For each approach to the platform, the bicyclists would ultimately dismount and walk their bicycles to the platform to park their bicycles or load their bicycles on the bus. The Draft Station Design Guidelines identify bike hoops for bike parking at BRT platforms. Confident riders could be expected to stay on their bicycles until arriving to the station platform. More conservative riders could be expected to dismount before reaching the platform and walk their bicycles using pedestrian crosswalks to arrive at the station platform. Bicyclists leaving the platform would walk their bicycles and use crosswalks until they reach the location where they choose to mount their bicycles and begin riding.

5.3 Segment 3: Kenmore

Table 5-11 presents a list and description of the project components in the Kenmore segment. There would be no proposed improvements on SR 522 in Kenmore except for frontage improvements at the BRT station platforms. The Future No-Build conditions include the City of Kenmore SR 522 West Segment B Improvements (57th Avenue NE to 61st Avenue NE) project, which is funded for design and permitting in 2019–2020 and completion by 2025–2026. That project includes an additional eastbound left-turn lane with U-turn capacity. The current channelization plan shows widening that would move the north curb line. The design of the station platform will be coordinated with this future improvement.

Two intersections would be modified on 73rd Avenue NE to serve park-and-ride users and Metro buses. NE 181st Street would become a one-way eastbound entrance for park-and-ride garage traffic and Metro buses. Local business would be allowed westbound outbound travel. The signal would be modified with a leading northbound left-turn phase. The park-and-ride driveway on 73rd Avenue NE (north of the St. Vincent de Paul building) to the park-and-ride garage would be modified with westbound left-turn and right-turn pockets for the outbound movement of traffic from the park-and-ride garage. Westbound Metro buses would exit to SR 522. Park-and-ride garage traffic with destinations on westbound SR 522 would also be provided with a right-turn-only for exiting the garage. The purpose of these modifications is to limit the daily traffic on the NE 181st Street access road to no more than existing traffic volumes.

Table 5-11 Kenmore proposed project components

SEPA project component number	Component[1]	Project component description
7	BRT station on SR 522 (Bothell Way NE) at 61st Avenue NE	Far-side eastbound platform and far-side westbound platform in each direction—both double-bus-length platforms.
8	BRT station on SR 522 at 68th Avenue NE	Far-side eastbound platform and far-side westbound platform in each direction—both double-bus-length platforms.
9	BRT station on SR 522 at existing Kenmore Park-and-Ride lot	Eastbound double-bus-length platform on SR 522 east of 73rd Avenue NE; westbound triple-bus-length platform east of 73rd Avenue NE adjacent to park-and-ride.
9	Kenmore Park-and-Ride garage	Approximately 302-stall, four-level garage.
9	NE 181st Street at 73rd Avenue NE	Modify the east leg of NE 181st Street to an entrance only for the park-and-ride from 73rd Avenue NE at NE 181st Street. Modify signal for a northbound leading protective left-turn phase.
9	Access to the Kenmore Park-and-Ride garage at north driveway	Modify the existing north driveway to provide for westbound left- and right-turn pockets.
7,8,9	Transit signal priority	At signalized intersections where BRT coaches travel through the intersection.
7,8,9	Leading pedestrian interval[2]	Recommended on SR 522 at: 61st Avenue NE, 68th Avenue NE and 73rd Avenue NE.

(1) Figure of project components provided in chapter 1, Project Description
(2) Leading pedestrian interval (LPI). An LPI gives pedestrians an advance walk signal before the motorists get a green light, giving the pedestrian several seconds to start in the crosswalk where there is a concurrent signal

The ST3-proposed park-and-ride garage would have two floors of parking, at 187 stalls per floor, for a total of 374 parking stalls. Metro plans to add one additional floor with 187 stalls, for a total of 561 stalls. There would be 259 existing stalls displaced, resulting in a total of 302 net new stalls. The 302 net new stalls are included in the traffic analysis of Future Build conditions. Parking space estimates are based on the conceptual design plans.

Park-and-ride users would access the garage the same way as they do under existing conditions: from the north via 73rd Avenue NE at NE 181st Street, and from SR 522 with a right-in/right-out-only access. Garage ramps at the north and south ends of the garage provide access to the floors above the transit center.

5.3.1 Traffic operations

Analysis of traffic operations for the Kenmore segment used the Synchro AM and PM peak hour model prepared for the project. There are no proposed project roadway improvements with the Future Build conditions, and traffic conditions would remain comparable to the Future No-Build conditions in the Kenmore segment. It is anticipated that there would be more pedestrians crossing SR 522 to access the BRT stations, which could affect the signal timing at intersections near stations. More detailed intersection timing plans will be prepared as the project design advances.

Trip generation for the proposed park-and-ride garage is estimated based on data collected from the existing Kenmore Park-and-Ride lot. The PM peak hour is the highest hourly volume generated from the park-and-ride garage and is also the highest hourly volume on the adjacent street; therefore, including the PM peak hour trips from the park-and-ride garage in the traffic analysis results in a worst-case scenario. Each stall generates 0.41 vehicle trips exiting and 0.06 vehicle per stall entering during the PM peak hour. The PM peak hour trip generation for the proposed park-and-ride garage is presented in **Table 5-12**.

Table 5-12 Kenmore Park-and-Ride garage PM peak hour trip generation

	Trip Generation rate[1]		Number of Trips	
New parking stalls	Entering	Exiting	Entering	Exiting
302	0.06	0.41	19	124

(1) Source: Parking Garage Traffic Impacts Methodology (Sound Transit 2019).

The ST Model was used to estimate the distribution of trips to and from the park-and-ride garage to their destinations using TAZs. **Figure 5-7** shows the destination to TAZs for the trips generated for the proposed park-and-ride garage. Seventy-six percent of the trips would have a northbound destination within the same TAZ in which the garage would be located.

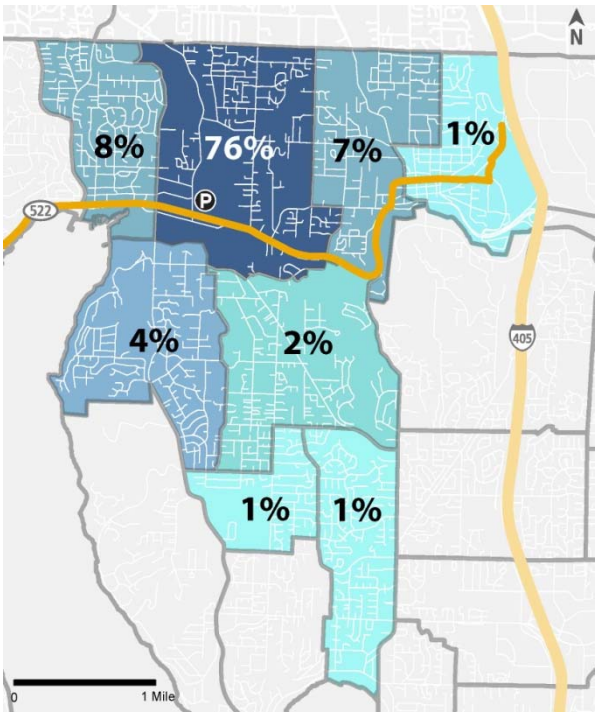

Figure 5-7 Distribution of Kenmore Park-and-Ride garage trips

The net new vehicle trips generated by the new park-and-ride garage were assigned to specific routes on the street network based on the trip distribution from the ST Model. The resulting PM peak hour traffic assignment is shown in **Figure 5-8.** Primary access to the park-and-ride garage would be from the driveway north of the St. Vincent de Paul building. The NE 181st Street entrance would be limited to one-way eastbound. This would result in approximately 81 new vehicle trips leaving the park-and-ride to the north along 73rd Avenue NE, 35 new trips to the south on 73rd Avenue NE, and eight trips entering the park-and-ride on NE 181st Street. The garage driveway at SR 522 would be limited to right-in/right out only with approximately six trips that would enter the garage from westbound SR 522 and eight trips would exit the garage to westbound SR 522. Garage ramps at the north and south ends of the garage would provide access to the floors above the transit center.

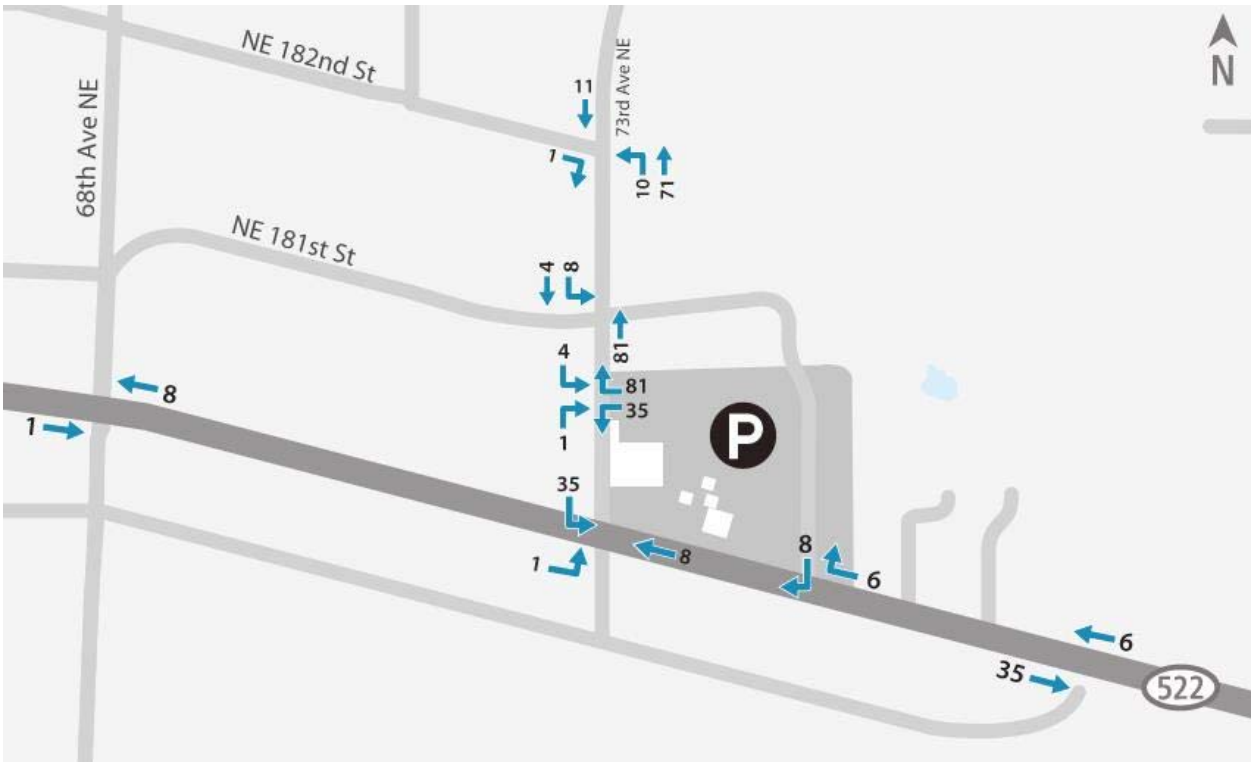

Figure 5-8 Kenmore Park-and-Ride garage PM peak hour traffic assignment

Figure 5-9 presents intersection LOS and delay for the Future Build AM peak hour, and **Figure** 5-10 shows the intersection LOS and delay for the Future Build PM peak hour, for the combined Sound Transit project components and Metro project components in this segment.

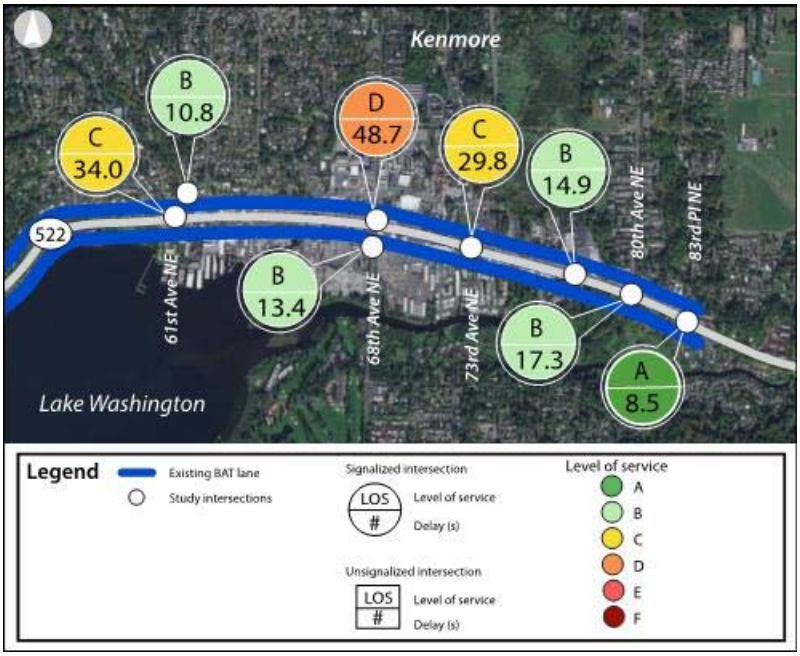

Figure 5-9 Kenmore 2042 Build AM peak hour LOS and delay

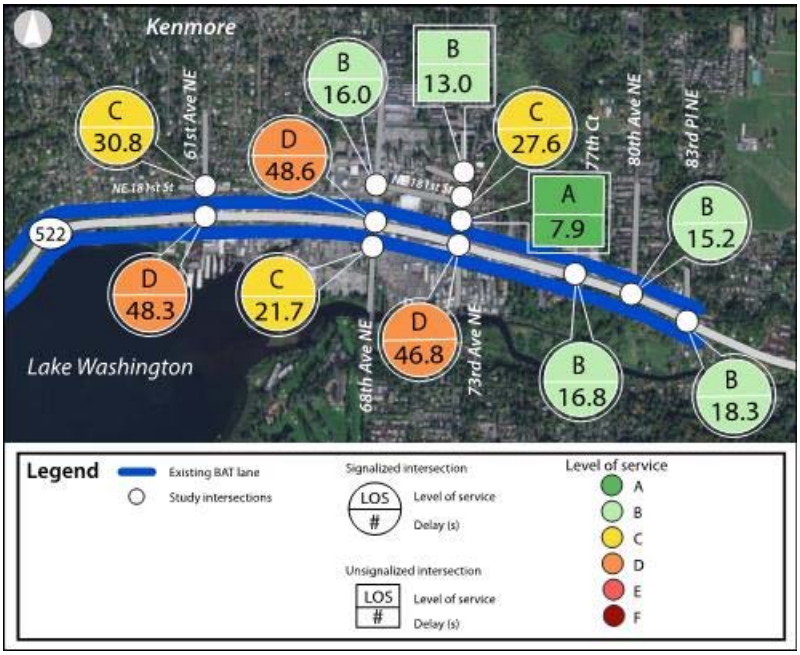

Figure 5-10 Kenmore 2042 Build PM peak hour LOS and delay

Table 5-13 presents the AM peak hour and PM peak hour delay and LOS for the 2042 No-Build and Build conditions with the 302-stall park-and-ride garage. All intersections would operate at an acceptable LOS in the Future Build conditions, and the project would result in the same or improved traffic conditions compared to the No-Build conditions.

Table 5-13 Kenmore 2042 AM peak hour intersection delay and LOS

Intersection	AM Peak Hour				PM Peak Hour			
	No-Build		Build		No-Build		Build	
	Delay[1]	LOS	Delay	LOS	Delay	LOS	Delay	LOS
SR 522 and 61st Avenue NE	33.1	C	34.0	C	40.0	D	48.3	D
61st Avenue NE and 181st Avenue	12.6	B	10.8	B	49.0	D	30.8	C
SR 522 and 68th Avenue NE	55.3	E	48.7	D	63.7	E	48.6	D
68th Avenue NE and 175th Street	12.4	B	13.4	B	19.9	B	21.7	C
NE 181st Street and 68th Avenue NE	N/A[2]	N/A	N/A	N/A	16.0	B	16.0	B
SR 522 and 73rd Avenue NE	47.6	D	29.8	C	54.6	D	46.8	D
North park-and-ride driveway and 73rd Avenue NE[3]	N/A	N/A	N/A	N/A	1.6	A	7.9	A
NE 181st Street and 73rd Avenue NE	N/A	N/A	N/A	N/A	32.4	C	27.6	C
NE 182nd Street and 73rd Avenue NE[3]	N/A	N/A	N/A	N/A	9.0	A	13.0	B
SR 522 and 77th Court	15.5	B	14.9	B	15.3	B	16.8	B
SR 522 and 80th Avenue NE	18.3	B	17.3	B	34.8	C	15.2	B
SR 522 and 83rd Place NE	10.3	B	8.5	A	45.4	D	18.3	B

(1) Seconds of delay (wait times) that vehicles would experience at intersections.

(2) N/A (not applicable) refers to intersections not analyzed during AM peak hour. These intersections were analyzed for the park-and-ride garage during the PM peak hour.

(3) Unsignalized intersection

The study intersections are estimated to operate at LOS D or better with the Future Build conditions. There would be decreases in delay for nearly all intersection locations in the AM and PM peak hours. The intersection of SR 522 and 68th Avenue NE would improve from LOS E to LOS D in the AM and PM peak hours with optimized the signal timing in the Synchro model. There would be an overall improvement in traffic conditions with the proposed project in the Kenmore segment.

5.3.2 Freight movement

The project design maintains the existing general-purpose traffic capacity, lane widths and curb return radii. The BRT project components, including signalized intersection improvements, would result in a decrease in delay and a benefit to travel time on SR 522 that also would benefit truck movement. There would be no impacts to truck mobility expected in this segment.

5.3.3 Parking

The proposed park-and-ride garage would displace 259 existing surface parking stalls and add 561 stalls, for a net of 302 new stalls.

There is no on-street parking on SR 522 with the proposed improvements; therefore, there would be no displacement of on-street parking in this project segment.

5.3.4 Safety

With Future Build conditions having comparable roadway characteristics for general-purpose travel in Segment 3 to existing conditions, vehicle crashes are expected to continue to reflect the traffic volumes and congestion in the corridor. Therefore, vehicle crashes would be expected to increase roughly in proportion to the increase in vehicle traffic. Without significant changes to the general-purpose roadway network, the safety concerns in Segment 3 would remain the same as those identified for the existing conditions and Future No-Build conditions.

An increase in ridership is expected with BRT Stride service and increases in Metro service, as well as the additional park-and-ride capacity. The increase in ridership would result in additional pedestrian volume across SR 522 at the stations. The increase in pedestrian crossings at stations would occur at signalized intersections near the BRT stations. Implementation of an LPI may help to reduce crashes involving pedestrians and bicyclists crossing at signalized intersections. Prohibiting right turns on red could be another way to enhance pedestrian safety at signals near BRT stations that have high volumes of right-turn vehicles at pedestrian crossing movements.

Based on the conceptual design plans for the Kenmore segment, there would be no increase in pedestrian walk distance across SR 522. Pedestrian crossing of SR 522 would continue to be accommodated at signalized intersections.

Implementation of a leading pedestrian interval, or LPI, at signalized intersections was considered to enhance pedestrian safety. An LPI at a signalized intersection would give pedestrians an advance walk signal before the motorist gets a green light, giving the pedestrian several seconds to start in the crosswalk where there is a concurrent green phase for the motorist. This earlier start for pedestrians crossing improves pedestrian visibility to drivers making a right turn, and drivers are more likely to yield to the pedestrian.

Proposed locations for implementing LPIs as a safety enhancement are based on details of the crash history, at BRT stations where pedestrian crossing volumes would increase, and/or at locations where the crossing distance is wider with the proposed BRT project. Crash history is an important factor in a safety assessment but does not necessarily reveal changes in risk to nonmotorized movement that could occur with changes in street geometry and operations. A list of the recommended LPI locations in this segment is provided in **Table 5-14**. Implementation of LPI would occur with approval of and in coordination with the City of Kenmore. With proposed project improvements, there would be no safety impacts anticipated.

Table 5-14 Proposed leading pedestrian interval locations – Kenmore

Location	Crossing	Safety review
SR 522 (Bothell Way NE) and 61st Avenue NE	To/from BRT station	Currently no crosswalk on west leg. The City of Kenmore's current SR 522 West Segment B Improvements (57th Avenue NE to 61st Avenue NE) project includes roadway widening and signal modifications.
SR 522 (Bothell Way NE) and 68th Avenue NE	To/from BRT station	Higher volume pedestrian and bicyclist area, especially for north-south crossing.
SR 522 (Bothell Way NE) and 73rd Avenue NE	SR 522 to/from Kenmore Park-and Ride garage to eastbound platform	Higher pedestrian volume across SR 522 at 73rd Avenue NE would conflict with westbound right turn. Recommend to pull back the westbound stop bar to increase visibility of crossing pedestrians at this angled crossing. Consider prohibiting right-turn on red for westbound movement during pedestrian crossing phase.

5.3.5 Nonmotorized transportation

Nonmotorized improvements in the Kenmore segment are associated with the BRT platforms, as shown in Figure 1-5. These improvements and their potential effect on pedestrians and bicycles are described below. The proposed project improvements would result in a net benefit to nonmotorized transportation, and no impacts are anticipated.

At the 61st Avenue NE Station, the westbound platform would be 10 feet deep and the eastbound platform would be 12 feet deep. The sidewalk facility would continue along the station platform. A pedestrian and bicycle facility is provided by the Burke-Gilman Trail on the south side of SR 522.

At the 68th Avenue NE Station, the westbound platform would be 10 feet deep and the eastbound platform would be 12 feet deep. The sidewalk facility would continue along the station platform to the existing sidewalks. A pedestrian and bicycle facility is provided by the Burke-Gilman Trail on the south side of SR 522.

At the Kenmore Park-and-Ride garage, the plaza area between the westbound platform and the bus bays on the ground-floor transit center within the garage would provide for general pedestrian movement for transferring riders. The westbound platform would be 10 feet deep. The eastbound platform at the far side of 73rd Avenue NE would be 12 feet deep, and a pedestrian and bicycle facility could be provided behind the platform. The Burke-Gilman Trail is on the south side of SR 522, with access near the platform.

Reconstructed signalized intersections would result in upgrading the signal equipment to current pedestrian and accessibility standards, and an improvement of pedestrian conditions. There are six signalized intersections in this segment that would have project signal modifications, which would improve pedestrian crossing safety.

There could be an increase in bicycle volumes to and from the BRT stations with increased ridership. The platform length is being designed to allow for bike racks on the front of the buses. Bike lockers would be available at the Kenmore Park-and-Ride garage. Bicycle access to the station platforms would primarily use the Burke-Gilman Trail that is parallel to SR 522 on the east side.

For each approach to the platform, the bicyclists would ultimately dismount and walk their bicycles to the platform to park their bicycles or load them onto the bus. The Draft Station Design Guidelines identify bike hoops for bicycle parking at BRT platforms. Confident riders could be expected to stay on their bicycles until arriving to the station platform. More conservative bicycle riders could be expected to dismount before reaching the platform and walk their bicycles using pedestrian crosswalks to arrive at the station platform. Bicyclists leaving the platform would walk their bicycles and use crosswalks until they reach the location where they choose to mount their bicycles and begin riding.

5.4 Segment 4: Bothell

The BRT route in the Bothell segment follows SR 522 to 98th Avenue NE, follows 98th Avenue NE and NE 185th Street from 98th Avenue NE to Beardslee Boulevard, and then goes along Beardslee Boulevard to I-405. The proposed BRT route in Bothell is through the downtown core in mixed traffic on streets with on-street parking, pedestrian activity, and lower speeds.

Transit treatments in the Bothell segment of SR 522 would include construction of a center bus-only lane from north of 96th Avenue NE to 98th Avenue NE. A second bus-only left-turn lane would be provided from the center bus-only lane to northbound 98th Avenue NE. The project includes intersection traffic control modifications on Bothell city streets to improve BRT travel time and reliability while operating in mixed traffic.

Table 5-15 presents a list and description of the proposed project components in the Bothell segment. The project would include revisions to intersection control and channelization on Bothell city streets.

The proposed park-and-ride garage is located south and west of Thorsk Street and Pop Keeney Way. The Sound Transit project would be a 300-stall park-and-ride garage. The City of Bothell Municipal code would require retail and office space at this site that could be implemented as a joint development project with private investment for the retail and office space.

Table 5-15 Bothell segment proposed project components

SEPA checklist component number	Component[1]	Project component description
10	SR 522 eastbound center-running bus-only lane from north of 96th Avenue NE to 98th Avenue NE	Eastbound center-running bus-only lane beginning approximately 1,300 feet north of 96th Avenue NE intersection (Wayne's Curve) and extending to 98th Avenue NE, plus sidewalk and buffer strip on the east side of SR 522.
10	SR 522 southbound U-turn south of Hall Road	A southbound U-turn on SR 522 approximately 1,000 feet south of Hall Road
	SR 522 at NE 180th Street	Shift road slightly to the west to continue center-running bus-only lane while maintaining general-purpose northbound left-turn lane. Northbound-to-southbound U-turn from general-purpose left-turn lane.
10	SR 522 at 98th Avenue NE	Additional eastbound bus-only left-turn lane at 98th Avenue NE that extends from the center-running bus-only lane.
11	BRT station on 98th Avenue NE at NE 183rd Street	Northbound near-side double-bus-length platform at sidewalk level. Platform is split by a driveway until future development occurs. Southbound far-side platform at sidewalk level that is a double-bus-length platform.
11	98th Avenue NE at NE 183rd Street	Modify 98th Avenue NE and NE 183rd Street as two-way stop control for the east-west movement.
12	98th Avenue NE and NE 185th Street between SR 522 and Bothell Way	Widen travel lane for BRT. Parking eliminated for sections on 98th Avenue NE between NE 183rd Street and Pop Keeney Way. Reconstruct curb and gutter with painted buffer between through lane and parking lane starting east of Pop Keeney Way to Bothell Way NE. Modify existing raised median.
12	Bothell Park-and-Ride garage	300-stall garage at Lot P South. Office and retail uses could be included as a joint development project.
12	NE 185th Street at Bothell Way NE	At the approach to Bothell Way NE, some parking on the north side of the street would be eliminated to retain the eastbound-to-northbound left-turn lane and two 11-foot travel lanes.
13	NE 185th Street at 101st Avenue NE	Modify 185th Avenue NE and 101st Avenue NE to be two-way stop control for the north-south movement.
14	NE 185th Street at 102nd Avenue NE	Add an eastbound-to-southbound right-turn pocket.
15	BRT station on NE 185th Street at 104th Avenue NE	Far-side platform in both directions, both double-bus-length platforms. Platforms at sidewalk level. On-street parking removed in this vicinity.
15	NE 185th Street at 104th Avenue NE	Add an eastbound-to-southbound right-turn pocket. Add a westbound-to-northbound right-turn lane. Restrict parking as needed. New traffic signal.

SEPA checklist component number	Component[1]	Project component description
16	Intersection improvement at NE 185th Street and Beardslee Boulevard	New traffic signal, crosswalks, and traffic island. Northbound left-turn pocket for fire station. On-street parking along southeast side removed with roadway reconstruction. Restrict northbound-to-westbound left turn from Beardslee Boulevard onto NE 185th Street.
16	BRT station at UW Bothell/Cascadia College	BRT station on Beardslee Boulevard would be midblock near Husky Village. Double-bus-length platforms at sidewalk level. Southbound platform is temporary. Pedestrian RRFB for crossing.
17	BRT station on Beardslee Boulevard at NE 195th Street/I-405	Northbound (eastbound travel) near-side platform, southbound (westbound travel) far-side platform. Sidewalk-level, single-bus-length platforms.
17	Beardslee Boulevard at NE 195th Street/I-405	Reconstruct existing curb line to accommodate in-lane BRT stops. Move existing bike lanes behind the platforms.
10 to 17	Transit signal priority	At signalized intersections where BRT coaches travel through the intersection.
10, 16	Leading pedestrian interval[2]	Recommended at NE 185th Street and Beardslee Boulevard.

(1) Figure of project components provided in chapter 1, Project Description

(2) Leading pedestrian interval (LPI). An LPI gives pedestrians an advance walk signal before the motorists get a green light, giving the pedestrian several seconds to start in the crosswalk where there is a concurrent signal.

5.4.1 Traffic operations

Traffic analysis in the Bothell segment was prepared for Bothell study intersections on SR 522 and Bothell city streets. Traffic analysis was prepared for the AM and PM peak hours using Synchro. The PM peak hour analysis includes the proposed garage in a location referred to as “Lot P South” on the west side of Pop Keeney Way. The site is currently vacant. Access to the garage would be via Thorsk Street.

The trip generation for the proposed park-and-ride garage is estimated based on existing data to determine the trip generation per stall for both exiting and entering trips. The PM peak hour trip generation for the proposed park-and-ride garage is presented in **Table 5-16**.

Table 5-16 Bothell Park-and-Ride garage PM peak hour trip generation

	Trip Generation Rate[1]		Number of Trips	
New parking stalls	Entering	Exiting	Entering	Exiting
300	.06	0.41	18	123

(1) Source: Parking Garage Traffic Impacts Methodology (Sound Transit 2019).

The ST Model was used to estimate the distribution of trips to their destinations by TAZs. The destination TAZs for the proposed Bothell Park-and-Ride garage are shown in **Figure 5-11**. For the Bothell garage, the destinations are distributed: 38 percent is the highest percentage destined to a zone to the east, and only 2 percent of trips would originate from the zone where the park-and-ride garage would be located.

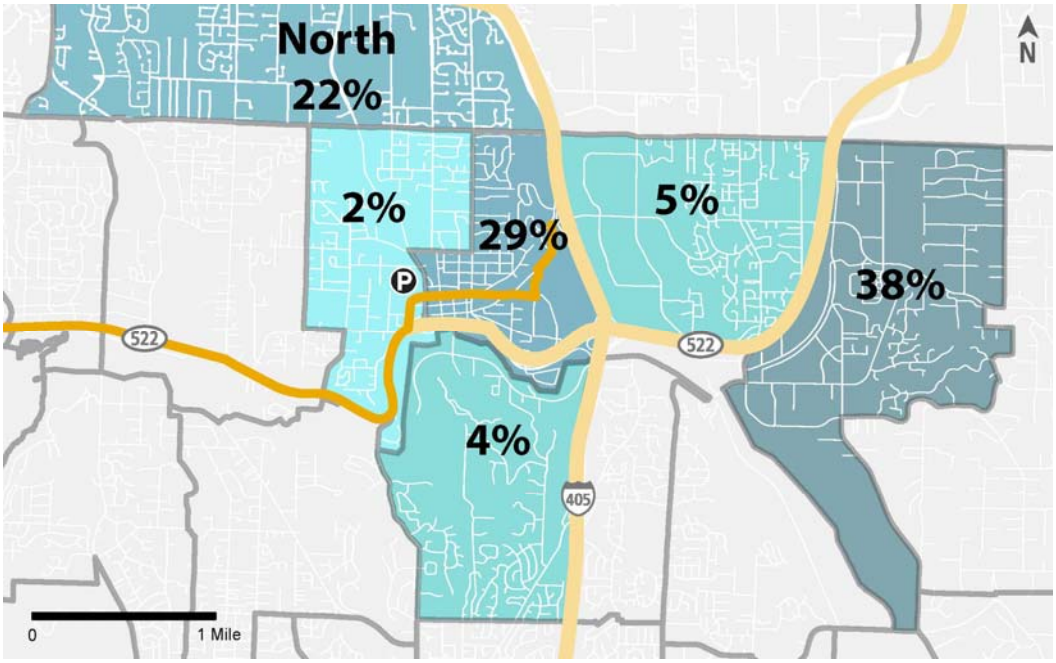

Figure 5-11 Bothell Park-and-Ride garage trip distribution

Trip distribution of traffic from the park-and-ride garage was assigned to the street network, as shown in **Figure 5-12**. The figure shows that there would be 27 PM peak hour trips to the north along Bothell Way NE, 52 trips to the east along SR 522, 5 trips to the south along 102nd Avenue NE across the river, 3 trips to the east using Thorsk Street, and 36 trips eastbound on NE 185th Street.

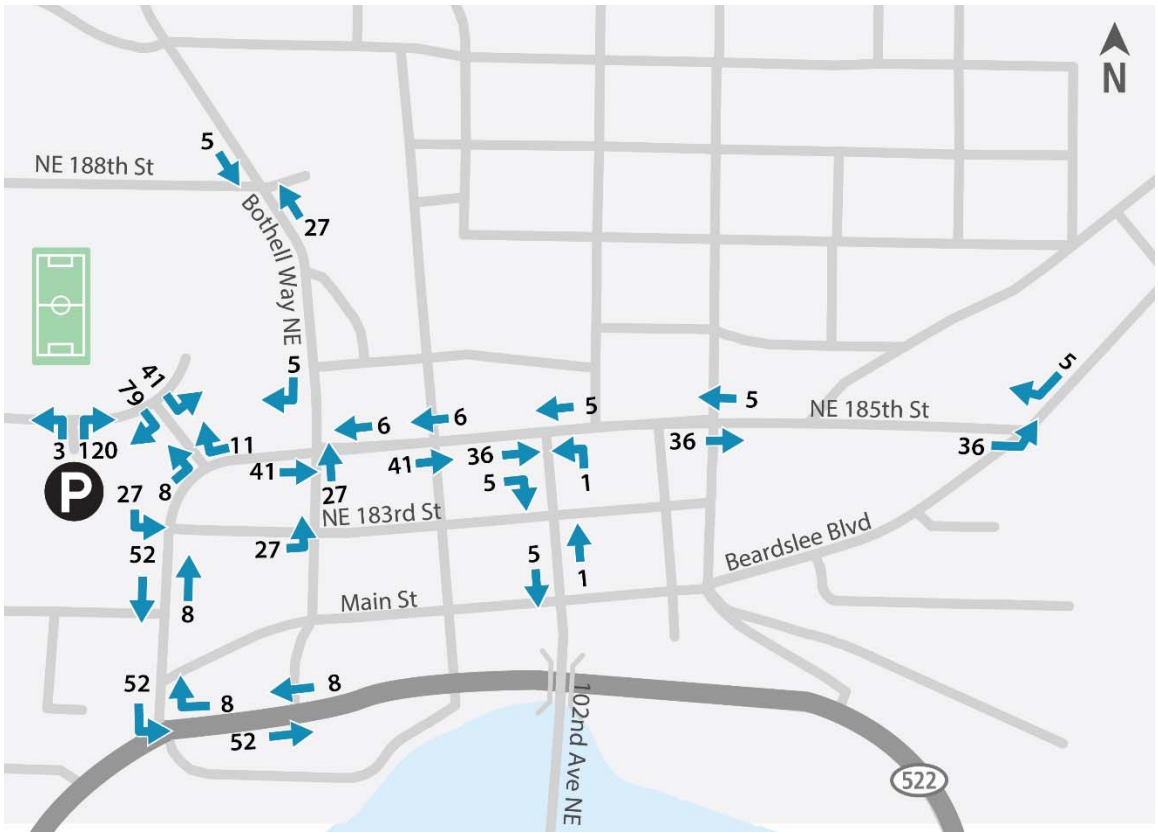

Figure 5-12 Bothell Park-and-Ride garage vehicle trip assignment

The park-and-ride garage could include retail and office space as a joint development with Sound Transit responsible for the ST3 300 stalls and a private developer responsible for the office and commercial space. There is currently no proposed retail and office project. Trip generation and traffic assignment for the retail and office space are based on the City of Bothell Municipal Code for mixed use development. The additional traffic was included in the analysis as a worst-case scenario of traffic generated from the park-and-ride garage site. However, the 2042 No-Build traffic forecasts represent approximately a full build-out of City of Bothell comprehensive plan land use designations.

Trip generation rates for the PM peak hours were determined by the *Trip Generation Manual*, 10th Edition (ITE 2020). For the proposed site in Bothell, Land Use Code #720 General Office Building was used to estimate the number of trips for the office space, and Land Use Code #820 Shopping Center was used to estimate the number of trips for the retail space. The estimated number of PM peak hour trips for the two land uses associated with the Bothell park-and-ride garage are shown in **Table 5-17**. The proposed development is estimated to have an additional 89 trips in the PM peak hour, 35 trips will enter the site and 54 trips will exit the site.

Table 5-17 Bothell Park-and-Ride garage retail and office trip generation

ITE Land Use Code[1]	Size[2]	PM		
		Enter	Exit	Total Trips
General Office Building (720)	17.93	3	18	21
Shopping Center (820)	17.93	32	36	68
Total		**35**	**54**	**89**

1) Trip Generation Manual, 10th Edition (ITE 2020)
2) 1,000 square feet

Trip distribution for the retail and office space is shown in **Figure 5-13**. The destinations are distributed based on general traffic patterns in the area, with 30 percent of trips traveling to/from the north, 30 percent of trips traveling to/from the east along SR 522, and 40 percent of trips traveling to/from the southwest along SR 522.

Figure 5-13 Bothell park-and-ride garage retail and office trip distribution

The routing for the Bothell retail and office space from the proposed park-and-ride site is shown in **Figure 5-14**. The retail and office uses would result in 16 new trips to the north along Bothell Way NE, 16 new trips to the east along SR 522, and 22 new trips to the west along SR 522. The inbound trip distribution would result in 10 new trips from the north along Bothell Way NE, 11 new trips from the east along SR 522, and 14 new trips from the west along SR 522.

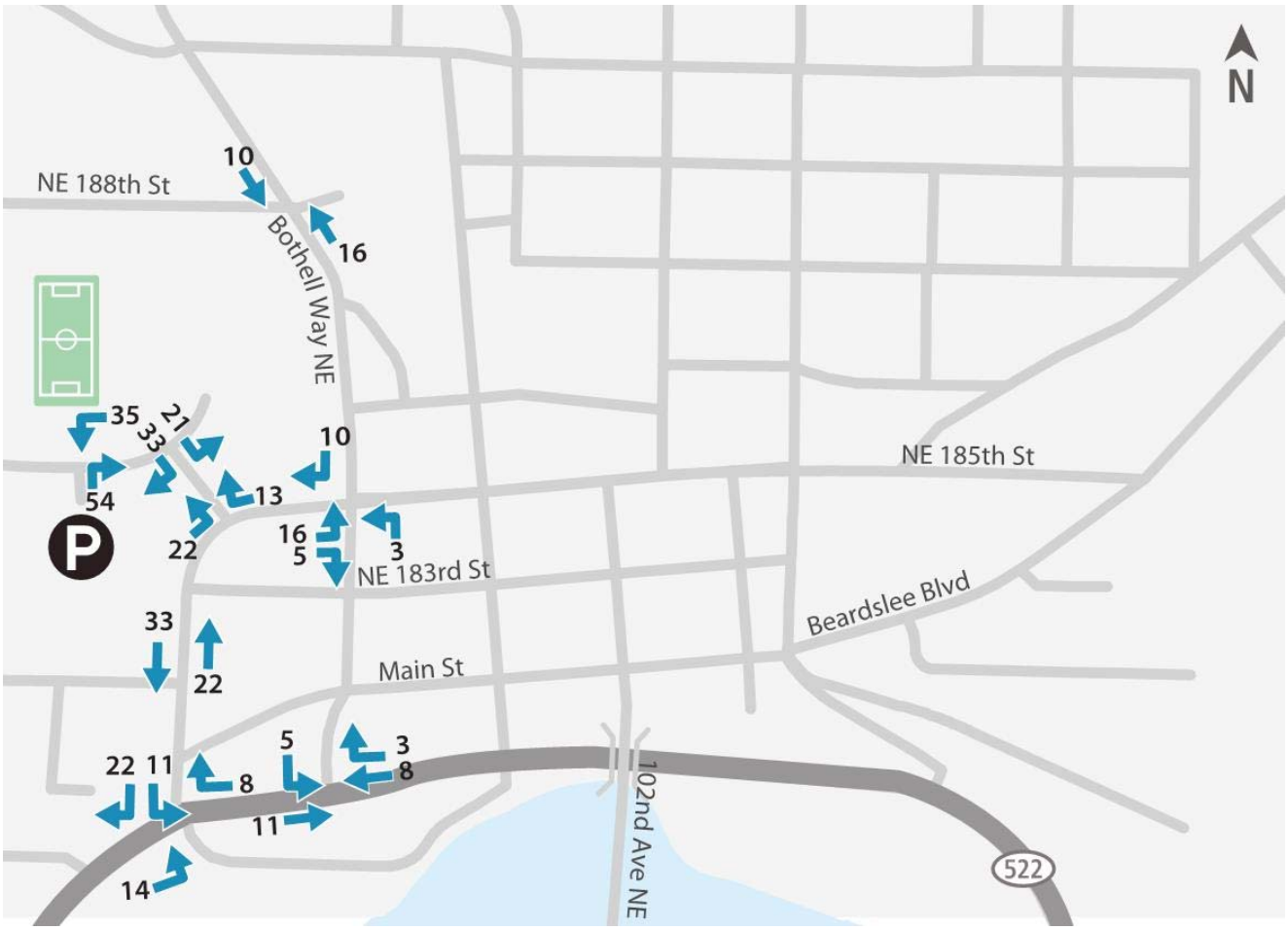

Figure 5-14 Bothell Park-and-Ride garage retail and office traffic assignment

Figure 5-15 presents intersection LOS and delay for the Future Build AM peak hour, and **Figure 5-16** shows the intersection LOS and delay for the Future Build PM peak hour, for the ST3 project components in the Bothell segment.

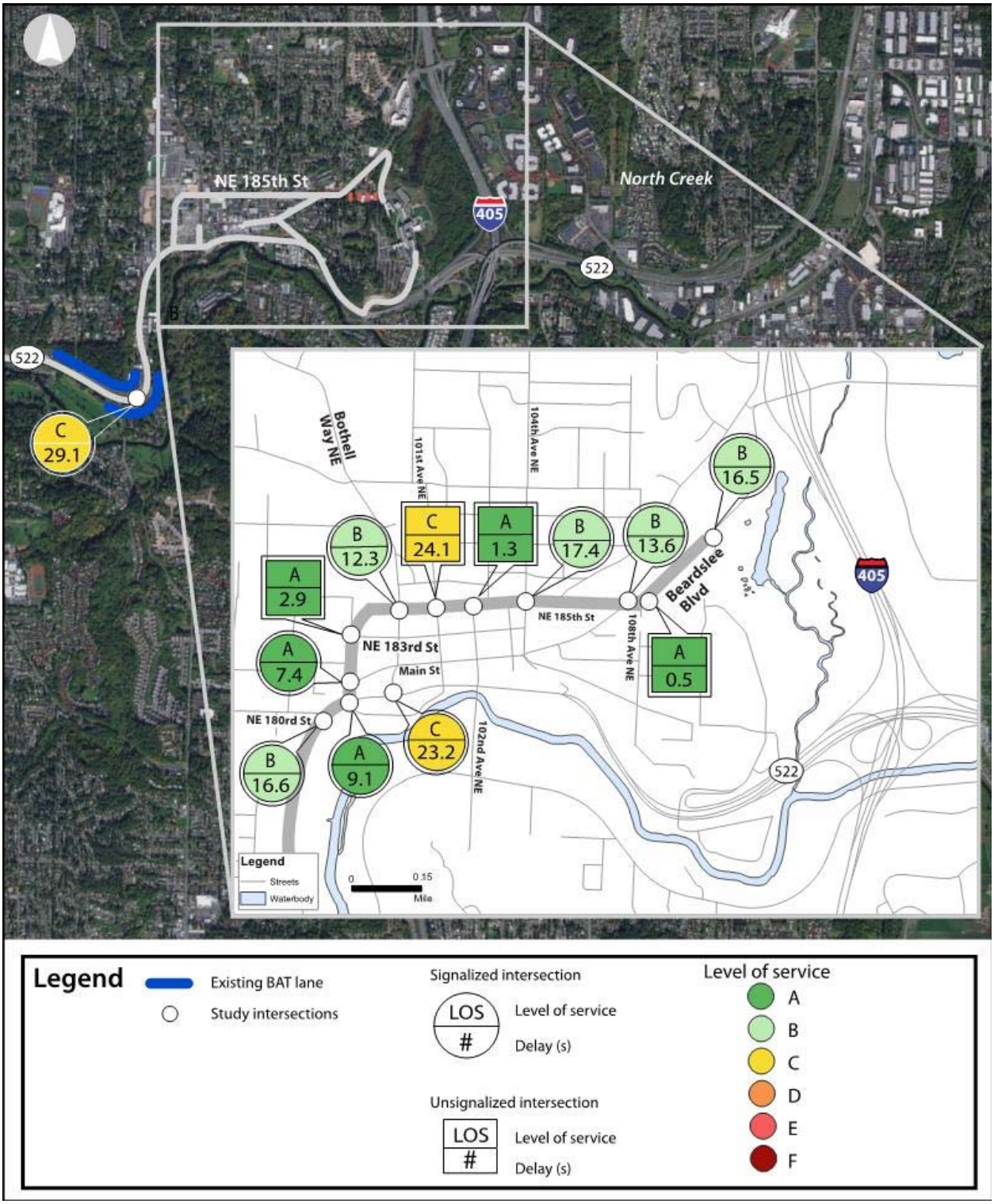

Figure 5-15 Bothell 2042 Build AM peak hour LOS and delay

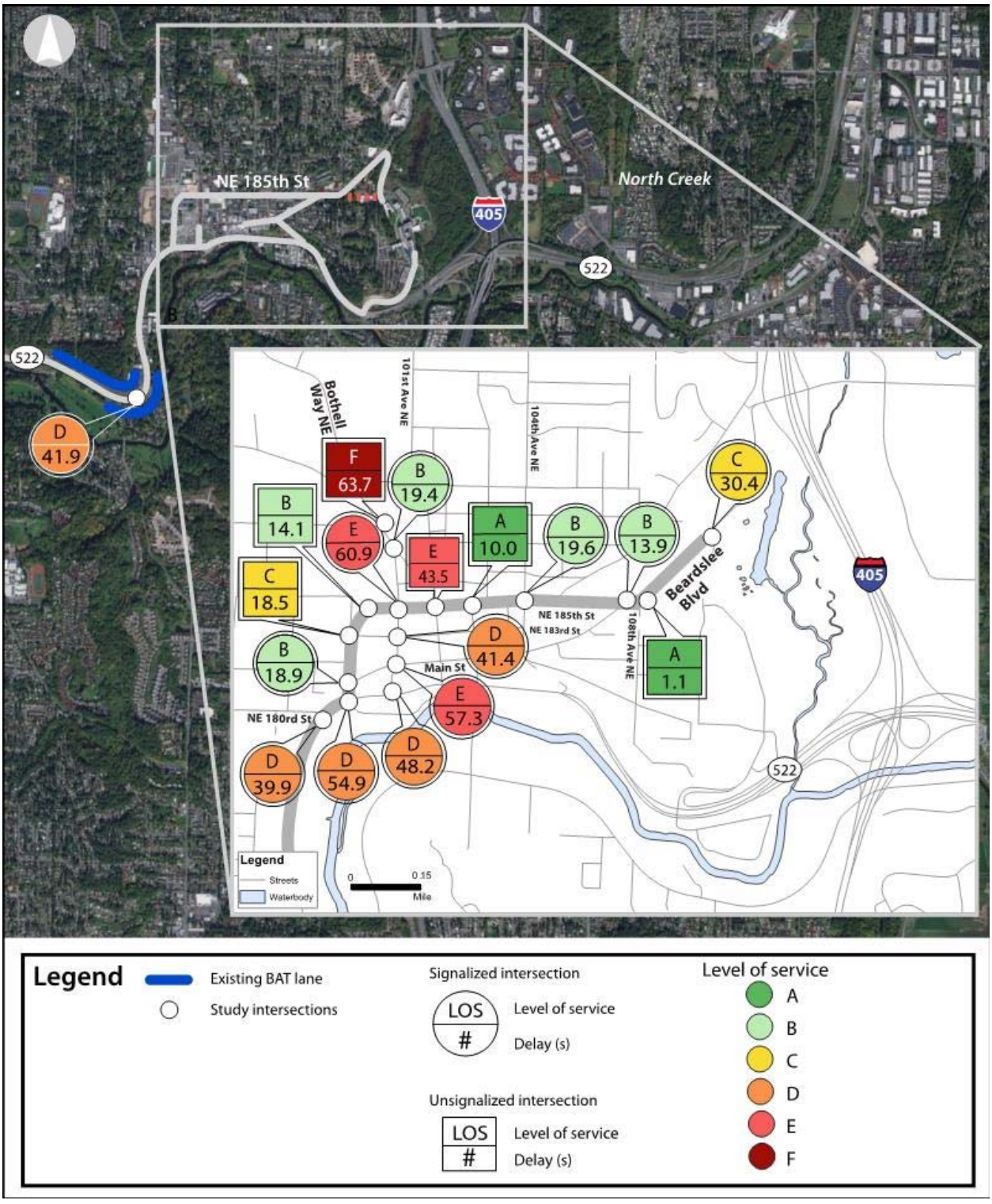

Figure 5-16 Bothell 2042 Build PM peak hour LOS and delay

Table 5-18 presents the AM peak hour and PM peak hour intersection delay and LOS, and compares the Future No-Build and Future Build conditions. Within the Bothell segment, the study intersections would operate at LOS C or better during the AM peak hour for the Future No-Build and Build conditions.

Table 5-18 Bothell 2042 intersection delay and LOS

Intersection	AM Peak Hour				PM Peak Hour			
	No-Build		Build		No-Build		Build	
	Delay[1]	LOS	Delay	LOS	Delay	LOS	Delay	LOS
SR 522 and 96th Avenue NE	29.3	C	29.1	C	41.6	D	41.9	D
SR 522 and NE 180th Street	15.9	B	16.6	B	37.1	D	39.9	D
SR 522 and 98th Avenue NE	8.3	A	9.1	A	51.7	D	54.9	D
Woodinville Drive (SR 522) and Bothell Way NE	22.2	C	23.2	C	56.1	E	48.2	D
98th Avenue NE and Main Street	6.3	A	7.4	A	18.0	B	18.9	B
98th Avenue NE and NE 183rd Street[2]	7.5	A	2.9	A	13.8	B	18.5	C
NE 185th Street and Pop Keeney Way[2]	N/A[3]	N/A	N/A	N/A	4.0	A	14.1	B
NE 185th Street and Bothell Way NE	12.1	B	12.3	B	59.2	E	60.9	E
NE 185th Street and 101st Avenue NE[2]	14.2	B	24.1	C	86.9	F	43.5	E
NE 185th Street and 102nd Avenue NE[2]	1.4	A	1.3	A	16.9	C	10.0	A
NE 185th Street and 104th Avenue NE	23.6	C[2]	17.4	B	81.9	F[2]	19.6	B
NE 185th Street and Beardslee Boulevard	14.2	B	13.6	B	10.4	B	13.9	B
108th Avenue NE and Beardslee Boulevard[2]	0.5	A	0.5	A	1.0	A	1.1	A
110th Avenue NE and Beardslee Boulevard[2]	16.4	B	16.5	B	30.1	C	30.4	C
NE 188th Street and Bothell Way NE[2]	N/A	N/A	N/A	N/A	64.9	F	63.7	F
Reder Way and Bothell Way NE	N/A	N/A	N/A	N/A	17.7	B	19.4	B
Bothell Way NE and Main Street	N/A	N/A	N/A	N/A	66.4	E	57.3	E
Bothell Way NE and NE 183rd Street	N/A	N/A	N/A	N/A	45.3	D	41.4	D

(1) Seconds of delay (wait times) that vehicles would experience at intersections.
(2) Unsignalized intersection.
(3) N/A (not applicable) refers to intersections not analyzed during AM peak hours. These intersections were analyzed for the park-and-ride garage during the PM peak hour.

There would be an overall improvement in traffic conditions with the proposed project in the Bothell segment. Intersection operations for Future No Build and Build conditions, at LOS E and LOS F, are described below.

At the intersection of SR 522 and Bothell Way NE, during the PM peak hour, the intersection would operate at LOS E in the Future No-Build condition. This LOS would occur because 20

percent of the eastbound-to-northbound left-turn traffic volume at SR 522 and 98th Avenue NE is assumed to divert to the intersection of SR 522 and Bothell Way NE. The 2042 future left-turning traffic volume would reach the capacity of the dual left-turn lane (shared with BRT) at SR 522 and 98th Avenue NE, and therefore it was assumed that drivers would choose to travel eastbound through the intersection at 98th Avenue NE and make their left turn at Bothell Way NE. In addition, it was assumed that drivers traveling eastbound on SR 522 with destinations on Bothell Way NE would prefer to travel on Bothell Way rather than on 98th Avenue NE. In the Future Build conditions, the intersection of SR 522 and Bothell Way NE is estimated to operate at LOS D during the PM peak hour and to have approximately 8 seconds reduction in average vehicle delay with changes in signal timing and coordination.

At the intersection of 98th Avenue NE and Main Street, a signal is assumed in the Future No Build condition as a result of the high PM peak hour volumes in 2042. The intersection would operate at LOS F, with severe delays, as an unsignalized intersection in both the Future No Build condition and the Build condition during the PM peak hour. As a signalized intersection, the level of service would be LOS B for the Future No Build condition and the Future Build condition for the PM peak hour.

At the intersection of NE 185th Street and Bothell Way NE, during the PM peak hour, the signalized intersection would operate at LOS E for both the Future No-Build condition and the Build condition, with approximately the same average vehicle delay.

At the intersection of NE 185th Street and 101st Avenue NE, during the PM peak hour, the unsignalized intersection level of service would improve from LOS F to LOS E, with approximately 43 seconds reduction in delay per vehicle. The reduction in delay would result from converting the four-way stop-controlled intersection in the Future No-Build condition to a two-way stop-controlled intersection in the Future Build condition, and the major traffic movement would be free flow.

At the intersection of NE 185th Street and 104th Avenue NE, during the PM peak hour, the unsignalized intersection in the Future No-Build condition would operate at LOF F, and the signalized intersection in the Future Build condition is estimated to operate at LOS B.

At the intersection of NE 188th Street and Bothell Way NE, during the PM peak hour, the unsignalized intersection would operate at LOS F for the Future No-Build and Future Build conditions, with approximately the same average vehicle delay.

At the intersection of Bothell Way NE and Main Street, during the PM peak hour, the signalized intersection would also operate at LOS E for both the Future No-Build condition and the Build condition, with a decrease in delay of approximately 9 seconds per vehicle due to signal timing changes to give the increase in traffic volume on Main Street more green time. Implementation of TSP would affect signal timing as green time is allocated to the bus movement. Signal timing, which includes the amount of green time dedicated to transit priority, is refined when the design of the signal occurs and would include the signal phasing and timing plans for implementation. These activities would occur in coordination with WSDOT and the City of Bothell.

5.4.2 Freight movement

The project design maintains the existing general-purpose traffic capacity, lane widths and curb return radii. There would be no impacts to truck mobility expected in this segment. The BRT route on Bothell city streets is not on City of Bothell truck routes, and there would be no impact to freight movement from the proposed project.

5.4.3 Parking

There is no on-street parking on SR 522 with the proposed improvements in this segment; therefore, there would be no displacement of parking in this project segment.

The proposed 300-stall park-and-ride garage would be located on an undeveloped lot, and no parking spaces would be displaced by the proposed garage.

On Bothell city streets, the following changes to on-street parking would occur:

- Up to six on-street parking spaces would be displaced on the southeast side of 98th Avenue NE between NE 183rd Street and around the curve to NE 185th Street to provide for a wider lane and safe mobility for BRT coaches.
- One parking space would be displaced on the south side of NE 185th Street near the intersection with Bothell Way NE.
- Up to eight on-street parking spaces would be displaced on the north side of NE 185th Street, west of Bothell Way NE.
- On NE 185th Street between 101st Avenue NE and Ross Road, up to 11 on-street parking spaces would be displaced, 7 on the south side and 4 on the north side, to accommodate the new turn lanes.
- At the redesigned intersection of NE 185th Street and Beardslee Boulevard, up to 17 on-street parking spaces would be removed to accommodate the intersection design with through-lane tapers and the new left-turn lane into the fire station. The displaced parking on the southeast side would include the proposed Husky Village development frontage improvements.

The parking spaces removed result from the proposed project improvements that provide for safe, bidirectional movement of buses along Bothell's Transit Priority Corridor (Bothell 2015). Sound Transit is currently working with the City of Bothell to identify strategies for replacing certain on-street parking stalls where required per development agreements.

5.4.4 Safety

Segment 4 along SR 522 is expected to experience a comparable number of vehicle crashes as those associated with the traffic volumes and congestion with the No-Build conditions. The proposed BAT lane on SR 522 would remove buses from general-purpose traffic lanes and may result in a reduced number of vehicle crashes on SR 522. Along Bothell city streets, the project would include construction of signal control at NE 185th Street and Beardslee Boulevard that could improve safety with increased intersection control.

The concept design for SR 522 in Bothell and on Bothell city streets would result in changed conditions at intersections, including new signals, crosswalks, relocated curb returns, and new ADA curb ramps. There would be relatively minor changes in the pedestrian crossing distances and crossing time, as shown in **Table 5-19**. Walk times were calculated based on the MUTCD (USDOT 2009) using the standard of 3.5 feet per second as the normal speed and 3.0 feet per second for slower pedestrians.

At NE 185th Street and 104th Avenue NE, there would be an increase in the crossing distance of the east leg, resulting in approximately three seconds of additional walk time. All other walk times would have between zero and one second of an increase in walk time.

Table 5-19 Bothell crossing distance and walk time

Intersection	Existing	Build	Increase (decrease) in distance	Increase (decrease) in walk time (seconds)	
	Distance[1] (feet)			For a walking speed of:	
				3.5 feet/second[2]	3.0 feet/second[3]
SR 522 at NE 180th Street[4]					
West leg	82	82	0	0	0
East leg	79	82	3	1	1
North leg (180th)	66	69	3	1	1
SR 522 at 98th Avenue NE[4]					
West leg	80	82	2	1	1
East leg	81	81	0	0	0
South leg	48	48	0	0	0
North leg	63	65	2	1	1
NE 185th Street at Bothell Way NE[4]					
West leg	39	39	0	0	0
East leg	46	46	0	**0**	**0**
South leg	63 + 22[6]	63+22	0	0	0
North leg	58 + 22	58 + 22	0	0	0
NE 185th Street at 102nd Avenue NE[5]					
South leg	42	44	2	1	1
NE 185th Street at 104th Avenue NE[4]					
West leg	40	45	5	1	2
East leg	37	46	9	3	3
South leg	35	39	4	1	1
North leg	39	43	4	1	1
NE 185th Street at Ross Road[5]					
North leg	No crosswalk	44		0	0
NE 185th Street at Beardslee Boulevard[4]					
West leg	52	27			
South leg	No crosswalk	44	0	0	0
Beardslee Boulevard at UW Bothell/Cascadia College Station[5]					
South leg	49	49	0	0	0

(1) Source: Bothell Civil Roadway draft conceptual design plan, 9/25/2020.
(2) Pedestrian walking speed, Manual of Uniform Traffic Control Devices (MUTCD) (USDOT 2009).
(3) Walk speed for slower pedestrians (USDOT 2009).
(4) Signalized intersection.
(5) Unsignalized intersection. No existing ADA curb ramps.
(6) Crossing of Bothell Way NE includes crossing the travel lanes and the collector/distributor parking lane on the east side of Bothell Way NE.

An increase in ridership is expected with BRT Stride service and increases in Metro service, as well as the additional park-and-ride capacity. The increase in ridership would result in additional pedestrian volume accessing the stations.

Implementation of a leading pedestrian interval, or LPI, at signalized intersections was considered to enhance pedestrian safety. An LPI at a signalized intersection would give pedestrians an advance walk signal before the motorist gets a green light, giving the pedestrian several seconds to start in the crosswalk where there is a concurrent green phase for the motorist. This earlier start for pedestrians crossing improves pedestrian visibility to drivers making a right turn, and drivers are more likely to yield to the pedestrian.

Proposed locations for implementing LPIs as a safety enhancement are based on details of the crash history, at BRT stations where pedestrian crossing volumes would increase, and/or at locations where the crossing distance is wider with the proposed BRT project. Crash history is an important factor in a safety assessment but does not necessarily reveal changes in risk to nonmotorized movement that could occur with changes in street geometry and operations. A list of recommended LPI locations is provided in **Figure 5-20**. Implementation of LPI would occur with approval of and in coordination with the City of Bothell. With proposed project improvements, there would be no safety impacts anticipated.

Table 5-20 Proposed leading pedestrian interval locations – Bothell

Location	Crossing	Safety review of pedestrian crashes
NE 185th Street and Beardslee Boulevard	All legs of intersection for access to BRT stations	Higher pedestrian and bicyclist area, especially east-west crossing.

5.4.5 Nonmotorized transportation

Nonmotorized improvements in the Bothell segment are shown in **Figure 1-6**. These improvements and their potential effect on pedestrians and bicycles are described below. The proposed project improvements would result in a net benefit to nonmotorized transportation, and no impacts are anticipated.

- A new 6-foot sidewalk with a 5-foot landscape buffer would be constructed along the south side of SR 522.
- The intersection of NE 185th Street and 104th Avenue NE would be signalized, providing traffic control for pedestrians crossing to the BRT station platforms.
- New sidewalk would be constructed on the north side of NE 185th Street between 104th Avenue NE and Ross Road, and would continue for a short distance east of Ross Road. New ADA curb ramps would be provided on at both corners on the north side of NE 185th Street at Ross Road.
- The intersection improvements at NE 185th Street and Beardslee Boulevard would include new and reconstructed sidewalks on the north side of NE 185th Street and Beardslee Boulevard and on the southeast side of Beardslee Boulevard. The intersection would be signalized, providing traffic control for pedestrian crossings.

- New ADA curb ramps would be constructed at intersections modified with the proposed project.

- Reconstructed signalized intersections would result in upgrading the signal equipment to current pedestrian and accessibility standards, and an improvement of pedestrian conditions.

The 98th Avenue NE Station would be located between NE 183rd Street and NE 182nd Street. The southbound platform would be 10 feet deep. The platform would be at curb height, and the sidewalk would continue along the station platform. In the northbound direction, the BRT coach would stop at the existing bus stop, and the sidewalk would continue along the bus loading area. Pedestrian crossings of 98th Avenue NE to access the platforms would occur using the existing crosswalk.

The 104th Avenue NE Station westbound platform would be 10 feet deep and would have a pedestrian facility behind the platform. The design would be compatible with future development in the northwest quadrant and an existing pedestrian path that connects on the north side of the platform. The eastbound platform would be 8-1/2 feet deep. The sidewalk facility would continue along the station platform. The platform would be at sidewalk level.

At the UW Bothell/Cascadia College Station, on Beardslee Boulevard, the westbound platform would be a temporary station until adjacent development and road widening occurs. The eastbound platform would be 12 feet deep and at curb height. Pedestrian, and bicycle facilities would pass behind the platform (this platform would be constructed by adjacent development). The BRT station is mid-block and a crosswalk with a pedestrian hybrid beacon (HAWK beacon) would be provide between the station platforms.

The Beardslee Boulevard Station platforms would be 12 feet deep in both directions. The westbound platform would have a 10-foot pedestrian and bicyclist facility behind the station. At the eastbound platform, the sidewalk facility would continue along the front of the platform, and a bicycle facility would be provided behind the platform. There would be no crosswalk at the station platforms due to limited sight distance. Pedestrian crossings would occur at the intersection of Beardslee Boulevard and the I-405 southbound ramps.

There could be an increase in bicycle volumes to and from the BRT stations with increased ridership. The platform length is designed to allow for bike racks on the front of the buses. Bike lockers would be available at the Bothell Park-and-Ride garage.

Bicycle access to the station platforms would use city streets. For each approach to the platform, the bicyclists would ultimately dismount and walk their bicycles to the platform to park their bicycles or load them on the bus. The Draft Station Design Guidelines identify bike hoops for bicycle parking at BRT platforms. Confident riders could be expected to stay on their bicycles until arriving at the station platform. More conservative bicycle riders could be expected to dismount before reaching the platform and walk their bicycles using pedestrian crosswalks to arrive at the station platform. Bicyclists leaving the platform would walk their bicycles and use crosswalks until they reach the location where they choose to mount their bicycles and begin riding.

5.5 Transit operations

The project components include new roadway and intersection transit treatments and BRT stations to achieve the speed and reliability of a BRT system. The SR 522/NE 145th BRT would replace ST Express Route 522.The proposed project stations would be shared with Metro and local Community Transit service. In Bothell, Community Transit does not currently plan to share the Stride BRT stations. Shared facilities result in the following design features in the corridor:

- Station platforms typically would be 142 feet long to accommodate two coaches—one BRT and one local service coach—on a shared platform. Some variances in platform lengths could occur due to design constraints. The station platforms would be 6 inches high to match sidewalk levels for the Bothell station platforms. The 6-inch height (rather than 9 inches for near-level boarding by BRT) would provide for shared BRT and local coach service. Off-board payment for Sound Transit service would provide for boarding from all three doors and also would reduce dwell time.

- In concert with the SR 522/NE 145th BRT Project, Metro is planning stop consolidation to improve speed and reliability along the corridor. The *522 BRT Bus Stop Rebalancing Plan – Proposed 2024* (Metro 2020) is the basis for identification of stop consolidation with the proposed project. The effects of stop consolidation on rider access to transit are presented below, by project segment, for the Future Build conditions.

5.5.1 Segment 1: Seattle/Shoreline

In Segment 1, NE 145th Street is planned to operate as a local transit corridor with overlay Stride service. Metro's future transit service assumptions are currently being revised as part of the North Link Connections Mobility Project and an update to *METRO CONNECTS*. (Metro 2021). Metro Route 65 or a similar route would be extended to the Shoreline South/NE 148th Link light rail station in 2024, providing local stops along NE 145th Street with a frequent connection to Link light rail. This service is planned to operate at similar service levels to Route 65 today and would have 10-minute headways for most hours of the day. The new transit queue bypass lane segments and TSP at signalized intersections on NE 145th Street would reduce BRT and bus travel time, and improve reliability, resulting in improved service for transit riders. The north-south local bus movements at 15th Avenue NE would also result in decreased delay due to the intersection and signal improvements.

Changes to transit stops are shown in **Figure 5-17**, and changes to stops and service providers for this segment are presented in **Table 5-21**.

Note: Components shown on this figure would all be located along NE 145th Street. Offset shown is due to limitation of graphic.

Figure 5-17 SR 522/NE 145th BRT stations and bus stops on NE 145th Street

Table 5-21 NE 145th Street transit stops and service for No-Build and Build conditions

Stop Location	No-Build		Build	
	Type	Transit service[1]	Type	Transit service[1]
Shoreline South/NE148th Street	Light rail transit with bus bays	Link, Metro	Light rail transit with BRT station	Link, BRT, Metro
Sixth Avenue NE (unsignalized)	Bus stop	Metro	Removed[2]	
12th Avenue NE (unsignalized)	Bus stop	Metro	Removed	
15th Avenue NE	Bus stop	Metro	BRT station	Stride, Metro
19th/20th Avenue NE	Bus stop	Metro	Bus stop	Metro
23rd Place NE (unsignalized)	Bus stop	Metro	Removed	
25th Avenue NE	Bus stop	Metro	Bus stop	Metro
27th Place NE (unsignalized)	Bus stop	Metro	Removed	
30th Avenue NE	Bus stop	Metro	BRT station	Stride, Metro
NE 145th Street (westbound) at 32nd Avenue NE (unsignalized)	Bus stop	Metro	Removed	

(1) Sound Transit Link Light Rail (Link), Sound Transit Express (ST Express) and King County Metro (Metro) transit routes serving each stop are provided in Section 3.5, Existing transit conditions.

(2) Source: Metro 2020 (map).

BRT stations that would be shared with Metro would provide improved waiting areas, lighting and rider information. Planned Metro stop consolidation would result in improved speed and reliability for BRT and Metro service, because the removed stops would reduce the frequency of BRT coaches being stopped behind Metro coaches at Metro bus stops.

Removal of bus stops may increase rider walk distance to a bus stop for some riders, but each bus stop removed would be no more than 0.25 mile from a BRT station. Bus stops that would be removed have a low volume of daily boardings. Stop consolidation would remove Metro bus stops at unsignalized intersections, and BRT stations would be at signalized intersections, thus providing riders with a controlled crossing of NE 145th Street. Riders on the bus would experience a decrease in travel time and increase in reliability of bus service with fewer bus stops, because the BRT coach would not be stopped behind local coaches at each stop. Less dwell time at stops would also result in reduced travel time for riders and improved reliability.

5.5.2 Segment 2: Lake Forest Park

SR 522 through Lake Forest Park is planned to operate as a shared BRT and express bus corridor. Metro's future transit service assumptions are currently being revised as part of the

North Link Connections Mobility Project and an update to *METRO CONNECTS*. (Metro 2021). Metro Routes 309 and 372 would continue to operate in this segment. Changes to transit stops are shown in **Figure 5-18**, and changes to stops and service providers for this segment are presented in **Table 5-22**.

Figure 5-18 SR 522/NE 145th BRT stations and bus stops in Lake Forest Park

Table 5-22 SR 522 Lake Forest Park transit stops and service for No-Build and Build conditions

Stop Location	No-Build		Build	
	Type	Transit service[1]	Type	Transit service[1]
SR 522 (eastbound) north of NE 145th Street	Bus stop	Metro, ST Express	BRT station	Stride, Metro
NE 153rd Street	Bus stop	Metro, ST Express	BRT station	Stride, Metro
39th Avenue NE (southbound only, unsignalized)	Bus stop	Metro	Removed[2]	
NE 165th Street	Bus stop	Metro, ST Express	BRT station	Stride, Metro
Lake Forest Park eastbound far side of 45th Avenue NE	Bus stop	Metro, ST Express	Removed	
Lake Forest Park Town Center	Bus stop	Metro, ST Express	BRT station	Stride, Metro

(1) Sound Transit Express (ST Express) and King County Metro (Metro) transit routes serving each stop are provided in Section 3.5, Existing transit conditions.
(2) Source: Metro 2020 (map).

The new northbound BAT lane with TSP at signalized intersections on SR 522 would reduce BRT and bus travel time and improve reliability of bus service in the Lake Forest Park segment, resulting in improved service for transit riders.

BRT stations that would be shared with Metro would provide improved waiting areas, lighting and rider information. Metro stop consolidation would result in improved speed and reliability for BRT and Metro service, because the removed stops would reduce the frequency of BRT coaches being stopped behind Metro coaches at Metro bus stops.

A southbound-only bus stop would be removed at 39th Avenue NE under Metro's *522 Bus Stop Rebalancing Plan – Proposed 2024* (Metro 2020). This bus stop is at an unsignalized location. The BRT NE 165th Street Station would be approximately 0.35 mile to the north, and the NE 153rd Street Station would be approximately 0.33 mile to the south. Riders could walk on parallel local streets to the NE 165th Street Station. Fewer direct local street options exist to the NE 153rd Street Station. The new northbound BAT lane between NE 145th Street and Brookside Boulevard NE would include a new 8-foot sidewalk and a 4-foot landscape buffer to be used for pedestrians to access the BRT stations.

There are currently three bus stops in the vicinity of Lake Forest Park Town Center, and Metro plans to remove one bus stop with the implementation of BRT. Sidewalks and signalized intersections are available for changes in rider walk routes to the BRT station.

5.5.3 Segment 3: Kenmore

SR 522 through Kenmore is planned to operate as a shared BRT and Metro express bus corridor. Metro's future transit service assumptions are currently being revised as part of the North Link Connections Mobility Project and an update to *METRO CONNECTS*. (Metro 2021). The preliminary transit service network concept includes limited stop between the Kenmore Park-and-Ride lot and South Lake Union in Seattle (similar to Metro Route 309 but with all-day two-way service) as well as service between UW Bothell/Cascadia College and UW Seattle (Metro Route 372 or a similar service). Metro route 312 would truncate at the Kenmore Park-and-Ride.

The travel time and reliability of BRT buses would be improved with implementation of TSP at intersections. The ST3-proposed park-and-ride garage in this segment would be located at the existing Kenmore Park-and-Ride lot, and would have the Metro transit function on the ground floor. Planned Metro facilities would include two active bays, one paratransit bay and nine layover bays. This portion of the park-and-ride garage function remains unfunded. Changes to transit stops are shown in **Figure 5-19**, and changes to stops and service providers for this segment are presented in **Table 5-23**.

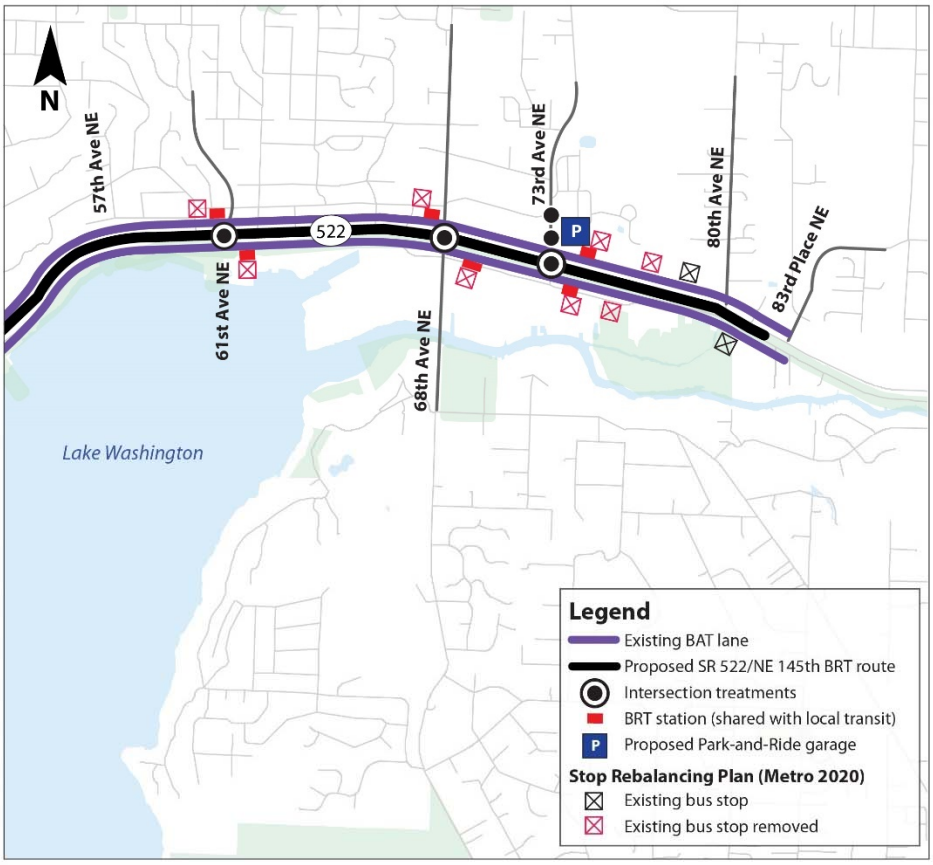

Figure 5-19 SR 522/NE 145th BRT stations and bus stops in Kenmore

Table 5-23 SR 522 Kenmore transit stops and service for No-Build and Build conditions

Stop Location	No-Build		Build	
	Type	Transit service[1]	Type	Transit service[1]
61st Avenue NE	Bus stop	Metro, ST Express	BRT station	Stride, Metro
68th Avenue NE	Bus stop	Metro, ST Express	BRT station	Stride, Metro
Kenmore Park-and-Ride lot eastbound at 73rd Avenue NE	Bus stop	Metro, ST Express	BRT station	Stride, Metro
Kenmore Park-and-Ride lot westbound at park-and-ride entrance	Bus stop	Metro	BRT station	Stride, Metro
77th Court NE	Bus stop	Metro	Removed[2]	
80th Avenue NE	Bus stop	Metro, ST Express	Bus stop	Metro

(1) Sound Transit Express (ST Express) and King County Metro (Metro) transit routes serving each stop are provided in Section 3.5, Existing transit conditions.

(2) Source: Metro 2020 (map).

BRT stations that would be shared with Metro would provide improved waiting areas, lighting and rider information. The Kenmore BRT stations would be located on SR 522. The BRT station at 61st Avenue NE would be 0.8 mile from the Lake Forest Park Town Center station, which is the same as existing conditions.

At the Kenmore Park-and-Ride Station, the westbound platform would be located adjacent to the garage on SR 522. Transfers between BRT and Metro service would occur between the active Metro bays—on the ground floor of the garage for Metro buses that start or end at the garage, and at the westbound platform for westbound Metro buses that remain on SR 522. The eastbound platform would be located on SR 522 on the east side (far side) of 73rd Avenue NE. Eastbound riders would cross at the signalized intersection to access the garage (either park-and-ride spaces or Metro service on the ground floor).

The bus stops at 77th Court NE would be removed with the 522 Bus Stop Rebalancing Plan – Proposed 2024 (Metro 2020). These bus stops are approximately 0.25 mile from the Kenmore Park-and-Ride lot. The intersection of 77th Court NE is a signalized intersection and provides riders a controlled crossing to walk to the Kenmore Park-and-Ride Station.

5.5.4 Segment 4: Bothell

The Bothell segment of BRT on SR 522 would include a center bus-only lane from north of 96th Avenue NE to 98th Avenue NE. A second left-turn lane from eastbound SR 522 to northbound 98th Avenue NE would be a bus-only lane. There would be no BRT stations on SR 522 in the Bothell segment. The Bothell Comprehensive plan identifies NE 185th Street as a Transit Priority Corridor. A key recommendation of Bothell's Transportation Advisory Committee, including the three transit agencies is to consolidate east-west transit service in downtown to NE 185th Street, and add some park and ride capacity to the new NE 185th Street / 98th Ave NE corridor. (Bothell 2015).

Metro's future transit service assumptions are currently being revised as part of the North Link Connections Mobility Project and an update to *METRO CONNECTS*. (Metro 2021). The preliminary transit service network concept includes limited stop service between UW Bothell/Cascadia College and UW Seattle (Metro Route 372 or a similar service. Metro route 312 would no longer run in Bothell but would truncate at the Kenmore Park-and-Ride. There would be an additional local service routes along this corridor, Metro Route 230.

Community Transit has indicated that its local service will share BRT stations on NE 185th Street at 104th Avenue NE, and on Beardslee Boulevard at UW/Cascadia College (midblock, southwest of 110th Avenue NE). Community Transit has communicated its intent to continue serving the City Hall with the bus stops on NE 185th Street at 101st Avenue NE, and will continue working with the City of Bothell. There would be an additional local service route along this corridor, Community Transit Route 105. Community Transit will not serve the Beardslee Boulevard station at NE 195th Street

Community Transit will begin planning the Swift Green Line extension, to UW Bothell/Cascadia College, when infrastructure improvements along SR 527 are complete. Extension of the Swift Green line is dependent on the city of Bothell's implementation of the widening of Bothell Way NE, which is not fully funded. If and when the Green Line extends to this service area, it will have its own independent stations.

Changes to transit stops are shown in **Figure 5-20**, and changes to transit stops and service providers for this segment are presented in **Table 5-24**.

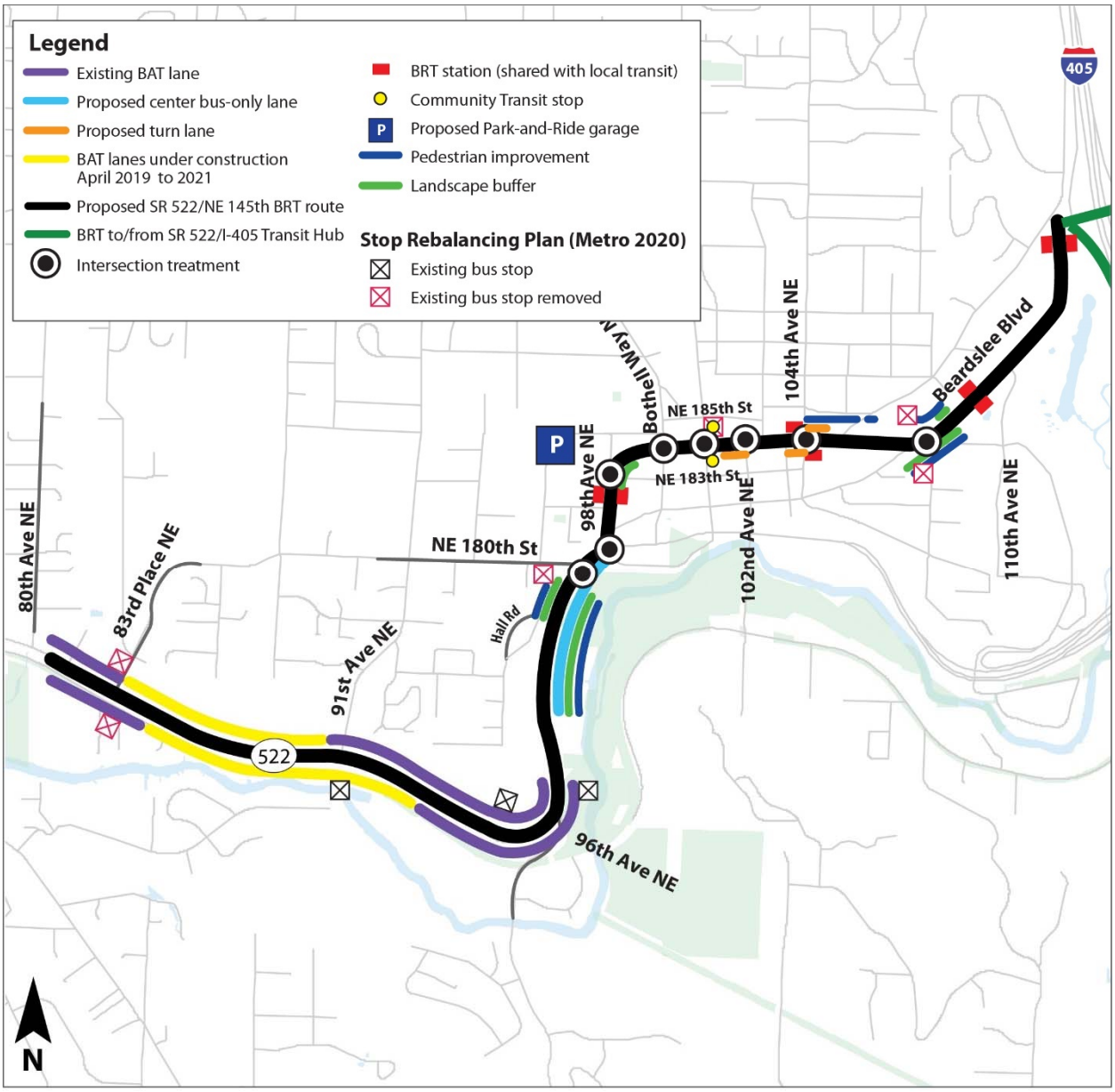

Figure 5-20 SR 522/NE 145th BRT stations and bus stops in Bothell

Table 5-24 Bothell transit stops and service for No-Build and Build conditions

Stop Location	No-Build		Build	
	Type	Transit service[1]	Type	Transit service[1]
SR 522/Bothell Way NE				
83rd Place NE	Bus stop	Metro	Removed[2]	
91st Avenue NE (westbound only) (unsignalized)	Bus stop	Metro	Bus stop	Metro
96th Avenue NE	Bus stop	Metro	Bus stop	Metro
NE 180th Street (westbound only)	Bus stop	Metro, ST Express	Removed	
98th Avenue NE				
Local Access Road (eastbound across from NE 183rd Street)	Bus stop	Metro, ST	Bus stop	Metro
NE 183rd Street	Bus stop	Metro	BRT station	Stride. Metro
Main Street, east of 98th Avenue NE	Bus stop	Metro, ST	Bus stop	Metro
NE 185th Street				
101st Avenue NE (westbound)	Bus stop	CT, Metro	Bus stop	CT
103rd Avenue NE (westbound)	Bus stop	CT, Metro	Bus stop	
104th Avenue NE	Bus stop	Metro	BRT station	CT, Stride, Metro
Beardslee Boulevard (westbound)	Bus stop	CT, Metro	Bus stop	
Beardslee Boulevard				
108th Avenue NE (eastbound)	Bus stop	CT, Metro	Bus stop	
UW Bothell/Cascadia College[3]	Bus stop	CT, Metro	BRT station	Stride, CT,[4] Metro
NE 195th Street (westbound)	Bus stop	CT. Metro, ST Express	BRT station	Stride, Metro
NE 195th Street (eastbound)	Bus stop	Metro, ST Express	BRT station	Stride, Metro
NE 195th Street/I-405 southbound on-ramp	Bus stop	Metro, ST Express	Removed	
SR 522/ I-405				
SR 522/I-405 Transit Hub	Transit Hub	BRT	BRT station	Stride[5], ST Express

(1) Sound Transit Express (ST Express), King County Metro (Metro) and Community Transit (CT) transit routes serving each stop are provided in Section 3.5, Existing transit conditions.

(2) Source: Metro 2020 (map).

(3) Located midblock between 108th Avenue NE and 110th Avenue NE.

(4) CT stops at 110th Avenue NE would move to share with BRT station platforms.

(5) SR 522/NE 145th BRT and I-405 BRT Stride service

5.5.5 Bothell to Woodinville

The SR 522/NE 145th Stride service would extend from the Beardslee Boulevard Station at NE 195th Street to a new SR 522/I-405 Transit Hub in the northwest quadrant of the SR 522/I-405 interchange. The new transit hub would be located in the northwest quadrant of a new interchange being designed and constructed by WSDOT as part of the ETL expansion project. (The expansion is an additional toll lane in each direction that will also be used by carpools and the I-405 BRT.)

The new transit hub would facilitate transfers to and from SR 522/NE 145th BRT, I-405 BRT, ST Express, and future potential service change by Community Transit. Riders that transfer between the SR 522/NE 145th BRT and I-405 BRT would walk between the transit hub and the I-405 BRT inline station. The walk distance would be approximately 320 feet. A proposed service restructure for the existing SR 522 ST Express route would provide service between Woodinville and Bellevue to the transit hub and/or the SR 522/NE 145th direct access ramps. Eastbound SR 522/NE 145th BRT coaches would travel to the SR 522/I-405 Transit Hub using the NE 195th Street southbound on-ramp and a transit-only roadway that would diverge from the ramp and lead directly to the SR 522/NE 145th BRT station at the new SR 522/I-405 Transit Hub in the northwest quadrant of the interchange.

The SR 522/NE 145th BRT coaches would return to the westbound trip on SR 522 by leaving the transit hub at a signalized intersection, traveling eastbound on SR 522 through the new interchange, using the northbound on-ramp to I-405 and the collector-distributor roadway to then exit to NE 195th Street, and travel on Beardslee Boulevard, on NE 185th Street, on 98th Avenue NE and on SR 522.

6 CONSTRUCTION IMPACTS

Construction of the project could begin in 2023 and continue into 2024/2025, pending the Sound Transit Board decisions on realignment due to the economic recession related to the COVID-19 pandemic. The following construction activities would generally occur in the sequence listed below:

- Mobilize equipment and establish staging areas
- Shift traffic to provide space for construction
- Commence construction beginning with major ground-disturbing activities to widen the outside roadway; install drainage; reconstruct driveways; and construct sidewalks, planted buffers, station platforms and retaining walls

Temporary detours and lane closures would occur during construction. Detours would occur on local roads approaching SR 522 and NE 145th Street. Certain properties that currently have full access could be temporarily restricted to right-in/right-out access during construction. The existing lanes on NE 145th Street and SR 522 would remain open to the extent possible during construction. Lane closures could occur on NE 145th Street or SR 522 during non-peak hours. Lane closures would occur temporarily on other streets in the area, typically between the hours of 8 a.m. and 4 p.m. Time periods for lane closures would be determined through the preparation of traffic control plans in consultation with WSDOT and the cities.

During construction, construction vehicles would be present and would add to the traffic volumes on streets. Construction vehicles would be on SR 523 or SR 522, and would only use side streets for a limited time where the project includes construction of the side-street approach. Adverse impacts such as vehicle and pedestrian detours would be temporary, and signage would be placed appropriately to inform the public about construction activities.

The temporary parking impacts during construction for each new garage would be as follows:

- Lake Forest Park Town Center: Construction staging could necessitate temporary use of existing town center parking spaces beyond the parcel acquired for construction of the garage. Adequate parking spaces (estimated 198 surplus) on the north side of the shopping center are available to address parking impacts during construction.
- Kenmore Park-and-Ride lot: At the existing Kenmore Park-and-Ride lot, parking spaces displaced during construction would be replaced with temporary leased spaces as needed. Nearby surplus parking could be leased during construction. Sound Transit would identify areas of leased parking spaces as the design and construction phasing is determined. Construction vehicles would be prohibited from using the NE 181st Street access roadway to the existing park-and-ride lot due to the proximity to the Great Blue Heron Rookery.
- Bothell Lot P South: There is no existing parking activity, and construction of the Sound Transit garage at this location would not necessitate temporary replacement parking. Sound Transit anticipates that the project would result in a net increase in the supply of publicly available parking in the district.

7 MITIGATION

7.1 BRT project mitigation

Based on the minimal changes in intersection movement delay and overall improvements in intersection operations from No-Build conditions to Build conditions, no mitigation measures are necessary.

No adverse impacts are anticipated as a result of the SR 522/NE 145th BRT Project.

7.2 Construction impact mitigation

Sound Transit would implement best practices to avoid or abate other transportation impacts during construction. In addition, Sound Transit would require its contractor to comply with the permits, certificates and approvals issued for this project, which would have conditions to address potential transportation impacts. Permit conditions would become part of the construction contract. The following measures would be implemented:

- 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 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, with Sound Transit and with 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.
- Prepare parking management plan during construction of the Lake Forest Park park-and-ride garage to use surplus spaces on the north side of shopping center.
- Prepare parking management plan during construction of the Kenmore park-and-ride garage, identifying potential leased spaces in the vicinity during construction.
- 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 garages and 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 bicyclist detours. Throughout the area of project construction, pedestrian access would be maintained during construction 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.

Constructing retaining walls could require closure of the existing sidewalks at proposed retaining wall locations. The duration of sidewalk closure and pedestrian detour is related to the length of the retaining wall and any complexities associated with the location of the proposed retaining wall. The construction contractor would be required to establish temporary pedestrian route detours during retaining wall construction.

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SR 522 Bus Rapid Transit

ATTACHMENT A

Traffic Forecasting and Simulation Modeling Methods and Assumptions Technical Memorandum

Traffic Forecasting and Simulation Modeling Methods and Assumptions Technical Memorandum

August 2020

SOUNDTRANSIT

Revision History

Version	Title	Date	Notes, As Required
Draft 1	Draft Traffic Forecasting and Simulation Modeling Methods and Assumptions	05/17/19	Submitted for Sound Transit review.
Final	Final Traffic Forecasting and Simulation Modeling Methods and Assumptions	06/14/19	
Updated Final	Final Traffic Forecasting and Simulation Modeling Methods and Assumptions	05/15/20	Updated to reflect updated methodology for future forecast for City of Bothell
Updated Final	Traffic Forecasting and Simulation Modeling Methods and Assumptions Technical Memorandum	08/24/20	Updated to include WSDOT comments.

Summary

Purpose

The purpose of this memorandum is to summarize the methods and assumptions for forecasting and simulation modeling of the future transit and motor vehicle travel with the implementation of the SR 522/NE 145th Street Bus Rapid Transit (BRT) Project (the Project).

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Acronyms and Abbreviations

AVL	Automated Vehicle Location - technology integrated within transit vehicles to provide data for the uses of tracking and dispatching transit vehicles.
BAT	Business Access and Transit - 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 - 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.
GEH	GEH statistic - a formula used to provide tolerances for a comparison between field data and simulation outputs.
HCM	Highway Capacity Manual
ICE	Intersection Control Evaluation - formerly known as the Intersection Control Analysis, is a 5-step process meant to screen and evaluate alternatives to determine the best possible intersection type and design for intersections within WSDOT facilities.
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.
NCHRP	National Cooperative Highway Research Program - a collaborative research group that addresses issues integral to the state Departments of Transportation (DOTs) and transportation professionals at all levels of government and the private sector. The NCHRP provides practical, ready-to-implement solutions to pressing problems facing the industry for application in transportation projects.
PHF	Peak hour factor
PSRC	Puget Sound Regional Council - the regional transportation planning organization for the Central Puget Sound Region (King, Kitsap, Pierce, and Snohomish counties) that is responsible for the adoption of multi-county planning policies. These policies provide guidance on a variety of growth management issues related to the jurisdictions within those four counties.
RBC	Ring Barrier Controller - the signal timing interface within Vissim to simulate actuated signal timing controller for signalized intersections.
RTP	Regional Transportation Plan, adopted by PSRC, this plan provides a planning program around the transportation system needs and preparation for the future, in a coordinated effort to align the goals for statewide and local jurisdictions. This plan works to support Vision 2040, which is the PSRC growth strategy to plan for

	and address the expected regional growth as a part of the Growth Management Act.
SDOT	Seattle Department of Transportation
ST3	Sound Transit 3 System Plan
TMC	Turning movement counts
WSDOT	Washington State Department of Transportation

Definitions

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.
Representative Project	The Representative Project was developed after extensive community input and was included in the ST3 Plan, which was approved by voters, to serve as the basis for refining the Project and identifying what elements would be built. The Representative Project includes project scope, high-level cost estimate, ridership forecasts, the BRT transit mode, corridor, and the general number and locations for stations.
SR 522/NE 145th Street BRT Project	The project defined by 10-30% Conceptual Preliminary Engineering Design of the ST3 initiative that was approved by voters in November 2016 that provides for BRT service between the Shoreline South Link light rail station, Seattle, Shoreline, Lake Forest Park, Kenmore, and Bothell, with an extension of Sound Transit service to Woodinville.

1 STUDY LIMITS

The traffic forecasting and simulation modeling study area extends along the Bus Rapid Transit (BRT) corridor from 5th Avenue NE/NE 148th Street in Shoreline to NE 180th St/Campus Way NE at the University of Washington – Bothell Campus (UW Bothell). The corridor and study intersections are shown in Figure 2-1 and the study intersections listed in Table 2-1. The study intersections include 33 signalized intersections and 24 unsignalized intersections. Two of the signalized intersections (#14 at 61st Avenue NE/NE 181st Street and #16 at 68th Avenue NE/NE175th Street) are closely spaced intersections adjacent to the proposed BRT corridor and are included in the study to allow for signal coordination with the proposed improvements.

2 TRAFFIC OPERATIONS ANALYSIS

2.1 Methodology

Traffic analysis will provide analysis to support (1) the refinement of the Refined Project concept identified in Phase 1, (2) the Intersection Control Evaluation (ICE) documentation and (3) the environmental documentation process. The traffic analysis could result in design concept changes to the Refined Project. The following sections describe the applications of traffic operations tools.

2.2 Analysis Tools

The following tools will be used in the Project analysis:

- Emme (version 4.3.5): Emme will be the software tool used to develop 2042 horizon traffic volumes for evaluation in both Synchro and Vissim. The Puget Sound Regional Council (PSRC) 4k Trip Based Model will be the travel demand model for future forecasts. For the base and future no build models, the networks and land use will be consistent with the Regional Transportation Plan (RTP) that was approved by PSRC as of May 31, 2018. PSRC's base year model reflects 2014 conditions and future no build model reflects 2040 conditions.
- Synchro/SimTraffic (version 10): Synchro will be used to evaluate the operations with respect to the delay and traffic level of service at each intersection. SimTraffic is only used for model validation. Reporting will be generated from Synchro.
- Vissim (version 11.00-64): Vissim will be used to develop simulation models to model traffic and transit detailed interactions and operations. For the Seattle/Shoreline area, Vissim will be used to develop simulation models to evaluate the operations of roundabout intersection control types.
- Sidra (version 8): Sidra will be used when needed to evaluate the operations of roundabouts with respect to volume/capacity (v/c) ratio, delay, and traffic level of service at intersections. Sidra analysis conducted will be consistent with the WSDOT SIDRA policy settings.

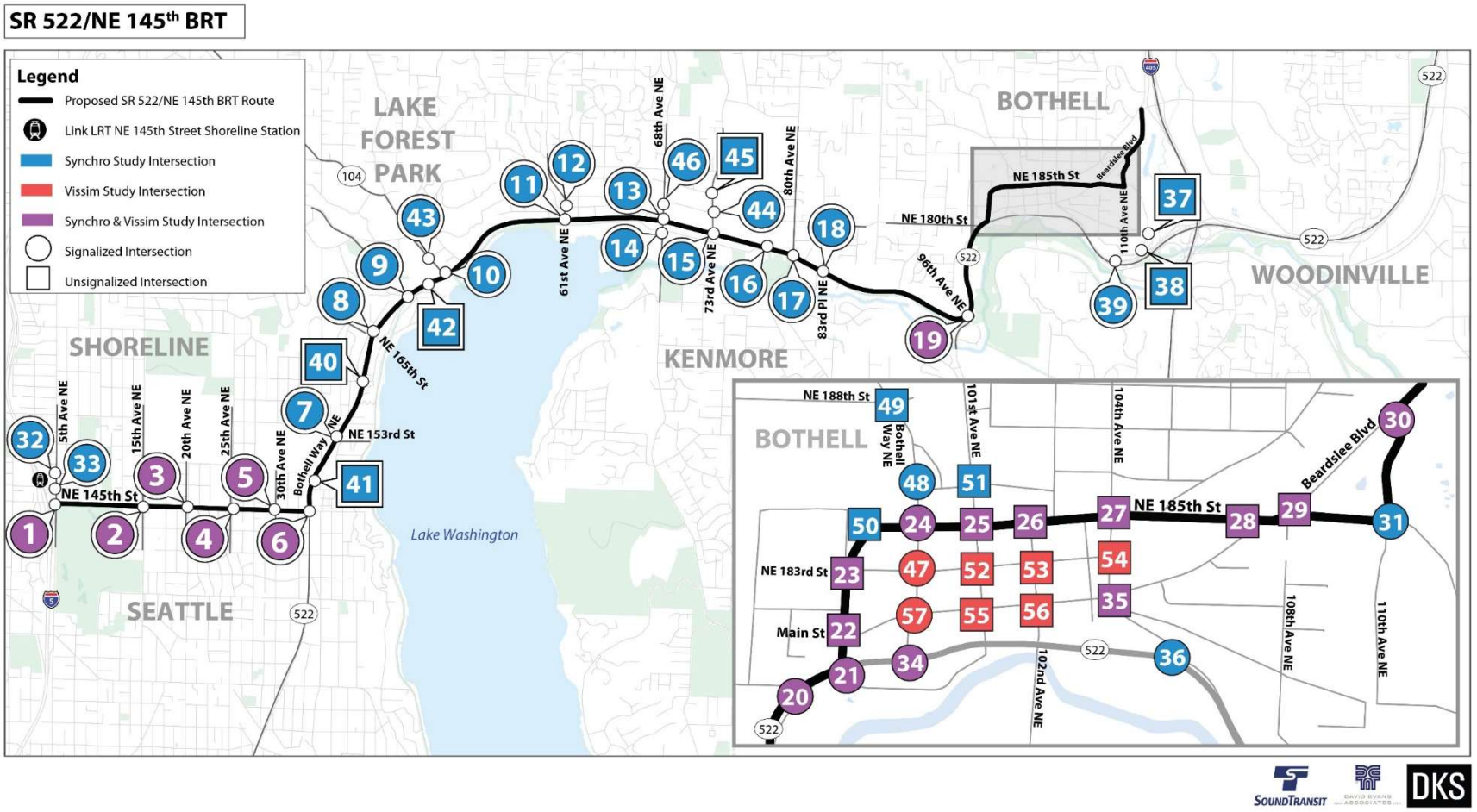

Figure 2-1 Operational Analysis Study Area

Table 2-1 SR 522/NE 145th BRT Study Intersections

	Intersection	Control Type	Signal Owner	Signal Operator
1	NE 145th Street and 5th Avenue NE	Signalized	WSDOT	WSDOT
2	NE 145th Street and 15th Avenue NE	Signalized	SDOT	SDOT
3	NE 145th Street and 20th Avenue NE	Signalized	SDOT	SDOT
4	NE 145th Street and 25th Avenue NE	Signalized	SDOT	SDOT
5	NE 145th Street and 30th Avenue NE	Signalized	SDOT	SDOT
6	NE 145th Street and SR 522 (Bothell Way NE/Lake City Way NE)	Signalized	SDOT	SDOT
7	SR 522 (Bothell Way NE) and NE 153rd Street	Signalized	WSDOT	WSDOT
8	SR 522 (Bothell Way NE) and NE 165th Street	Signalized	WSDOT	WSDOT
9	SR 522 (Bothell Way NE) and Beach Drive NE	Signalized	WSDOT	WSDOT
10	SR 522 (Bothell Way NE) and Ballinger Way NE (SR 104)	Signalized	WSDOT	WSDOT
11	SR 522 (Bothell Way NE) and 61st Avenue NE	Signalized	WSDOT	WSDOT
12	61st Avenue NE and NE 181st Street	Signalized	WSDOT	WSDOT
13	SR 522 (Bothell Way NE) and 68th Avenue NE	Signalized	WSDOT	WSDOT
14	68th Avenue NE and NE 175th Street	Signalized	WSDOT	WSDOT
15	SR 522 (Bothell Way NE) and 73rd Avenue NE	Signalized	WSDOT	WSDOT
16	SR 522 (Bothell Way NE) and 77th Court NE	Signalized	WSDOT	WSDOT
17	SR 522 (Bothell Way NE) and 80th Avenue NE	Signalized	WSDOT	WSDOT
18	SR 522 (Bothell Way NE) and 83rd Place NE	Signalized	WSDOT	WSDOT
19	SR 522 (Bothell Way NE) and 96th Avenue NE	Signalized	Bothell	Snohomish County
20	SR 522 (Bothell Way NE) and NE 180th Street	Signalized	Bothell	Snohomish County
21	SR 522 (Bothell Way NE) and 98th Avenue NE	Signalized	Bothell	Snohomish County
22	98th Avenue NE and Main Street	TWSC	n/a	n/a
23	98th Avenue NE and NE 183rd Street	AWSC	n/a	n/a
24	NE 185th Street and Bothell Way NE	Signalized	Bothell	Snohomish County
25	NE 185th Street and 101st Avenue NE	AWSC	n/a	n/a
26	NE 185th Street and 102nd Avenue NE	TWSC	n/a	n/a
27	NE 185th Street and 104th Avenue NE	AWSC	n/a	n/a
28	NE 185th Street and Beardslee Boulevard	TWSC	n/a	n/a
29	Beardslee Boulevard and 108th Avenue NE	TWSC	n/a	n/a
30	Beardslee Boulevard and 110th Avenue NE	Signalized	Bothell	Snohomish County
31	110th Avenue NE and NE 185th Street	Signalized	Bothell	Snohomish County
32	NE 148th Street and 5th Avenue NE	TWSC*	n/a	n/a

	Intersection	Control Type	Signal Owner	Signal Operator
33	I-5 NB On-ramp and 5th Avenue NE	TWSC*	n/a	n/a
34	Bothell Way NE and SR 522 (Woodinville Drive)	Signalized	WSDOT	WSDOT
35	Beardslee Boulevard and Kaysner Way	AWSC	n/a	n/a
36	SR 522 (Woodinville Drive) and Kaysner Way	Signalized	Bothell	Snohomish County
37	Campus Way NE and NE 180th Street	AWSC	n/a	n/a
38	Campus Way NE and Campus Way Parking	TWSC	n/a	n/a
39	SR 522 (Woodinville Drive) and Campus Way NE	Signalized	WSDOT	WSDOT
40	SR 522 and 39th Avenue NE	TWSC	n/a	n/a
41	SR 522 and NE 149th Street	TWSC	n/a	n/a
42	LFP Town Center Driveway and SR 522 (Bothell Way NE)	TWSC	n/a	n/a
43	NE 175th Street and SR 104	Signalized	WSDOT	WSDOT
44	73rd Avenue NE and NE 181st Street	Signalized	WSDOT	WSDOT
45	73rd Avenue NE and NE 182nd Street	TWSC	n/a	n/a
46	68th Avenue NE and NE 181st Street	Signalized	WSDOT	WSDOT
47	Bothell Way NE and NE 183rd Street	Signalized	Bothell	Snohomish County
48	Bothell Way NE and Reder Way	Signalized	Bothell	Snohomish County
49	Bothell Way NE and NE 188th Street	TWSC	n/a	n/a
50	NE 185th Street and Pop Keeney Way	TWSC	n/a	n/a
51	NE 186th Street and 101st Avenue NE	TWSC	n/a	n/a
52	NE 183rd Street and 101st Avenue NE	AWSC	n/a	n/a
53	NE 183rd Street and 102nd Avenue NE	AWSC	n/a	n/a
54	NE 183rd Street and 104th Avenue NE	TWSC	n/a	n/a
55	Main Street and 101st Avenue NE	AWSC	n/a	n/a
56	Main Street and 102nd Avenue NE	AWSC	n/a	n/a
57	Main Street and Bothell Way NE	Signalized	Bothell	Snohomish County

NOTES:
(1) AWSC: All-way Stop Controlled
(2) TWSC: Two-way Stop Controlled
(3) * Future Signalized Intersection to be constructed by Lynwood Link Extension

2.3 Analysis Years/Periods

The traffic forecast and simulation modeling will be conducted for the following existing and horizon years:

- Existing Year: 2018
- Year of Opening: 2024 (Bothell only)

- Horizon Year: 2042

2.4 Travel Demand Modeling and Forecasted Volumes

The PSRC 4k Trip Based Travel Demand Model was used for base year traffic volumes and future traffic volumes. To maintain consistency with the adopted RTP, the base year and future travel demand models are 2014 and 2040, respectively. Emme software was used to run both models. Though considered a 2014 base year, the roadway network reflected 2018 conditions with no network edits needed. The 2040 model networks are consistent with the RTP, except in locations where specific funded projects in the study area have been identified by project stakeholders, and modifications to the model network were made in these locations. The only changes made were in the Bothell area: Beardslee Boulevard widening, 228th Street SE widening and a new connection between Bothell Way and 88th Avenue along 242nd Street SE. The base year conditions model was calibrated by comparing link level model outputs with traffic count data for four screen lines within the study area—one screen line in each of the four jurisdictions within the study area. It is noted that Seattle and Shoreline share a jurisdiction along NE 145th Street, where one screen line exists for the two jurisdictions.

After both the base year and future conditions models were updated during Phase 1, the traffic data was used to establish forecast intersection turning movement counts at each of the study intersections. The forecasting methodology was consistent with the growth methods outlined per National Cooperative Highway Research Program (NCHRP) 765 to estimate the turning movement counts at each study intersection. Straight line extrapolations were used to forecast the intersection turning movement counts to 2042 traffic volumes, using the turning movement counts post-processed from the travel demand models, because the study horizon year is two years later than the 2040 forecasts from travel demand model.

For this analysis, one set of forecasted volumes within the study area were used as the basis for both the horizon year no build scenario and the horizon year build scenarios.

2.4.1 2042 NE 145th Street Forecasted Volumes

Along the NE 145th Street corridor, adjustments were made to accommodate additional growth projected by the City of Shoreline zoning changes as part of the Shoreline 145th Street Station Subarea Plan. Volumes were adjusted to reflect the change in land use around the corridor to maintain consistency with the Shoreline subarea plan. Methodology was jointly approved by City of Shoreline, Seattle Department of Transportation (SDOT), WSDOT and Sound Transit. From this work, AM and PM peak period volumes were updated for the 2042 analysis in Synchro and Vissim.

2.4.2 2042 Bothell Forecasted Volumes

Discussions with the City of Bothell and PSRC concluded that the current PSRC travel demand model did not reflect the level of growth anticipated in Downtown Bothell. Instead, the 2042 Bothell forecast was based on the 2035 volumes from the City of Bothell's *Downtown Transportation Needs Analysis - Downtown Revitalization Transportation Plan.* The 2035 volumes were increased at a 0.8% annual growth rate based on land use data from the City of Bothell and then reduced by 5% to reflect travel demand management measures anticipated by the City in response to the densification of their downtown core. This methodology was

approved by the City of Bothell and Sound Transit.

2.4.3 2024 Bothell Forecasted Volumes

Volumes were forecasted for a year-of-opening scenario in the Bothell network. These volumes assumed a 3.5% annual growth rate on all local streets, a 0.5% annual growth rate on SR 522, and a 2.2% annual growth rate on SR 527 using the Existing Year 2018 volumes as a base. Local street growth was determined in coordination with the City of Bothell, while the SR 522 and SR 527 growth rates were based on conversations with PSRC.

2.5 Synchro Modeling Scenarios

AM and PM peak hour models will be built for the following scenarios:

- Existing Year 2018
- Horizon Year 2042 No Build
- Horizon Year 2042 Refined Project

2042 Synchro analysis was used to support the SEPA application.

2.6 Vissim Modeling Scenarios

Build AM and PM peak hour models for the Seattle/Shoreline area will be updated from Phase 1 for up to four scenarios. No changes to the existing year 2018 models are expected.

PM peak hour models will be developed for the Bothell area for the intersections shown in Figure 2-1 for Existing Year 2018, Year of Opening 2024 No Build and up to two Year of Opening 2024 build scenarios to determine the improvements needed to support transit when BRT opens in 2024.

3 SYNCHRO ANALYSIS

3.1 Data Collection

The data collection for model calibration for the existing year Synchro model is summarized below:

- Roadway Geometry Data: Number of lanes, roadway length and width, turn pocket lengths, and turn restrictions will be collected from Google Earth supplemented with field reviews.
- Traffic Volume Data: Two-hour AM and PM peak turning movement counts (TMC), pedestrian counts, and bicycle counts will be collected for each of the study intersections. Truck percentages and peak hour factors from the TMC data, by intersection approach.
- Traffic Control Data: Signal phasing diagrams and signal timing data will be collected for signalized intersections.

3.2 Measures of Effectiveness

The following measures of effectiveness (MOEs) will be reported from the Synchro models for the AM and PM peak hour:

- Level of service and delay at each intersection (signalized and unsignalized)
- Level of service and delay, by movement, for each intersection
- Queue lengths

No SimTraffic modeling will be prepared for the Synchro operational analysis for the Project.

3.3 Other Assumptions

The following assumptions will apply to existing year and horizon year Synchro models:

- To model transit delay, business access and transit (BAT) lanes are modeled specifically at the intersections.
- For right turns that share the lane with transit in a BAT lane configuration, Right Turn On Red is assumed prohibited to better model delay to transit and reflect a conservative delay to general-purpose vehicles in the case when bus is the first vehicle in the queue.
- Bus volumes are based on data provided by the Transit Integration team which includes Community Transit, King County Metro, and Sound Transit.
- Bus volumes are added to the right-turning volumes in a BAT lane situation and removed from the adjacent through volume corresponding with the bus's direction of travel.
- For the horizon year build scenarios, bus volumes will be increased to reflect assumed increased bus service levels along the corridor as provided by the Transit Integration team.
- For the horizon year, a peak hour factor (PHF) of 1 will be used for all study intersections in accordance with WSDOT's Synchro and SimTraffic Protocol.
- Horizon year build models will reflect additional traffic volume to/from final parking garage locations based on access assumptions.

4 VISSIM ANALYSIS

Vissim analysis for both the Seattle/Shoreline and Bothell study areas will follow WSDOT protocols.

4.1 Data Collection

The data to be collected to build and calibrate the existing year Vissim model for the Bothell study area is summarized below:

- Roadway Geometry Data: Number of lanes, roadway length and width, parking, transit facilities, and turn restrictions.

- Traffic Control Data: Posted speed limits, traffic restrictions, signs, traffic signal timing, and detection.
- Traffic Volume Data: TMC for vehicles, heavy vehicles, bicycles, and pedestrians.
- Transit Data: Routes, headways, stop locations, and dwell times. Existing transit routes and headways will be coded into the Vissim model based on information from the Transit Integration team.
- Travel Time Data: Transit travel time for existing routes in the corridor will be derived from Automatic Vehicle Location (AVL) data provided by King County Metro. For segments of the corridor that do not currently have transit service, floating car travel times (used to measure peak-hour car travel time in the field) will be used to estimate transit travel time.
- Field Observations: Major queuing locations, bottlenecks, saturation flow rate, and lane utilization.

4.2 Shoreline Vissim Assumptions

The Shoreline Vissim models will be updated from Phase 1 models. The existing conditions models were calibrated to field conditions during Phase 1 and will not be updated in Phase 2. The horizon year 2042 no build model will be used as a baseline for comparison with the Phase 2 build scenarios.

The Phase 2 AM and PM horizon year 2042 build models will be based on the improvements identified as the Refined Project in Phase 1 and further refinements to station locations, intersection improvements, and project elements in coordination with the SR 523 Interchange project. For build models with roundabouts, roundabout capacity will be compared with HCM values to verify calibration.

4.3 Bothell Vissim Assumptions

Assumptions for the existing year (2018) model include the following:

- In the Vissim analysis, general-purpose traffic volumes will be balanced.
- Some unsignalized side streets may be included as right-in/right-out to help balance the volumes.

Assumptions for the year of opening (2024) model includes the following:

- Annual percent growths were used to calculate Year of Opening 2024 volumes using the Existing Year 2018 volumes as a base.
- More growth is expected on local streets than on SR 527 and SR 522. General purpose traffic routes were adjusted with a higher growth rate on local streets than on SR 527 and SR 522.

4.4 Bothell Vissim Assumptions for Modeling Transit

Existing transit routes will be modeled in areas being evaluated with Vissim. The following assumptions apply to the transit component of the Vissim models:

- The existing bus routes and scheduled headways will be based on the data provided by the Transit Integration team.
- The run time for existing bus service will be coded based on the AVL data provided by King County Metro for Metro, Community Transit, and Sound Transit routes.
- The existing dwell times for buses will be coded and calibrated based on expected ridership, as coordinated with the Transit Integration team.
- Horizon year bus routes and schedules, transit stop locations, and dwell time distributions will be coded based on assumptions provided by the Transit Integration team.
- Planning level Transit Signal Priority for green extension or early green will be included in Vissim Ring Barrier Controller (RBC) signal operations where used in existing timing or planned for in horizon year.

4.5 Bothell Vissim Calibration Targets

The following calibration targets will be used in the Vissim analysis for the Project:

- A quantitative comparison between field data and model outputs for traffic volumes and corridor travel times for the existing conditions model.
- A qualitative comparison (visual inspection) of traffic operations and queuing for the existing conditions model.

4.6 Measures of Effectiveness

The following MOEs will be collected from the Vissim models for the one-hour “system peak” for the PM peak period:

- General purpose travel time
- General purpose queue lengths
- General purpose delay and level of service at study intersection
- Transit vehicle signal delay at study intersections
- Transit vehicle travel time including station dwell times; Results will be summarized by average travel time and representative statistics of travel time reliability
- Vehicle queue spillback
- Relative delay queue plots

4.7 Other Assumptions

The following assumptions will apply to existing year and horizon year Vissim models:

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

- Desired speeds will be based on posted speed limits in the field. Changes to the posted speed limits and horizon year speeds will be coordinated with the Transit Integration team prior to the modification of desired speeds.
- Reduced speed zones for turns will include 9 miles per hour for right turns and 15 miles per hour for left turns (consistent with Synchro and Vissim protocol). However, these values may be adjusted to match field conditions.
- Dynamic traffic assignment will be used to generate static vehicle routes.
- Pedestrian volumes from TMC will be entered into the Vissim models. For horizon year, pedestrian growth will be based on projected ridership growth.
- Bicycle volumes will not be modeled.
- Parking interaction will be modeled on NE 185th St only.
- Individual run output will be reviewed to validate that there are no fatal simulation errors. Simulation results will be based on an average of 10 validated simulation runs.
- TMC in Vissim will be validated using the GEH statistic, a formula used to provide tolerances for a comparison between field data and simulation outputs. This statistic will be used as part of the WSDOT's Vissim protocol for calibration.
- Peaking profiles and truck percentages will be based on collected TMC.

SR 522 Bus Rapid Transit

ATTACHMENT B

Parking Garage Traffic Impacts Methodology

To:	Kathy Leotta, Sound Transit Brian Kemper, Sound Transit Lacy Bell, Sound Transit
From:	Wintana Miller, P.E., P.T.O.E, DKS Associates
Prepared by:	Wintana Miller, P.E., P.T.O.E, DKS Associates Ilana Burstein, E.I.T., DKS Associates
CC:	Dwight Schock, David Evans and Associates, Project Manager
Date:	November 9, 2020
Re:	Park-and-Ride Garage Traffic Impacts Methodology

Purpose

The purpose of this memorandum is to summarize the methodology used to distribute PM vehicle trips from the park-and-ride garages planned for the SR 522/NE 145th BRT project. The traffic impact of the planned park-and-ride garages focuses on the PM peak hour for the horizon year 2042 in support of the environmental documentation process.

Figure 1: Kenmore Park and Ride Access Points and Tube Count Locations

Trip Generation

In order to establish trip generation assumptions for the planned park-and-ride garages, data was collected on the usage of the existing Kenmore Park and Ride. Tube counts were collected at the driveways of the existing park and ride in June 2019, while school was in session. Figure 1 shows where the tubes were placed at each of the four access points to the park and ride. The number of trips entering and exiting the park and ride during the system peak hour of 4:45 PM to 5:45 PM was determined for each of the four access points and is shown below in Table 1. The system peak hour was determined based on the turning movement counts collected at adjacent intersections.

Most of the trips during the PM peak are exiting the park and ride. Thirteen of the vehicles entering the park and ride are buses completing their route.

Based on the tube count data shown below in Table 1, 248 vehicles exit the park and ride during the peak hour. The Kenmore Park and Ride has a total capacity of 603 stalls; meaning each stall generates 0.41 exiting vehicle trips in the PM peak hour, or 41% of total park and ride capacity exits during the PM peak hour. This rate/percentage can be applied to the planned garages at Lake Forest Park, Kenmore and Bothell to determine the number of peak hour trips that would be generated exiting the garage. The planned park-and-ride garages will have a capacity of approximately 300 stalls. This methodology results in an estimated 123 trips being generated during the PM peak hour exiting from the planned park-and-ride garages.

Of the 51 inbound trips to the Kenmore Park and Ride, 13 of those were buses and 38 were other vehicle trips. The 38 vehicle trips represent 6% of the total capacity. This percentage of trips can be applied to the planned garages at Lake Forest Park, Kenmore and Bothell to determine the number of inbound peak hour trips that would be generated. This methodology results in an estimated 19 inbound trips being generated during the PM peak hour entering the planned park-and-ride garages.

Peak Hour Park and Ride Trip Data: 4:45-5:45 PM										
	Access Point 1		Access Point 2		Access Point 3		Access Point 4		Total	
	In	Out	In	Out	In	Out	In	Out	In	Out
# of Trips	16	101	9	19	8	8	18	120	51	248

Table 1: Kenmore Park and Ride Vehicle Tube Counts

The Bothell park-and-ride garage will have additional retail and office space that would generate additional trips to and from the site. Trip generation rates for the PM peak hours were determined by the ITE Trip Generation Manual, 10th Edition. For the proposed site in Bothell, Land Use Code #720 General Office Building was used to estimate the number of trips for the office space and Land Use Code #820 Shopping Center was used to estimate the number of trips for the retail space. The estimated number of PM peak hour trips for the two land uses associated with the Bothell park-and-ride garage are shown in Table 2. The proposed development is estimated to have an additional 89 trips in the PM peak hour, 35 trips will enter the site and 54 trips will exit the site.

Peak Hour Trip Generation Rates: 4:45-5:45 PM				
Land Use (ITE Land Use Code)	Size	PM		
		Enter	Exit	Total Trips
General Office Building (720)	17.93 kSF	3	18	21
Shopping Center (820)	17.93 kSF	32	36	68
Total		35	54	89

Table 2: Bothell Office and Retail Space Trip Generation

Trip Distribution

Sound Transit's ridership model was used to determine the distribution of the trips exiting each planned park-and-ride garage. Sound Transit's ridership model forecasts the number of trips from the future park and rides to their destinations, aggregated into Traffic Analysis Zones (TAZs). The destination TAZs for each park and ride can be found in Figure 2 through Figure 4. According to the ridership model, 80% of trips leaving the planned Lake Forest Park garage are destined to one TAZ to the east of the garage. For the Kenmore garage, 76% of trips are destined for the same zone in which the garage would be located. For the Bothell garage, the destinations are slightly more distributed with 38% as the highest percentage destined to a zone to the east and only 2% of trips originating from the same zone that the park and ride is in. Inbound trips are distributed in the same manner as outbound trips. For the Bothell office and retail space, the destinations are distributed based on general traffic patterns in the area with 30% of trips traveling to/from the north, 30% of trips traveling to/from the east along SR 522, and 40% of trips traveling to/from the southwest along SR 522. Figure 5 shows the trip distribution for the office and retail space.

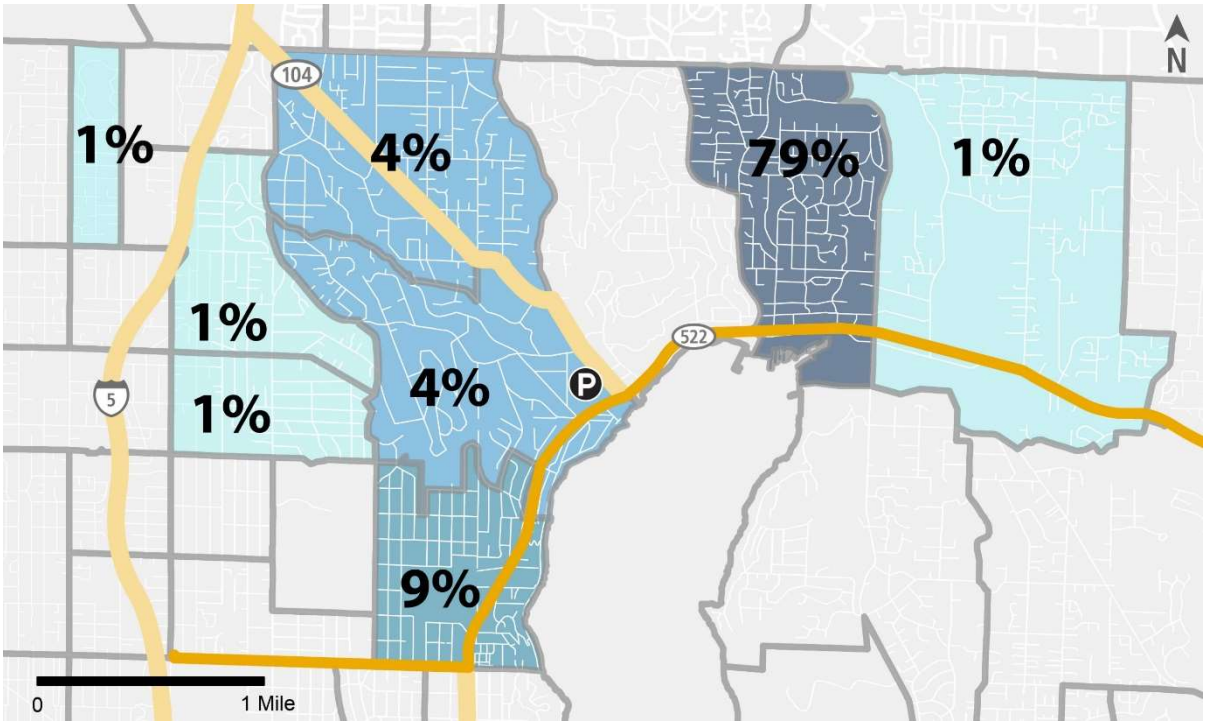

Figure 2: Lake Forest Park Park and Ride Destinations

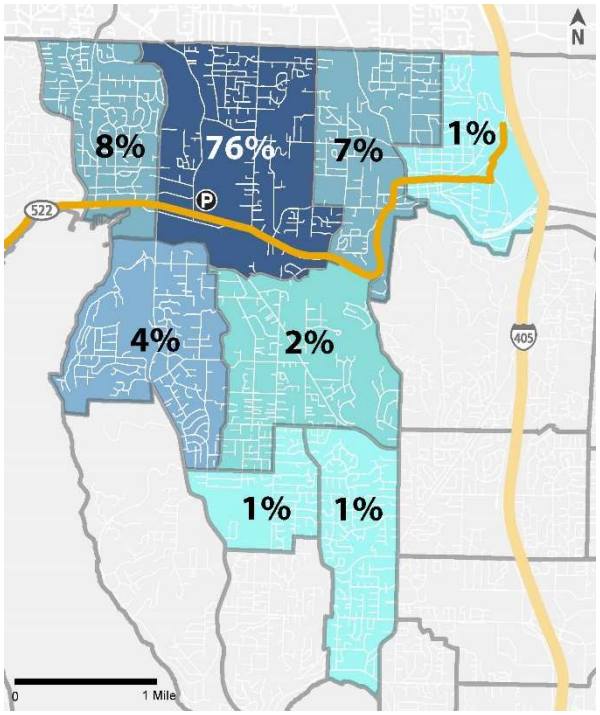

Figure 3: Kenmore Park and Ride Destinations

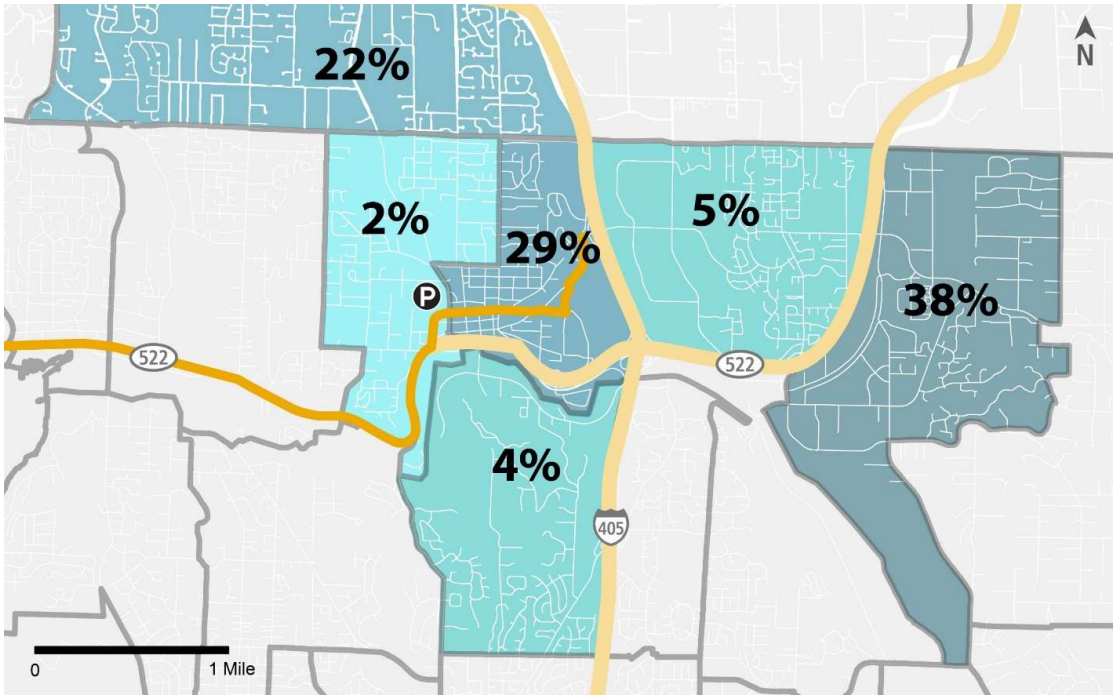

Figure 4: Bothell Park and Ride Destinations

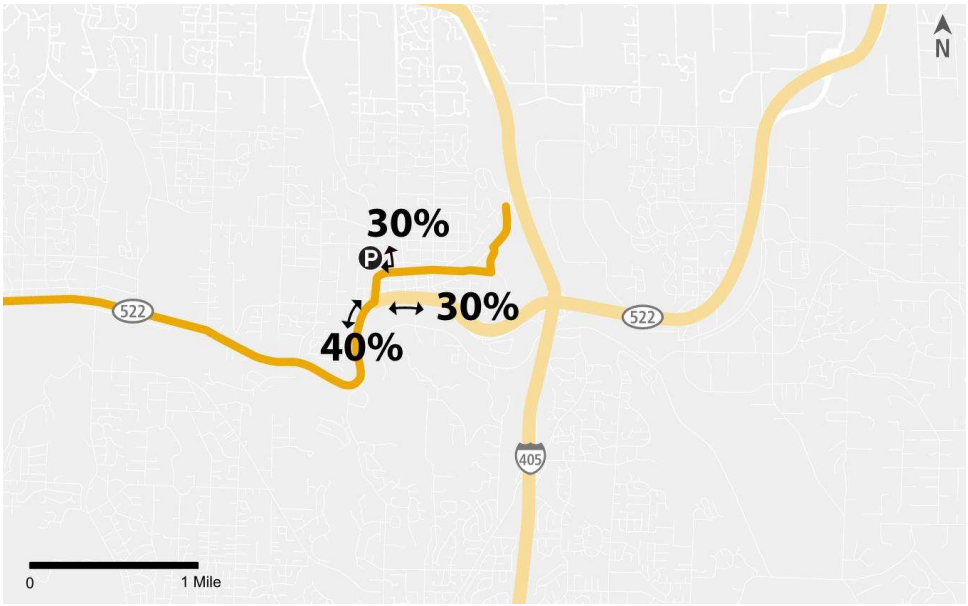

Figure 5: Bothell Office and Retail Space Distributions

Route Assignment

The next step is to assign the generated vehicle trips to specific routes on the street network based on the trip distribution previously described. Trip distributions for the Lake Forest Park garage are shown below in Figure 6. The Lake Forest Park garage results in 10 new trips to the west along SR 522, 99 new trips along SR 522 to the east and 14 new trips north along SR 104. Nineteen inbound trips are generated with one trip from the north along SR 104, 17 trips from the east along SR 522, and one trip from the west along SR 522.

Figure 6: Lake Forest Park Route Assignment

Trips for the new garage at the Kenmore Park and Ride as shown in Figure 7 results in 71 trips to the north along 73rd Ave NE, 35 new trips to the east along SR 522, 10 trips to the northwest along NE 182nd St, and 8 new trips to the west along SR 522. The inbound trip distribution results in 11 trips from the north along 73rd Ave NE, 6 new trips from the east along SR 522, 1 new trip from the northwest along NE 182nd St, and 1 new trip from the west along SR 522. The distribution shown in Figure 7 incorporates the planned restriction of NE 181st St to exiting garage traffic.

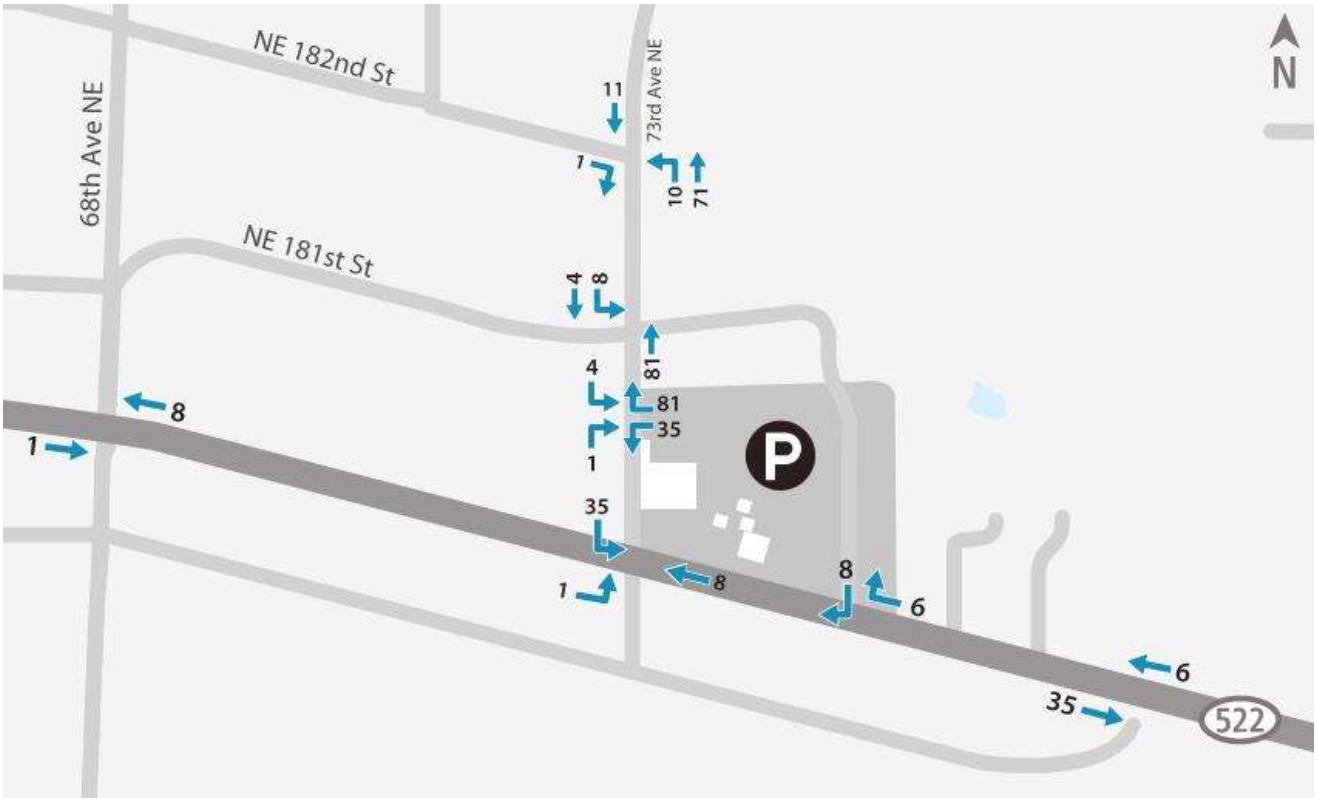

Figure 7: Kenmore Route Assignment

The routing for the Bothell Park and Ride is shown in Figure 8. The new park-and-ride garage in Bothell results in 27 new trips to the north along Bothell Way NE, 52 new trips to the east along SR 522, 5 new trips to the south, across the river, along 102nd Ave NE, and 36 new trips towards the UW campus along NE 185th St. The inbound trip distribution results in 5 new trips from the north along Bothell Way NE, 8 new trips from the east along SR 522, 1 new trip from the south, across the river, along 102nd Ave NE, and 5 new trips from the UW campus area along NE 185th St.

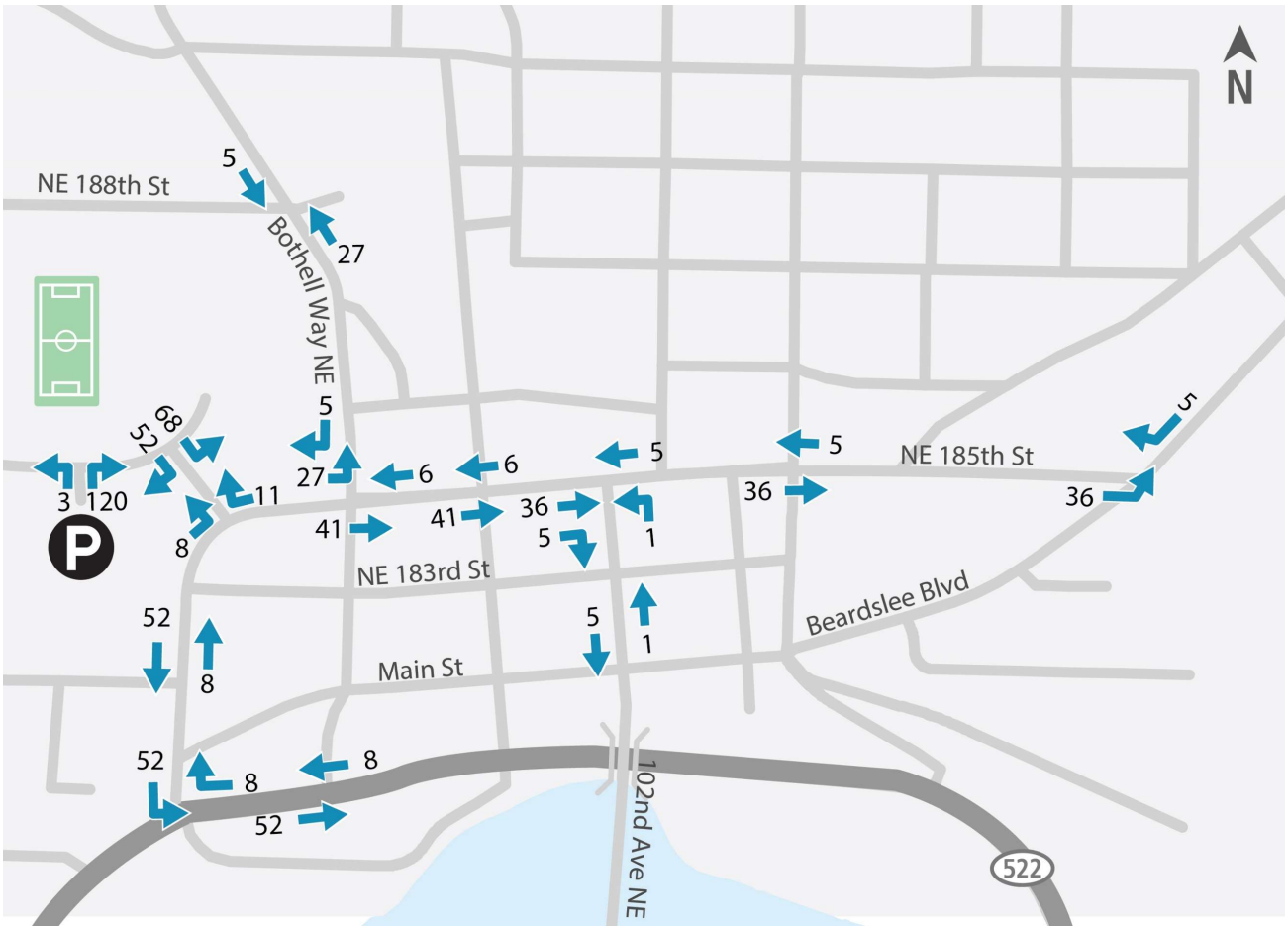

Figure 8: Bothell Route Assignment – Park-and-Ride Garage

The routing for the Bothell office and retail space in the new park-and-ride garage is shown in Figure 9Figure 8. The development results in 16 new trips to the north along Bothell Way NE, 16 new trips to the east along SR 522, and 22 new trips to the west along SR 522. The inbound trip distribution results in 10 new trips from the north along Bothell Way NE, 11 new trips from the east along SR 522, and 14 new trips from the west along SR 522.

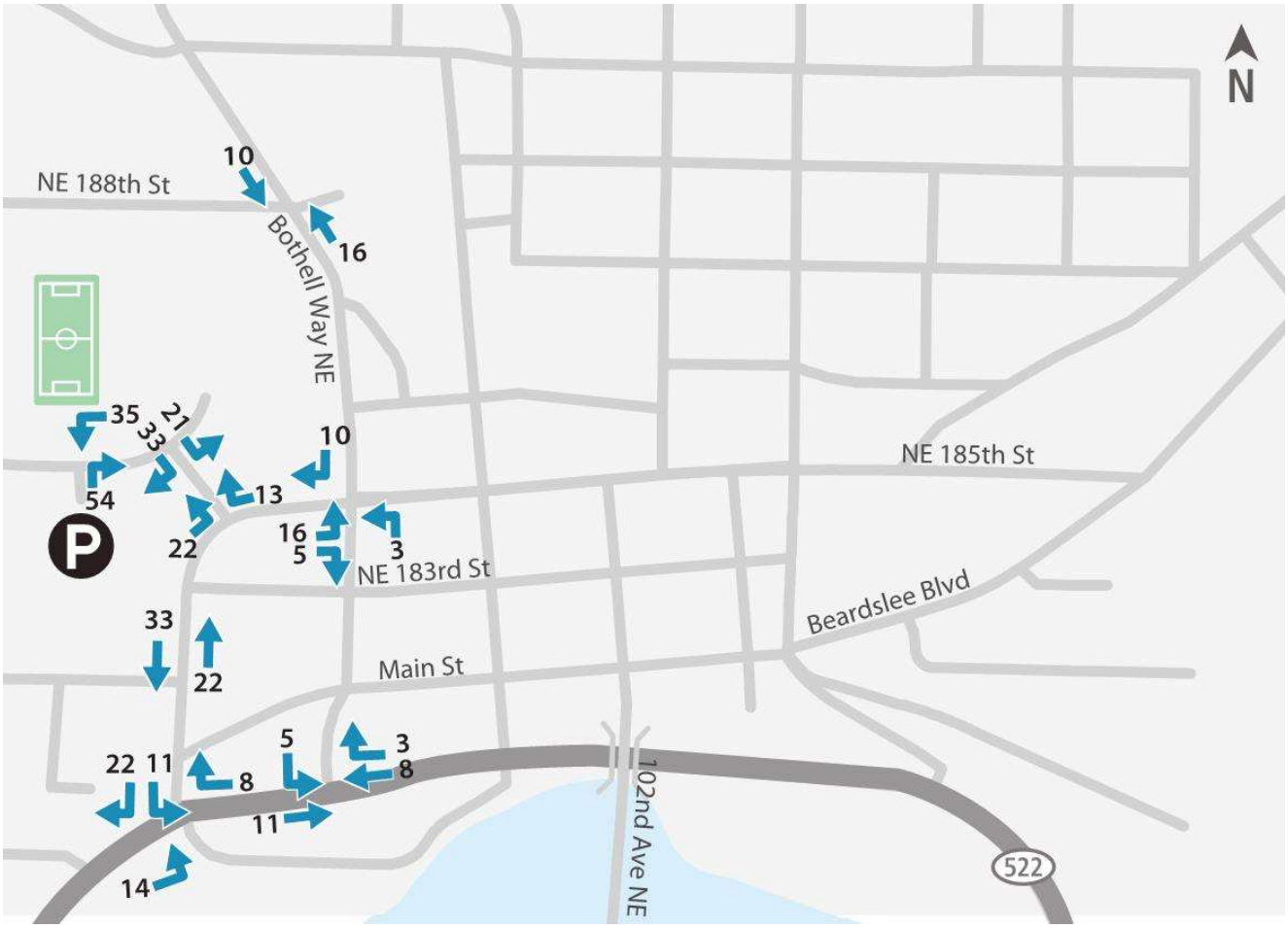

Figure 9: Bothell Route Assignment – Retail and Office Space

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