LYNNWOOD LINK EXTENSION

DRAFT ENVIRONMENTAL IMPACT STATEMENT

Transportation Technical Report

SOUNDTRANSIT

U.S. Department of Transportation
Federal Transit Administration

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Acronyms and Abbreviations

acc/MEV	accidents per million entering vehicles
ADA	Americans with Disabilities Act
BNSF	Burlington Northern Santa Fe
CFR	Code of Federal Regulations
EIS	Environmental Impact Statement
FGTS	Washington State Freight and Goods Transportation System
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
HAL	high accident location
HOV	high-occupancy vehicle
HSS	Highways of Statewide Significance
I-405	Interstate 405
I-5	Interstate 5
LOS	level of service
mph	miles per hour
NEPA	National Environmental Policy Act
PSRC	Puget Sound Regional Council
PUD	Public Utility District
RCW	Revised Code of Washington
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SEPA	State Environmental Policy Act
Sound Transit	Central Puget Sound Regional Transit Authority
SR	State Route
ST2	Sound Transit 2
TCQSM	Transit Capacity and Quality of Service Manual
TRCP	Transit Cooperative Research Program
USC	United States Code
v/c ratio	volume-to-capacity ratio
VHT	vehicle hours of travel
VMT	vehicle miles of travel
WSDOT	Washington State Department of Transportation

1 INTRODUCTION

1.1 Project Background

The Central Puget Sound Regional Transit Authority (Sound Transit) intends to extend the Link light rail system from the planned station at the Northgate Transit Center in Seattle to the Lynnwood Transit Center in Lynnwood in southern Snohomish County, as shown in Figure 1-1. This project is currently known as the Lynnwood Link Extension. As part of the federal regulations and guidelines leading to the application for New Starts grant funds, Sound Transit conducted an Alternatives Analysis (Sound Transit 2011a) to support the evaluation of several options for addressing mobility needs in the project corridor. Sound Transit is conducting analysis and preparing a National Environmental Policy Act (NEPA) and State Environmental Policy Act (SEPA) Environmental Impact Statement (EIS) for the project.

The project corridor generally follows Interstate 5 (I-5) between Northgate and Lynnwood. While it is the major north-south route through the state of Washington, I-5 also serves a large commuter market between Snohomish and King counties and the city of Seattle. The corridor falls within an urban area that is constrained by Puget Sound to the west and Lake Washington to the east. There is a large north-to-south commuter market in this area that travels between the communities in Snohomish and King counties, toward Seattle or north to Everett, where many of the region's jobs are located.

The Lynnwood Link Extension is an element of Sound Transit's adopted Long-Range Plan and is part of the Sound Transit 2 (ST2) Plan for regional transit investments approved by voters in 2008. The project is also in the region's Metropolitan Transportation Plan (Puget Sound Regional Council's *Transportation 2040*). All of these plans anticipate the eventual extension of mass transit service north to Everett, and connecting to a regional system of rail and bus service serving other markets to the south, such as the University of Washington, Capitol Hill, downtown Seattle, downtown Bellevue, Redmond, SeaTac, and Federal Way.

The EIS phase for the Lynnwood Link Extension is building on the results of the Alternatives Analysis that Sound Transit performed in 2010 and 2011. The Alternatives Analysis developed and evaluated a range of alternatives to improve transit in the corridor, and resulted in an *Alternatives Analysis Report and SEPA Addendum* that identified the most promising alternatives for more detailed study and analysis (Sound Transit 2011a). From September 30, 2011, to October 31, 2011, Sound Transit and the Federal Transit Administration (FTA) conducted public scoping for the EIS. Based on the results of the scoping process, in December 2011 the Sound Transit Board determined that the alternatives to be further developed and studied in the EIS would be limited to light rail, and the general alignment would be along I-5 (Sound Transit 2011b).

Figure 1-1. Lynnwood Link Extension Vicinity Map

1.2 Purpose of Technical Report

This technical report presents detailed findings from the technical analysis of potential transportation impacts of the Lynnwood Link Extension. A summary of the information in this report is provided in Chapter 3, Transportation Impacts and Mitigation, of the Lynnwood Link Extension Draft EIS.

1.3 Organization of Technical Report

In addition to this Chapter 1, Introduction, the report comprises the following chapters:

- Chapter 2, Methodology and Assumptions, summarizes the analysis methods used to assess the alternatives in this report.
- Chapter 3, Relevant Plans, Policies, and Coordination, provides information regarding guiding regulations, plans, and policies and agency participation in the planning and analysis process.
- Chapter 4, Affected Environment, discusses current transportation conditions.
- Chapter 5, Long-Term Impacts, describes anticipated impacts in terms of the following:
  - Regional Context and Travel Patterns
  - Transit
  - Freeway Operations
  - Arterials and Local Streets
  - Nonmotorized Facilities
  - Freight Mobility and Access
  - Parking
  - Safety
- Chapter 6, Construction Impacts, discusses expected impacts due to project construction activities.
- Chapter 7, Indirect and Secondary Impacts, describes the project effects that may occur later in time or some distance from the project.
- Chapter 8, Cumulative Impacts, describes the potential additional cumulative transportation effects of other projects that were not included in the traffic and ridership modeling.
- Chapter 9, Potential Mitigation Measures, describes the potential measures that could be implemented to mitigate effects of the project.

2 METHODOLOGY AND ASSUMPTIONS

The methodology and assumptions used to analyze the transportation impacts of the Lynnwood Link Extension are presented in detail in the *Transportation Technical Analysis Methodology Memorandum* (Sound Transit 2012), which is provided in Appendix A of this technical report. That report provides the following information.

- Guiding regulations, plans, and/or policies that guide the transportation analysis
- A list of lead and cooperating agencies
- Data needs and sources, such as traffic volumes, parking supply and utilization, pedestrian and bicycle facilities, accident data, and transit service characteristics
- Study area and area of effect, including intersections and roadway segments studied
- Analysis tools used for travel demand forecasting and traffic operations analysis
- Assessment methods and analysis thresholds used for analysis of regional transit, regional traffic, corridor traffic, local and sub-regional bus service, intersection operations, freeway and ramp operations, property access and local circulation, parking, nonmotorized facilities and modes, freight, construction, and safety
- Methodology for development of detailed traffic volumes
- Assessment methods for indirect and cumulative effects
- Transportation data developed for use by other disciplines
- Development of mitigation measures

3 RELEVANT PLANS, POLICIES, AND COORDINATION

3.1 Guiding Regulations, Plans, and/or Policies

The transportation analysis is guided by the following laws and regulations:

- NEPA
- SEPA
- Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), Public Law 109-59
- Code of Federal Regulations (CFR) 23 Part 450 (implementing United States Code [USC] 23 Section 111, which requires the U.S. Secretary of Transportation to approve access revisions to the Interstate System)
- CFR 23 Part 771 (Environmental Impact and Related Procedures)
- Washington State Growth Management Act (Revised Code of Washington [RCW] 36,70A.070)

In addition to the laws and regulations identified above, the analysis of local transportation impacts is guided by the policy direction established in the numerous plans or policy documents adopted within the project corridor. These include, but are not limited to:

- ST2 Plan, approved November 4, 2008
- Strategic Plan for Public Transportation 2011–2021 (King County Department of Transportation Metro Transit Division, July 11, 2011)
- 2012–2017 Transit Development Plan (Community Transit, November 15, 2011 Draft)
- Community Transit Long-Range Transit Plan (Community Transit, February 4, 2011)
- Washington Transportation Plan 2007–2026 (Washington State Department of Transportation [WSDOT], November 14, 2006)
- WSDOT Design Manual
- WSDOT Development Service Manual (M.3007.00)
- Puget Sound Regional Council (PSRC) *Transportation 2040: Toward a Sustainable Transportation System*
- Comprehensive and/or Transportation Plans for the Cities of Seattle, Shoreline, Mountlake Terrace, and Lynnwood, as well as King County and Snohomish County

- 6-Year Capital Improvement Program for the Cities of Seattle, Shoreline, Mountlake Terrace, and Lynnwood, as well as King County and Snohomish County

3.2 Agency Coordination

The transportation planning and analysis process has involved local jurisdictions, state agencies, federal agencies, transit agencies, PSRC, and other interested parties.

3.2.1 NEPA Lead Agency

The FTA is the lead agency for development of the Draft EIS in accordance with NEPA regulations.

3.2.2 Cooperating and Participating Agencies

For the development of the Draft EIS and this Transportation Technical Report, Sound Transit staff and consultants met with and/or coordinated with staff planners and engineers from the following cooperating and participating agencies for this project:

- WSDOT
- Federal Highway Administration (FHWA)
- PSRC
- Community Transit
- King County Metro
- City of Lynnwood
- City of Mountlake Terrace
- City of Shoreline
- City of Seattle
- Snohomish County
- King County

4 AFFECTED ENVIRONMENT

4.1 Regional Context and Travel Patterns

This section discusses the primary roadways in the project area and their current use. Key observations and findings include the following:

- Peak direction traffic volumes across north-south screenlines in the corridor currently approach overall capacity.
- Approximately 115,000 persons travel through the corridor by transit and auto at Northgate during the three-hour PM peak period. This includes travel on I-5 and adjacent arterials.
- Traffic congestion on I-5 currently adds 44 minutes of travel time to the general purpose lanes and 38 minutes to the high-occupancy vehicle (HOV) lanes for a trip from Everett to Seattle during the AM peak period.
- The general purpose lanes on I-5 operate at over capacity during multiple hours of the day. The HOV lane is also congested, although not to the level of the general purpose lanes.
- The HOV lanes on I-5 are currently not meeting WSDOT's adopted performance standard (maintaining an average speed of 45 mph or more at least 90 percent of the time during the morning and afternoon rush hours).[1]
- Major origins of trips from within the Lynnwood Link Extension to downtown Seattle and the University District include north Seattle, North Creek, Shoreline, Edmonds, and Lynnwood.

In summary, the I-5 corridor, which is the predominant travel corridor connecting urban centers, including Lynnwood, Northgate, and downtown Seattle, has limited person throughput and reliability for auto and transit users due to traffic congestion in both the general purpose and HOV lanes.

4.1.1 Transportation Facilities

The project area is served by a network of roadways consisting of a major interstate route (I-5), state highways (State Route [SR] 99, SR 523, SR 522, and SR 104), and other local arterials and roads as shown in Figure 4-1.

Major Limited-Access Highways

The primary north-south highway through the project area is I-5, a limited access freeway, facilitating regional and interstate movement, regional express bus service, and access to jurisdictions within the corridor. It is an essential roadway for the movement of people and goods in the Puget Sound region and is at or near capacity

[1] http://wsdot.wa.gov/publications/fulltext/graynotebook/CR12.pdf

during many hours of the day. A number of traffic management features are incorporated in this highway facility, including HOV lanes, ramp meters, queue bypass lanes, and variable message signs to provide information to drivers. WSDOT operates a roadway conditions service Web site for I-5 and other facilities in Puget Sound that links to mobile devices, providing roadway congestion information.

State Highways and Local Arterials

Several of the north-south arterials offering connections among neighborhoods, commercial districts, major access points to I-5, and major destinations include Aurora Avenue North (SR 99), Meridian Avenue North, 5th Avenue NE, 15th Avenue NE, 52nd Avenue West, and segments of Roosevelt Way North.

Four state highways located within the project area provide access to bus transit, passenger rail, and the movement of freight through the area.

SR 99 (Aurora Avenue North) is a primary north-south roadway that is parallel to I-5 through the project area. It is an important arterial with high traffic volumes, five to seven travel lanes, a high degree of access control, and traffic signal coordination that facilitates north-south travel flows. Portions of this roadway have managed access, which improves the roadway capacity by limiting left-turn movements at midblock locations into businesses and local streets. SR 99 also serves as a major facility for transit with business access and transit lanes accommodating bus rapid transit services through much of the project area as well as other express and local bus services. Arterial improvements are under construction in Shoreline to implement additional business access and transit lanes plus managed access.

SR 523, also known as North/NE 145th Street, is a four-lane arterial that provides access to I-5 as well as Lake City Way to the east and SR 99 to the west. North/NE 145th Street is an arterial that connects communities, forms the city boundary between Seattle and Shoreline, and passes through residential development.

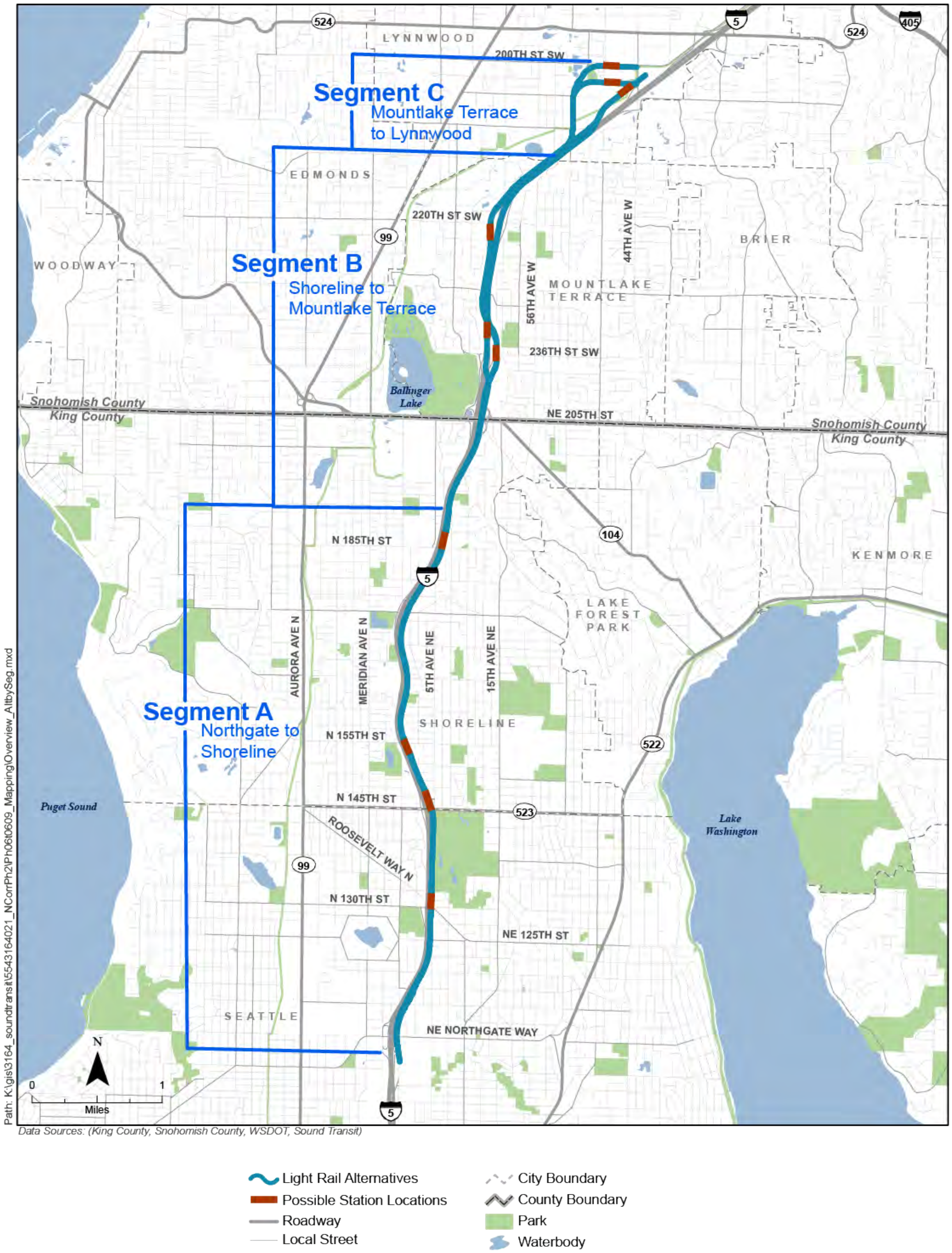


Figure 4-1. Lynnwood Link Extension Project Area

SR 104 extends from SR 522 to the Edmonds Ferry Terminal where SR 104 crosses Puget Sound via the Washington State Ferries. In the project area, SR 104 is named differently depending on the jurisdiction in which it is located. From east to west, it is known as Ballinger Way, 244th Street SW, NE 205th Street (the King-Snohomish county line), and Edmonds Way as it approaches the Edmonds Ferry Terminal. SR 104 is a two-to-four-lane arterial that runs northwest-southeast and provides access to I-5. Peak-period congestion along SR 104 is recurring within the SR 104/I-5 interchange area, extending east along Ballinger Way and west along the SR 99/Aurora Village commercial district.

SR 524, also known as 196th Street, is a major east-west arterial through Lynnwood. In the west, it connects to SR 99 and Edmonds. To the east, SR 524 continues under Interstate 405 (I-405) with no access to the interstate and ends at SR 522.

East-west arterial travel within the project area is tied to connections with I-5, to Aurora Avenue North/SR 99, and to Lake City Way/SR 522. A limited number of north-south arterials provide connectivity among neighborhoods, commercial districts, and communities, both east and west of I-5.

NE 130th Street, NE 145th Street, and NE 175th Street are four-lane arterials that access I-5 with interchanges, where congestion occurs regularly. North 117th Street, NE 155th Street, and NE 185th Street cross I-5 connecting business districts on each side of I-5. Peak-period travel conditions on east-west routes are a function of arterial spacing, access to I-5, and proximity to commercial districts. East-west traffic flows generally at arterial speeds between 30 and 35 miles per hour (mph).

Other major north-south roadways in the project area include Meridian Avenue North/76th Avenue West, 15th Avenue NE, 5th Avenue NE, Greenwood Avenue North, Westminster Way North, and SR 522. These arterials provide additional capacity for commuters during peak travel periods as well as access to residential neighborhoods.

Meridian Avenue North is a two-lane minor arterial (30 mph) that provides both property access and neighborhood connections among the single-family residential neighborhoods north of North 130th Street. It extends across the county boundary, continuing as 76th Avenue West in Snohomish County and connecting to SR 99/Pacific Highway. Meridian Avenue North carries between 6,100 and 12,000 vehicles per day within Shoreline[2]. Meridian Avenue North/76th Avenue West has limited intersection control, with signals at major east-west arterials; otherwise, it serves as a direct north-south route between I-5 and SR 99.

15th Avenue NE is a two- to five-lane arterial that extends north from Northgate Way to SR 104/Ballinger Way east of I-5. It carries between 9,100 and 16,600 vehicles per day[3]. The speed limit is 25 to 35 mph. This major arterial passes

[2] City of Shoreline Traffic Flow Map, December 2009
[3] Ibid.

through the Northgate commercial district as well as a historical Shoreline business district. This route provides neighborhood and community connections, a commuter bypass to I-5, and links to residential areas.

5th Avenue NE, which is a remnant collector arterial from the I-5 construction, lies immediately adjacent to I-5 between NE 130th Street and NE 185th Street. It is a two-lane street that provides access to single-family residential neighborhoods and neighborhood commercial districts in Shoreline. The speed limit is 30 mph, and traffic volumes are modest within Shoreline at 3,300 to 6,900 vehicles per day[4]. 5th Avenue NE is likely used as a bypass to I-5 during peak-period congestion.

Roosevelt Way North/NE is another remnant of I-5 construction with a segment west of I-5 that connects North 130th Street to Aurora Avenue North and North 145th Street, running northwest to southeast. It is a two-lane, tree-lined street with an open ditch that serves adjacent single-family residential neighborhoods as a low-speed and low-volume collector street. Roosevelt Way extends to the east of I-5 from the North 130th Street interchange and connects to SR 522/Lake City Way via NE 125th Street.

Within Lynnwood, 200th Street SW provides a three-lane minor arterial connection between SR 99 and the Lynnwood Transit Center. With a posted speed limit at 30 mph, traffic along 200th Street SW flows smoothly through multifamily residential neighborhoods.

4.1.2 Travel Demand and Patterns

Miles Driven and Hours Spent in Travel

Table 4-1 shows the vehicle miles of travel (VMT) and vehicle hours of travel (VHT) for the Puget Sound region as modeled with the PSRC Regional Model: WSDOT Project Version for the existing year (2011). Detailed information about that model is provided in the *Transit Ridership Forecasting Technical Report* (Sound Transit 2012). These are systemwide measures that are useful primarily for comparison purposes. They will be used to compare to future conditions with and without the Lynnwood Link Extension to indicate travel growth in the region and the effect of the project on that growth.

Table 4-1. VMT and VHT for Existing Year 2011

	VMT	VHT
Existing Year (2011)	79,440,000	2,210,000

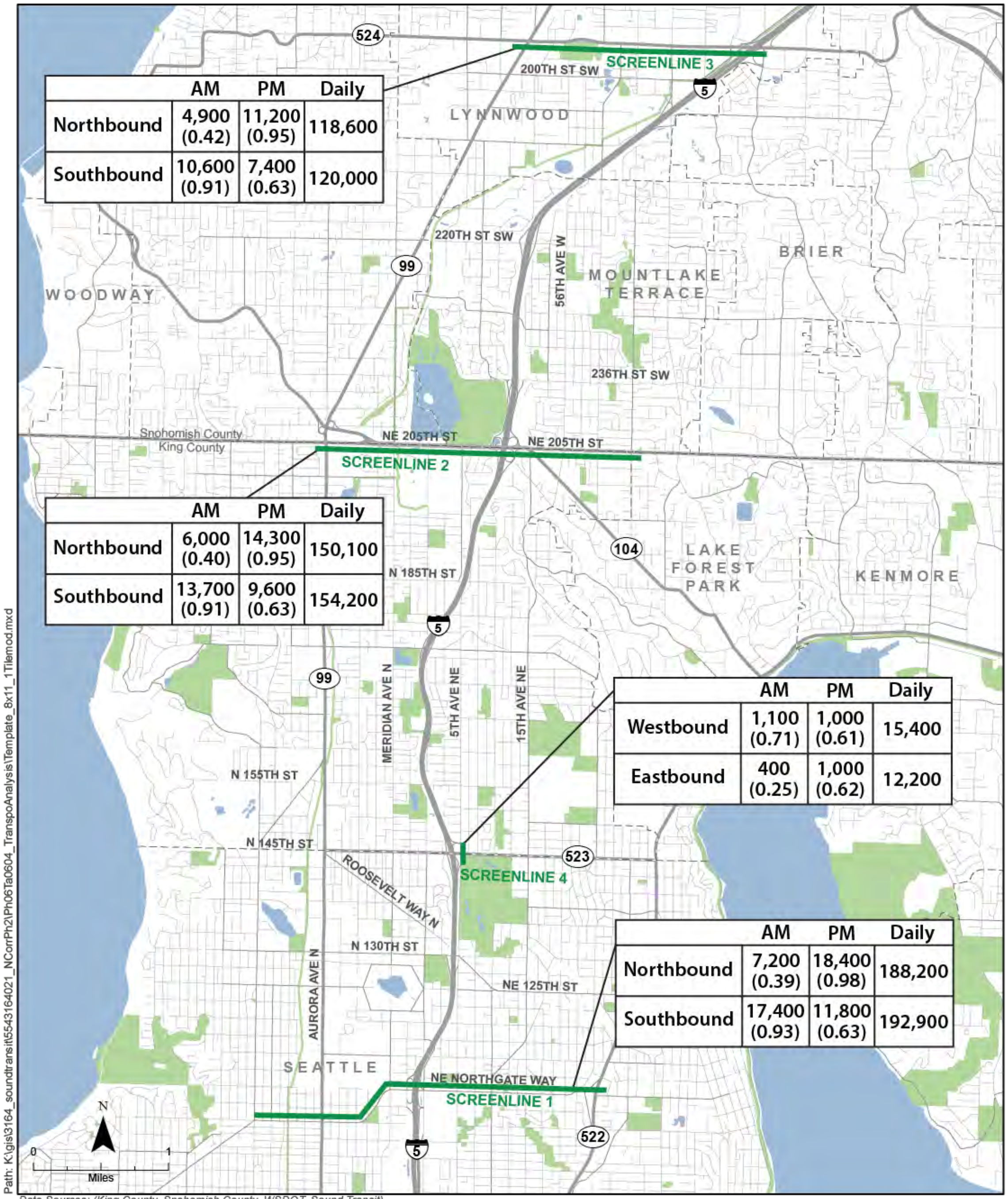
[4] Ibid.

Vehicles Traveling through the Corridor

Figure 4-2 presents the four screenlines that were used for analyzing corridor traffic conditions along with current AM peak hour, PM peak hour, and daily traffic volumes across those screenlines by direction, including directional volume-to-capacity (v/c) ratios for the peak hours. A "screenline" is an imaginary line across a section of freeway and/or arterials. Screenlines are often used in traffic analyses to determine how much volume is entering or exiting a particular area based on how much traffic crosses the screenline. A v/c ratio above 0.90 (or 90 percent of capacity) typically represents congested conditions. A v/c ratio of 1.0 indicates that a corridor is operating at capacity and represents highly congested conditions. The four screenlines used in this analysis were selected by Sound Transit in consultation with local agencies to represent locations within the corridor where major movements might be affected by the project. The v/c ratios are an indicator of a given facility to accommodate the demand wanting to use it, and as such, provide a general assessment of congestion levels. The traffic volumes and v/c ratios shown were also derived from the PSRC Regional Model: WSDOT Project Version for the existing year (2011) scenario.

During the AM peak hour, in the southbound peak direction of traffic flow, traffic volumes approach the overall capacity at screenlines 1, 2, and 3, indicating that AM peak hour travel in the peak direction through the corridor is currently congested. However, these three screenlines are well below capacity in the reverse direction, with a v/c ratio of around 0.40. Screenline 4, on NE 145th Street just east of I-5, has a v/c ratio of 0.71 in the westbound direction (the peak flow of travel) indicating relatively high volumes, but within the capacity of the facility. At a v/c ratio of 0.25 in the eastbound direction, traffic flows are well within the capacity of the roadway.

Similar to the AM peak hour, during the PM peak hour, the screenlines show traffic volumes approaching or at the overall capacity of screenlines in the northbound direction, which is the peak direction of traffic flow—reflecting congested conditions. These screenlines are below capacity in the reverse direction, at a v/c ratio of 0.63; however, southbound travel is still typically difficult in the PM peak hour due to a combination of bottleneck locations, particularly in the Northgate area near the terminus of the reversible I-5 express lanes, and congestions emanating from multiple points as far south as downtown Seattle. In the Northgate area, in the PM peak hour (when the express lanes are northbound) the southbound HOV lane traffic is forced to merge into the southbound general purpose lanes at this location. Additionally, immediately south of this point, traffic from the Northgate interchange merges into the mainline, and then a southbound lane drops to NE 80th/85th Streets, resulting in only a three-lane southbound mainline. This constraint builds upon the southbound congestion that emanates from farther south and causes southbound congestion that backs up to north of Northgate on a regular basis in the PM peak period. Additionally, because the southbound HOV lane terminates at this point, current southbound express bus service cannot bypass the freeway congestion, resulting in very unreliable southbound transit travel times, as well as significant delay for buses returning to terminals or bases at the end of service or to start a route.



	AM	PM	Daily
Northbound	4,900 (0.42)	11,200 (0.95)	118,600
Southbound	10,600 (0.91)	7,400 (0.63)	120,000

	AM	PM	Daily
Northbound	6,000 (0.40)	14,300 (0.95)	150,100
Southbound	13,700 (0.91)	9,600 (0.63)	154,200

	AM	PM	Daily
Westbound	1,100 (0.71)	1,000 (0.61)	15,400
Eastbound	400 (0.25)	1,000 (0.62)	12,200

	AM	PM	Daily
Northbound	7,200 (0.39)	18,400 (0.98)	188,200
Southbound	17,400 (0.93)	11,800 (0.63)	192,900

Data Sources: (King County, Snohomish County, WSDOT, Sound Transit)

Legend

Screenlines

X,XXX = Volume

(0.XX) = Volume-to-Capacity (V/C) Ratio

Figure 4-2. Analysis Screenlines

Screenline 4 has a v/c ratio of about 0.60 in both directions during the PM peak hour, generally indicating acceptable levels of service.

On a daily basis, screenline traffic volumes are fairly well balanced, with slightly higher traffic volumes in the southbound direction on screenlines 1 through 3 and higher volumes in the westbound direction on screenline 4.

People Traveling through the Corridor

Table 4-2 shows existing person throughput during the PM peak period in the corridor at two screenline locations. The person throughput includes trips on I-5, SR 99, and other north-south arterials via both automobile and transit. Approximately 115,000 persons travel through the corridor at Northgate during the 3-hour PM peak period. Similar to the VMT and VHT measures, this measure is most useful for comparison purposes. It is used to compare to future conditions with and without the Lynnwood Link Extension to indicate the expected trip growth within the corridor, and the effect of the project on that growth.

Table 4-2. Person Throughput—PM Peak Period

Screenline	Screenline Location	Northbound	Southbound	Total
1	North of Northgate Way NE			
	Auto	11,000	2,000	13,000
	Transit	62,000	40,000	102,000
	Total	73,000	42,000	115,000
2	South of North 205th Street			
	Auto	7,000	1,000	8,000
	Transit	49,000	32,000	81,000
	Total	56,000	33,000	89,000

Sources: Sound Transit Ridership Model and PSRC Regional Model: WSDOT Project Version (2012)

Roadway Congestion

WSDOT reports and records traffic conditions for major roadway facilities on a daily basis. The segment of I-5 between Everett (at the SR 526 interchange) and downtown Seattle carries some of the highest vehicle volumes in the region. Figure 4-3, the WSDOT traffic conditions map, characterizes traffic conditions from “stop and go” to “wide open” conditions. A typical November weekday is shown in this figure; however, a wide variation of peak period congestion is experienced throughout the corridor. A recent study of I-5 operations by WSDOT[5] found that, although the recent recession has caused a decrease in traffic volumes, traffic congestion continues to be an issue in the corridor. Figure 4-4 summarizes data collected in 2011, indicating that areas of extreme congestion continue to occur in the corridor throughout much of the AM and PM peak periods.

[5] WSDOT Express Lane System Pre-design Studies Project

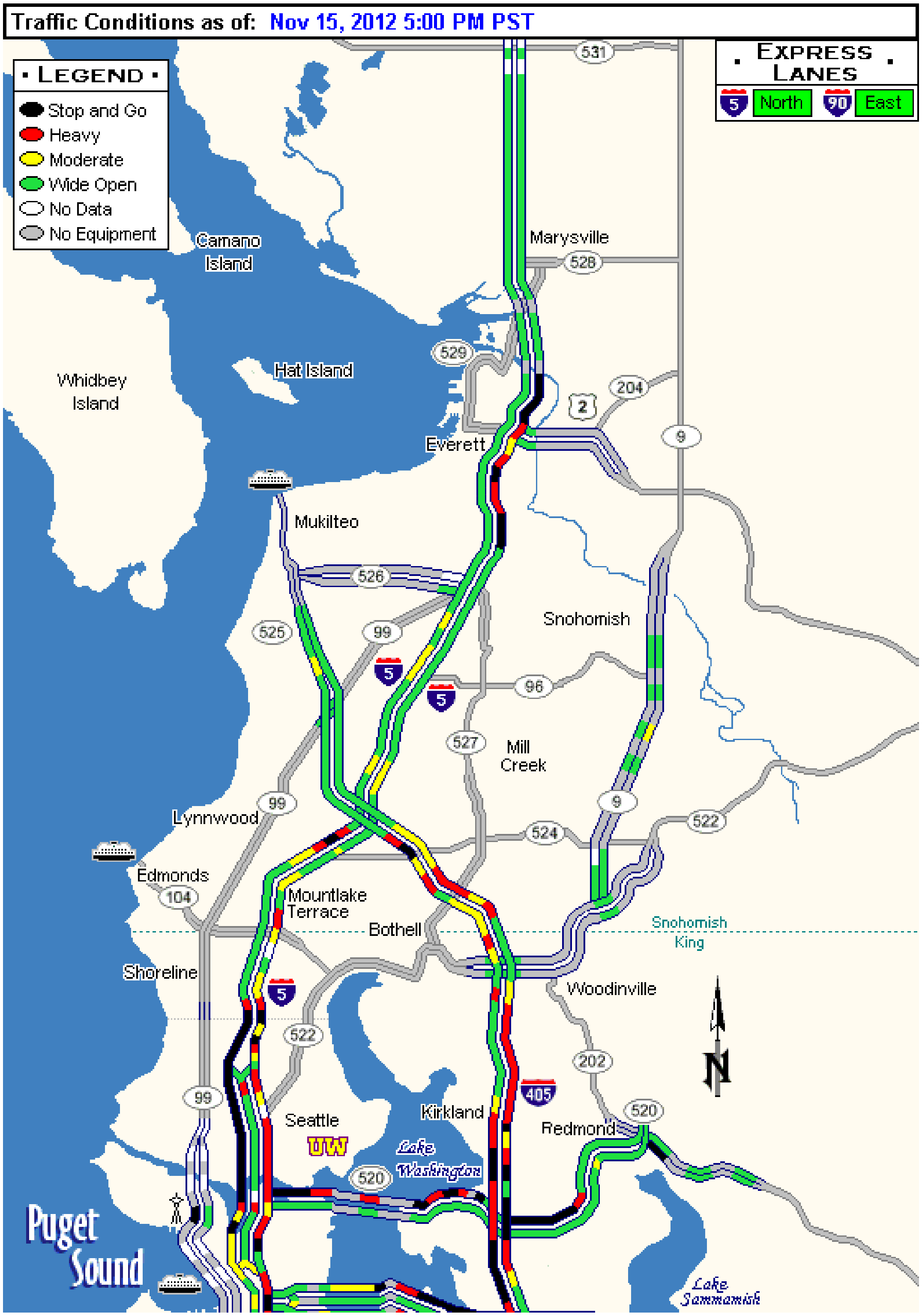
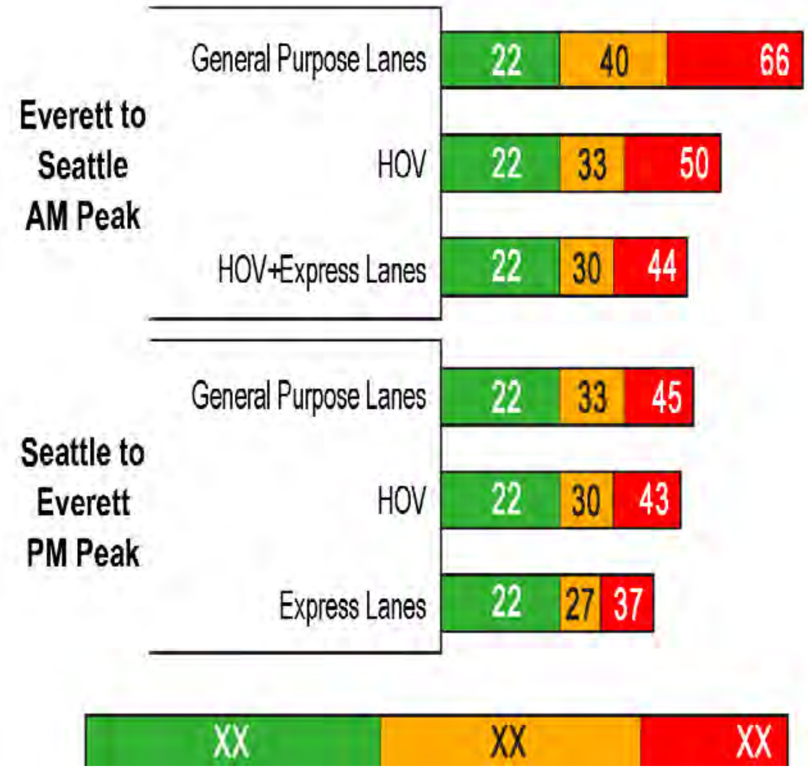


Figure 4-3. Example of WSDOT Traffic Conditions Map

Source: WSDOT Congestion Data, 2011

Figure 4-4. Extreme Congestion Conditions, Northgate to Lynnwood

Roadway congestion is often reported in terms of travel-time reliability. Typically, a travel time in the 95th percentile is used to describe the reliability of a trip or the variance in the time it can take between destinations. Drivers may use this travel-time value to estimate when they need to leave to reach a destination on time. The 95 percent reliable travel times along I-5 are much longer during peak periods compared to travel times during uncongested periods when traffic is at free-flow speeds. As shown in Figure 4-5, vehicles traveling from Everett to Seattle during the AM peak period and using the general purpose lanes would arrive on time 95 percent of the time if they allowed 66 minutes to complete the trip. A vehicle trip in the HOV lane would take 50 minutes, a savings of 16 minutes. The travel time from Everett to Seattle at the posted speed limit (i.e., no congestion) is 22 minutes, meaning that the AM peak period congestion causes a traveler to allot 44 additional minutes of time for the trip if using the general purpose lanes, and 38 additional minutes if using the HOV lanes.



Source: The 2012 Congestion Report, WSDOT

Figure 4-5. Travel-Time Reliability for the Everett-to-Seattle Commute

General Purpose Lane Performance

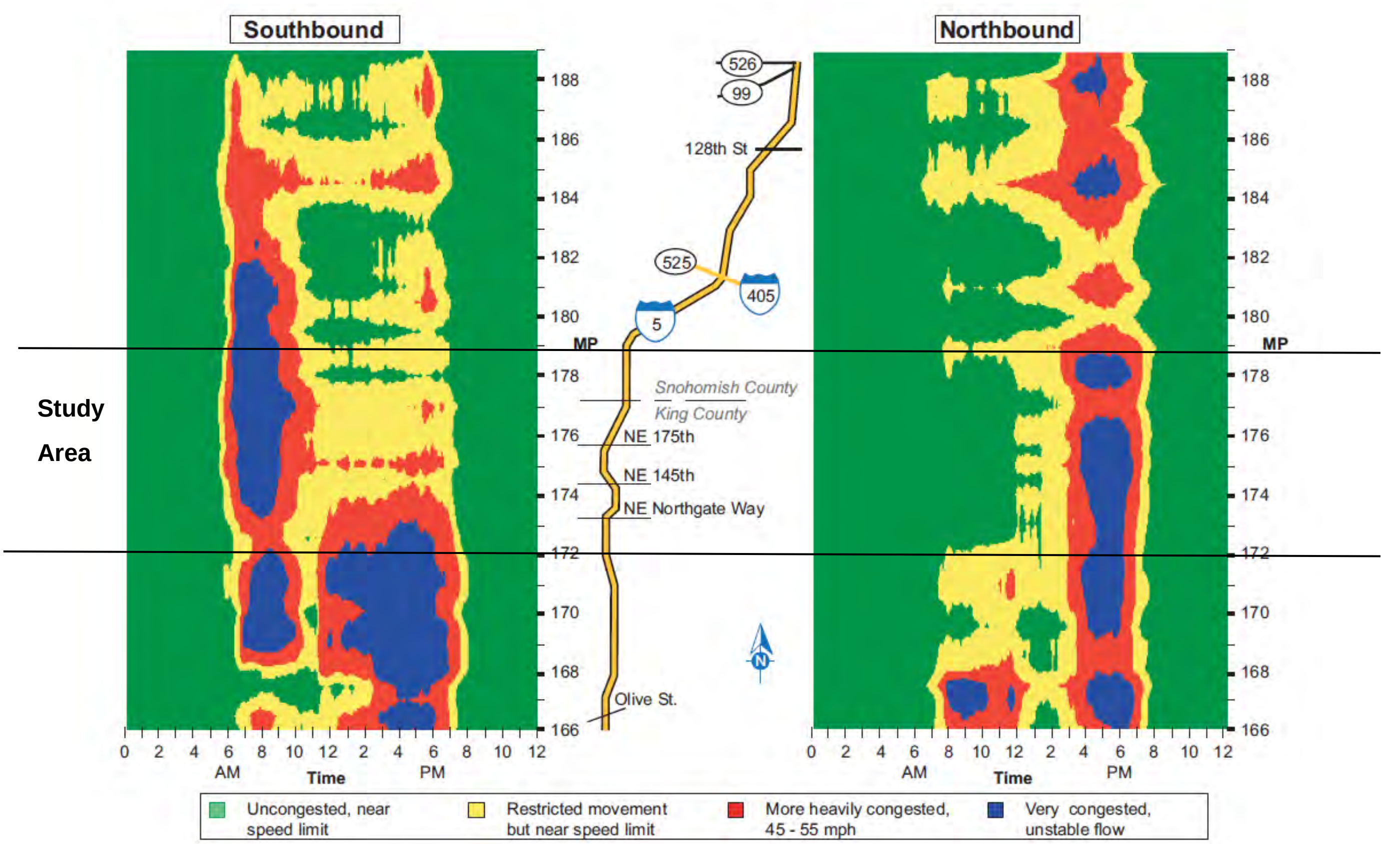
Data provided by WSDOT show recurring congestion based on I-5 travel speeds for the AM and PM peak periods. Figure 4-6 illustrates the average congestion levels along I-5 between downtown Seattle and Everett. I-5 operates at over capacity during many hours of the day.[6] Afternoon southbound traffic on I-5 regularly backs up into Shoreline for a variety of reasons: (1) congestion is emanating from as far south as downtown Seattle, and (2) the express lanes are serving northbound traffic, hence providing proportionately less capacity southbound south of Northgate. If the express lanes were to serve southbound traffic during the PM peak period, congestion would still be likely to occur, although it would not be as severe. To better understand congestion levels along I-5, it is helpful to look at not only average traffic congestion but also the frequency of congestion. Congestion frequency measures the times and locations that heavy congestion is likely to occur and, therefore, can be an indicator of the "reliability" of good travel performance in an

[6] WSDOT & Washington State Transportation Center (TRAC), Central Puget Sound Freeway Network Usage and Performance Report, 2003 Update, 2005: http://depts.washington.edu/trac/bulkdisk/pdf/623.1.pdf

area. Figure 4-7 shows the frequency of significant congestion in terms of the number of weekdays per week that congestion occurs. As shown in Figure 4-7, not only does this stretch of I-5 operate at over capacity many hours of the day (as shown in Figure 4-6), but it also operates at over capacity for many days each week.[7]

Additional WSDOT measures of congestion are provided in Figures 4-8 and 4-9 illustrating three measures: (1) average travel time; (2) 95th percentile travel time; and (3) the likelihood of a "slow" trip, defined as an average overall trip speed on the freeway of less than approximately 35 mph for 2007 traffic conditions.

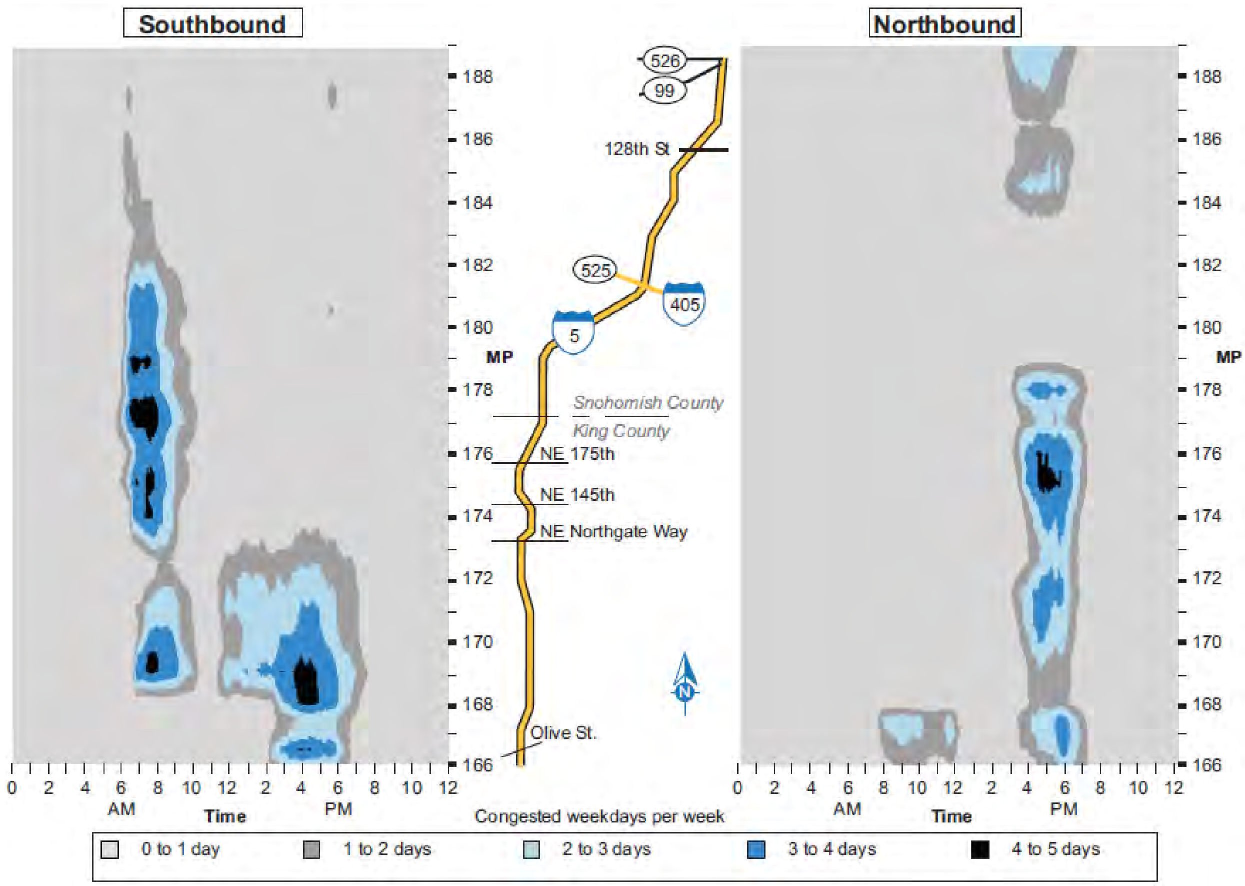
Northbound trips from downtown Seattle to south Everett experience only minor slowing throughout the day until about 2:00 pm, when trip times begin to steadily increase, peaking between 4:00 pm and 5:00 pm, and a steady decline to uncongested conditions at around 7:30 pm. Average trip times during the PM peak period are approximately 80 percent longer than those during the off-peak period, with 95th percentile travel times being more than 100 percent higher than those during the off-peak period. There is a moderate (50 percent) likelihood of a slow trip during the PM peak period.



Note: "MP" = milepost

Figure 4-6. I-5 North—General Purpose Traffic Congestion (2006)

[7] Ibid



Note: "MP" = milepost

Figure 4-7. Frequency of Significant Congestion on I-5 North—General Purpose Lanes, 2006 Weekday Average

In the southbound direction, travel times increase during both the morning and afternoon commutes. Average trip times during the AM peak period are twice as long as those during the off-peak period. Trip times decrease during the midmorning hours but increase again in the early afternoon, gradually peaking around 4:00 pm at about 70 percent higher than those during off-peak uncongested periods. The likelihood of a southbound trip with an average speed of less than 35 mph is up to almost 70 percent during the middle of the AM peak period and around 45 percent during the PM peak period.

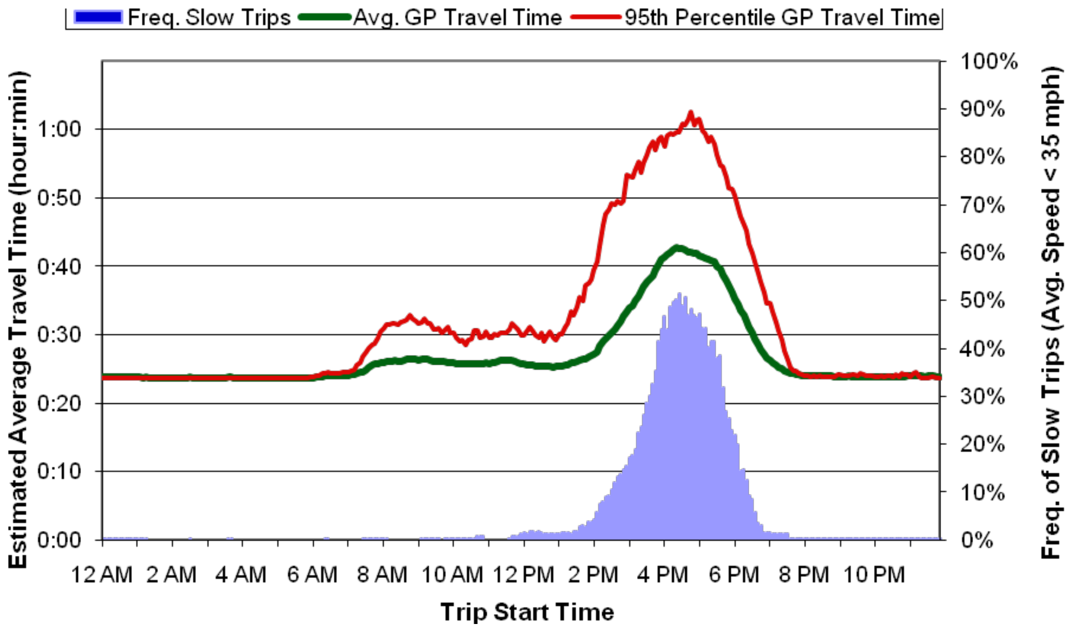


Figure 4-8. Estimated Average Weekday Travel Times (2006)—Seattle Central Business District to SR 526 Interchange: Northbound General Purpose Lanes (23.7 Miles)

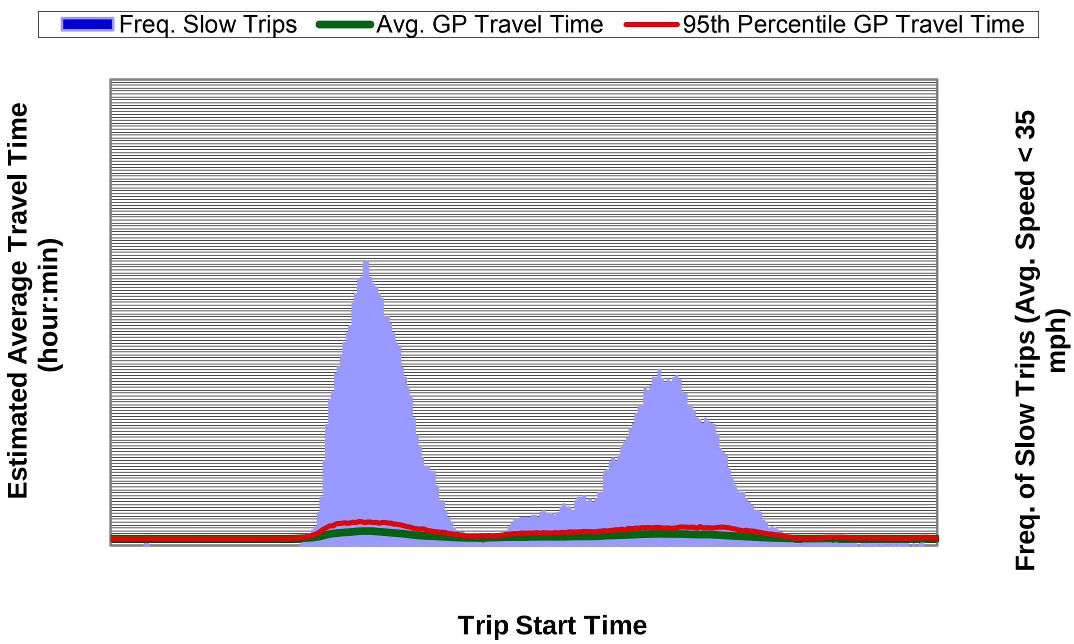


Figure 4-9. Estimated Average Weekday Travel Times (2006)—SR 526 Interchange to Seattle Central Business District: Southbound General Purpose Lanes (23.7 Miles)

HOV Lane Performance

The HOV lanes along I-5 are for vehicles with two or more passengers. According to a 2002 study by the Washington State Transportation Center,[8] the northbound HOV lane near Northgate can exceed 1,500 vehicles per hour during the afternoon commute, which is comparable to the adjacent general purpose lanes. Hence, the HOV lanes tend to be congested in the peak directions during the peak periods, although not to the level of the general purpose lanes because the magnitude of HOV volumes are causing congestion and slower travel speeds in the HOV lanes. With no physical separation between the HOV and general purpose lanes, as well as less than ideal lane widths and limited shoulder width to the left of the HOV lane, congestion in the general purpose lanes also affects the operation of the HOV lanes. Also, the high number of buses using the HOV lane can contribute to congestion in the HOV lane.

In addition, in some locations buses using I-5 must weave across the general purpose lanes when entering or exiting the freeway, except at the Lynnwood Transit Center and Mountlake Terrace Freeway Station, where buses use the direct-access ramps to access the HOV lane. While this movement does not have a significant impact on traffic in the general purpose lanes, it does cause additional delay to buses making this movement.

WSDOT's adopted public policy regarding HOV lane performance is that a driver in an HOV lane should be able to maintain an average speed of 45 mph or more at least 90 percent of the time during the morning and afternoon rush hours. As shown in Figures 4-10 through 4-12, the HOV lanes on I-5 are currently not meeting this performance standard.[9, 10] This low level of performance in the HOV lanes affects the ability of bus transit service to maintain schedules and provide fast, reliable service. In addition, buses traveling in the non-peak direction (e.g., southbound during the PM peak period) must travel in general purpose lanes from Northgate to downtown Seattle because the reversible express lanes operate in the peak direction only. Thus, these bus trips are subject to general purpose traffic congestion for that portion of the trip.

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8 TRAC, HOV Lane Performance Monitoring 2002 Report – Volume 2, 2004: http://depts.washington.edu/trac/bulkdisk/pdf/584.1.pdf
9 WSDOT, HOV Policy, 2010: http://www.wsdot.wa.gov/HOV/Policy.htm
10 TRAC, Executive Summary for HOV Action Plan Phase 1, WSDOT project T4118-24, April 2008

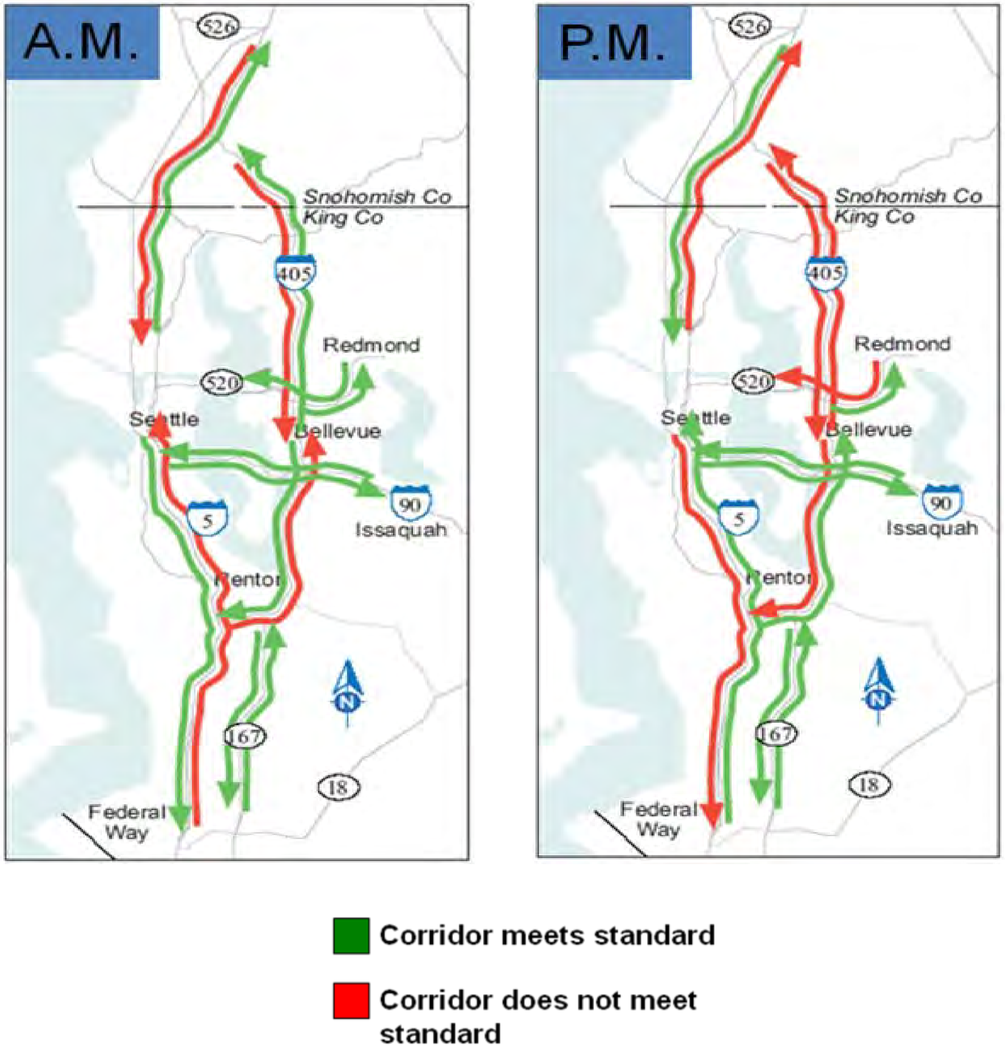


Figure 4-10. HOV Lane Performance Standard

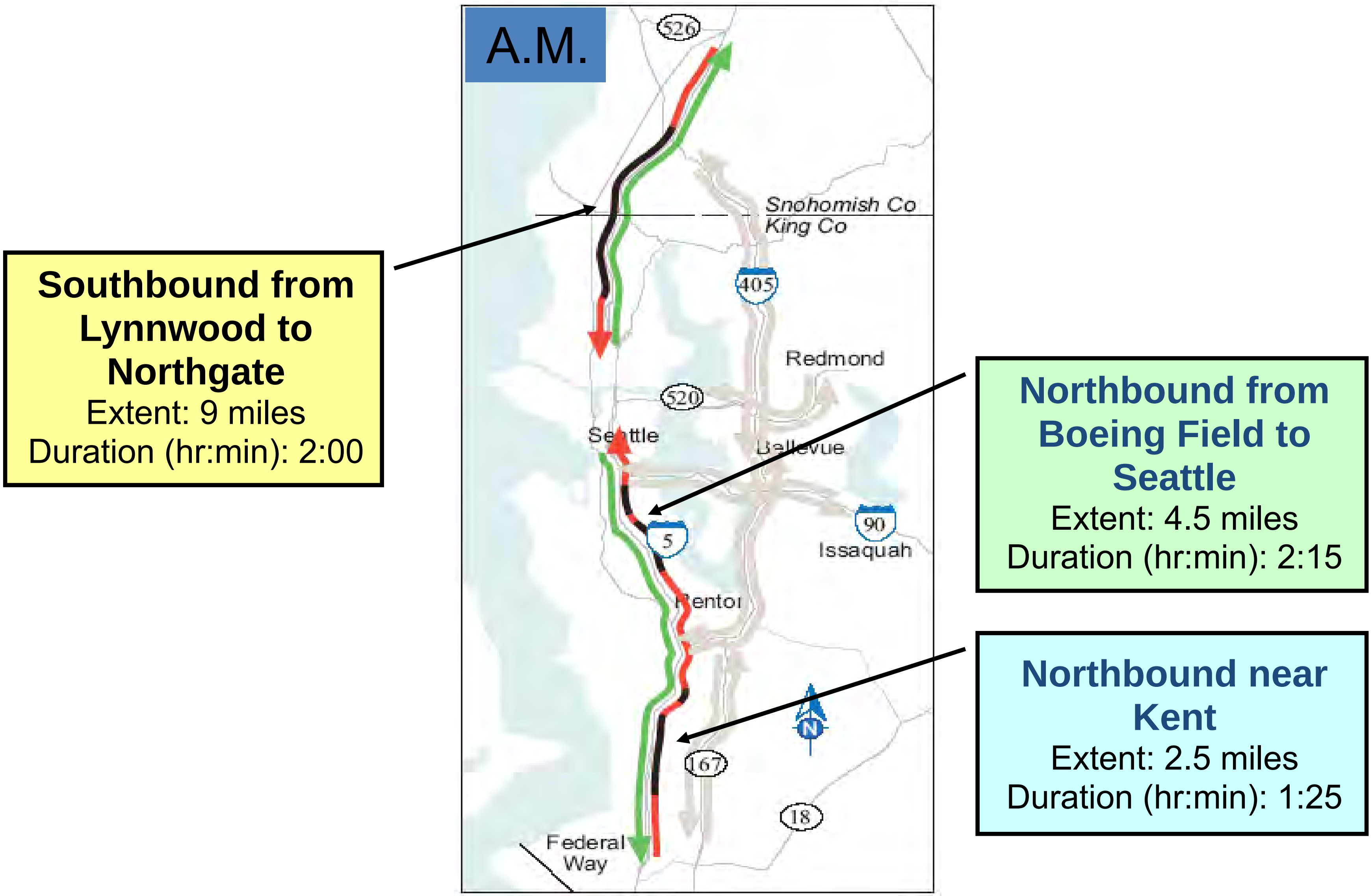


Figure 4-11. Heavily Congested Segments (AM)

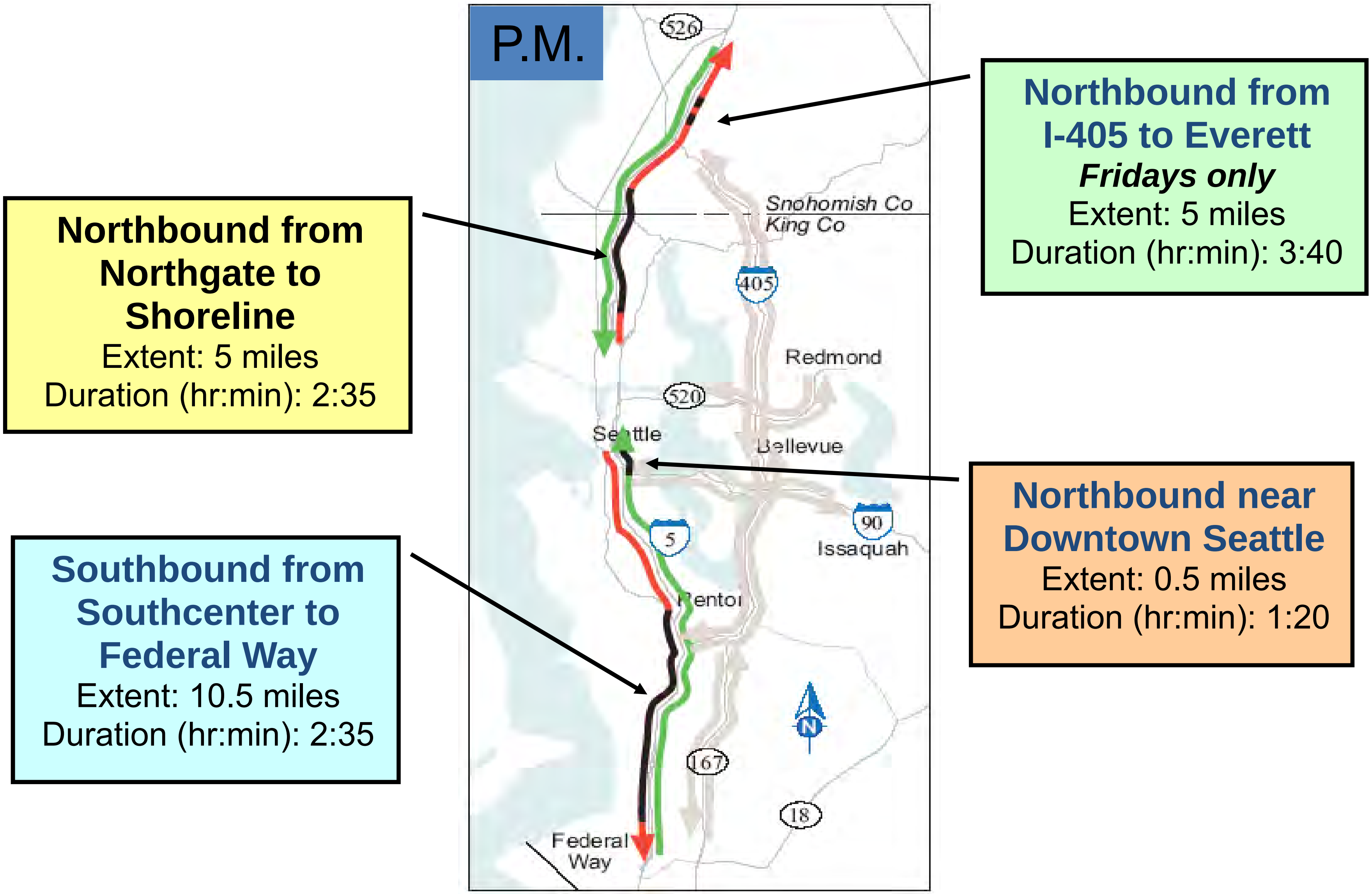


Figure 4-12. Heavily Congested Segments (PM)

The portion of the I-5 HOV system from downtown Seattle to Lynnwood suffers from significant geometric limitations that, when combined with high vehicle volumes, cause congestion. The most significant bottlenecks are at the entrances and exits to the reversible express lanes where there is considerable lane changing when many vehicles enter and leave the HOV lanes to and from the general purpose lanes.[11] As mentioned previously, in addition to high volumes and changes in geometry, congestion in the HOV lanes can also be caused by the interaction between HOV lane traffic and nearby slow traffic in the general purpose lane (i.e., "lane friction") because drivers in the HOV lane are reluctant to travel at speeds that are significantly greater than the speed of vehicles in the adjacent lane. Also, when drivers in the HOV lane need to leave the HOV lane and enter the congested general purpose lane, congestion can result as the driver slows down to wait for a gap in the adjacent lane. As HOV traffic merges from on-ramps (either via general purpose lanes or from HOV direct-access ramps), congestion can also occur in the HOV lane. Finally, traffic incidents are a frequent cause of congestion for both general purpose and HOV lanes. These can take the form of incidents in the HOV lane that block traffic directly, incidents in the general purpose lanes that contribute to lane friction, or disabled vehicles in the shoulder, again causing lane friction.

According to the Washington State Transportation Center, the HOV lanes become congested precisely when most transit service is using them. In the morning, southbound I-5 north of Northgate is "one of the most routinely congested freeway segments in the metropolitan area, and the HOV lanes are severely affected by this congestion."[12] Figure 4-13 illustrates the change in HOV lane speed and reliability between 2006 and 2007. For the I-5 southbound lanes, there is little change during the AM peak period. The southbound HOV lane operates between 25 and 35 mph over the entire AM peak period, well below the 45-mph speed threshold. Figure 4-14 shows that while speeds for the northbound HOV lane remain relatively similar over the PM peak period (30 to 40 mph) for 2006 and 2007, the probability of having a slow trip increases from 30 percent in 2006 to almost 50 percent in 2007.

[11] TRAC, HOV Lane Performance Monitoring 2002 Report – Volume 2, 2004: http://depts.washington.edu/trac/bulkdisk/pdf/584.1.pdf
[12] TRAC, HOV Lane Performance Monitoring 2002 Report – Volume 1, 2004: http://depts.washington.edu/trac/bulkdisk/pdf/584.2.pdf

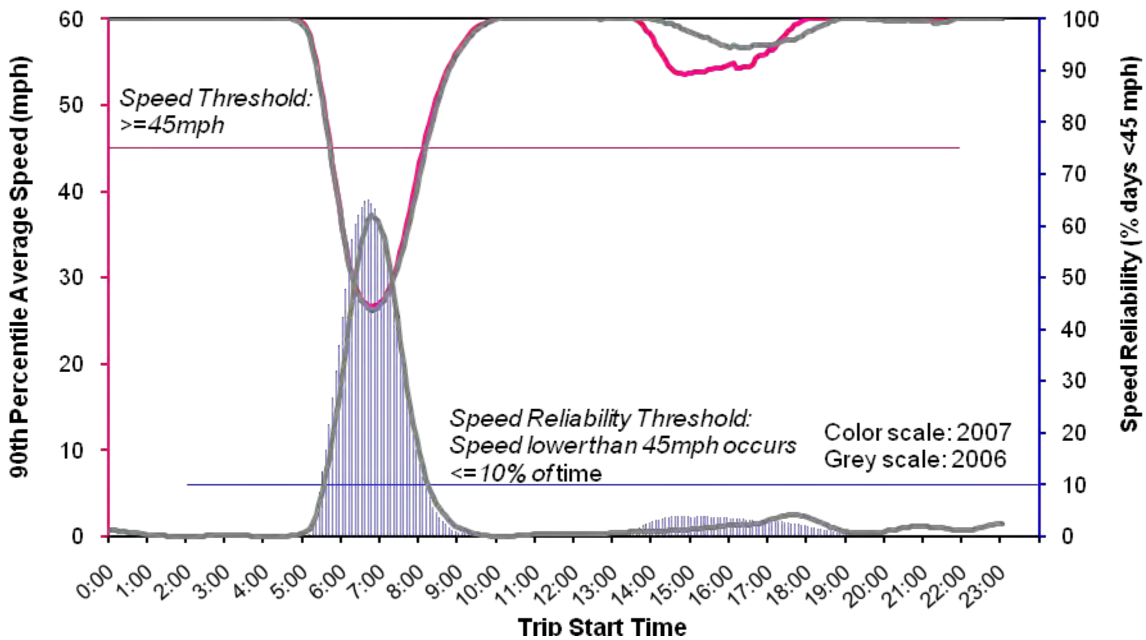


Figure 4-13. Change in HOV Lane Speed and Reliability—I-5 Southbound, SR 526 to Northgate (16.6 Miles)

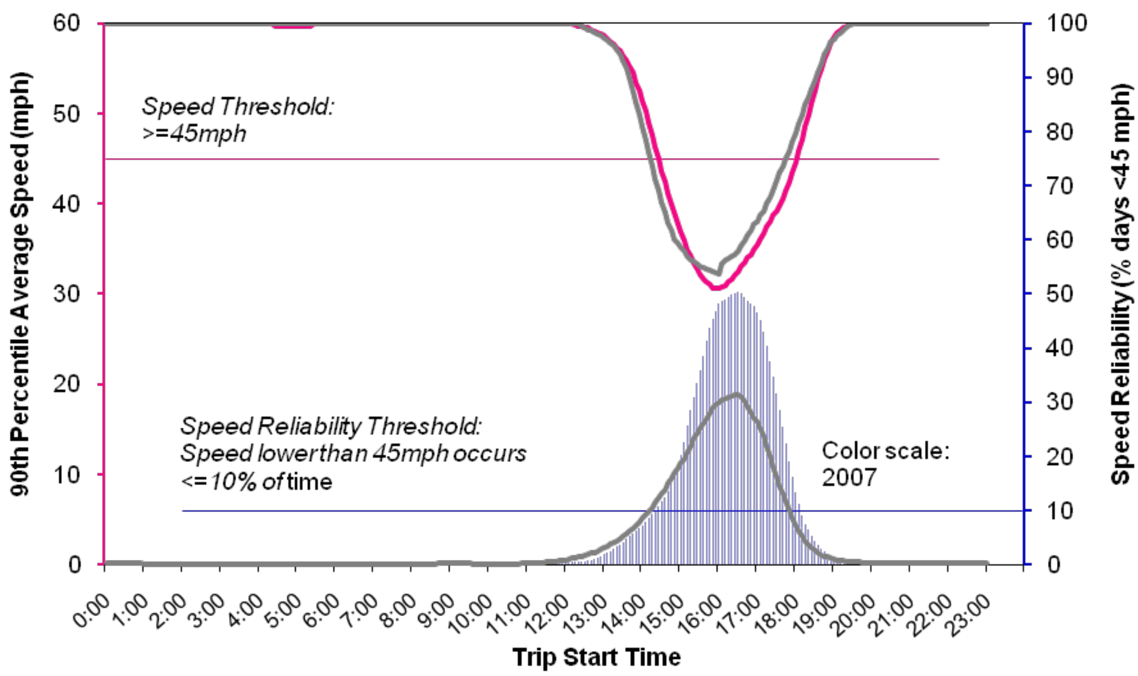


Figure 4-14. Change in HOV Lane Speed and Reliability—I-5 Northbound, SR 526 to Northgate (16.6 Miles)

4.2 Transit

This section describes existing conditions for regional and local transit facilities, operations, and services within the project area and the Lynnwood Link Extension's impacts on those transit facilities and services.

- Daily bus ridership in the Lynnwood Link Extension corridor is approximately 19,400 riders on I-5 bus routes north of Northgate, which reflects the highest transit ridership of any corridor in the region.
- Southbound transit trips from Shoreline during the AM peak period are 16 minutes to Northgate and 66 minutes to Sea-Tac Airport, while trips from Lynnwood are 36 minutes to downtown Seattle and 79 minutes to Sea-Tac Airport.
- Transit passenger level of service for service frequency for trips between the corridor and regional destinations currently ranges generally between level of service (LOS) A and LOS D. Some regional locations are not served with direct (i.e., one-seat, no transfer) bus service from within the corridor.
- Transit passenger level of service for hours of service currently ranges between LOS A and LOS B for trips between the corridor and most regional destinations. However, there are a few destinations for which trips from the corridor are experiencing LOS E or worse conditions.
- Transit passenger level of service for passenger load for trips between the corridor and regional destinations currently ranges between LOS A and LOS B.
- Transit passenger level of service for reliability and on-time performance for trips between the corridor and regional destinations currently ranges between LOS B and LOS C.

4.2.1 Transit Operations and Level of Service

Selected major urban center destinations, transit centers, and transit hubs at potential light rail station areas were used to measure transit (bus and light rail) LOS for the project area. Existing and future regional transit services were evaluated based on the following categories:

- Service characteristics
- Ridership
- Transit travel times
- Transfers

The quality of transit service was evaluated based on the following transit LOS measures:

- Service frequency LOS
- Hours of service LOS
- Passenger load LOS (passenger crowding)
- Reliability of service LOS (on-time performance and headway adherence)

The destinations and transit activity centers used to evaluate transit LOS include major regional urban centers, existing transit centers in the project area, and the areas of potential light rail stations for the alternatives. These include the following:

- Downtown Bellevue
- Sea-Tac Airport
- Downtown Seattle
- Capitol Hill
- University District
- Northgate
- North Seattle (NE 130th Street/NE 145th Street)
- Shoreline (NE 155th Street/NE 185th Street)
- Mountlake Terrace Transit Center
- 220th Street SW
- Lynnwood Transit Center

The transit LOS performance levels were analyzed using the methodology defined by the *Transit Capacity and Quality of Service Manual* (TCQSM), 2nd Edition, Part 3, Transit Research Board, 2003, and Transit Cooperative Research Program (TRCP) Report 100, Transit Research Board, 2003. These are nationally recognized resources for the measurement of transit capacity and quality of service. The Transportation Methods and Assumptions Report in Appendix A of this report provides a detailed discussion of the transit LOS methodology.

Similar to how LOS is typically measured for highway or arterial performance in the U.S., transit LOS is measured using the letters grades A through F, with A denoting the best performance and F generally considered failing performance. Transit LOS was analyzed for the PM peak hour (5:00 pm to 6:00 pm) to describe transit performance during the period when traffic congestion and transit ridership are typically high. LOS A indicates more frequent service, more hours served during the day, high reliability, and minimal passenger crowding in a transit vehicle. Circulation is defined as the route(s) on which transit operates. Appendix B of this report provides the TCQSM descriptions of each of the transit LOS levels, their ranges, and their grade descriptions. The individual components of transit LOS are defined below.

Service Frequency LOS is the number of times within the PM peak hour that a bus or light rail train stops at a specific location. Generally, the shorter the headway between buses for a transit route, the less time a rider has to wait between bus arrivals; hence, the better the service frequency LOS. Bus routes that have headways of less than 10 minutes are considered LOS A, whereas headways higher than 60 minutes reflect LOS F. Table 4-3 shows thresholds for each LOS level.

Table 4-3. Service Frequency LOS Thresholds

LOS	Average Headway (minutes)	Vehicles per Hour	Comments
A	<10	>6	Passengers do not need schedules
B	10–14	5–6	Frequent service, passengers consult schedules
C	15–20	3–4	Maximum desirable time to wait if bus/train missed
D	21–30	2	Service unattractive to choice riders
E	31–60	1	Service available during the hour
F	>60	<1	Service unattractive to all riders

Source: Transit Capacity and Quality of Service Manual

Hours of Service LOS is the total transit operating hours provided within a 24-hour (daily) period. Hours of service LOS is intended to measure the availability of transit service to riders and potential users. The longer that transit service is provided throughout the day, the better the LOS. Table 4-4 shows thresholds for each LOS level.

Table 4-4. Hours of Service LOS Thresholds

LOS	Hours of Service	Comments
A	19–24	Night or "owl" service provided
B	17–18	Late evening service provided
C	14–16	Early evening service provided
D	12–13	Daytime service provided
E	4–11	Peak hour service only or limited midday service
F	0–3	Very limited or no service

Source: Transit Capacity and Quality of Service Manual

Passenger Load LOS is intended to measure passenger comfort and the ability of a rider to find a seat on the bus or train during the PM peak hour. Passenger load LOS also measures crowding in the transit vehicle. On buses, passenger load LOS is defined by the number of passengers per seat. For light rail, passenger load LOS is a measure of square footage available for standing per standing passenger. Passenger load LOS A indicates that riders are able to spread out on the vehicle along with the potential to use empty seats for storing parcels and/or bags instead of carrying them on their laps. A passenger load LOS at or worse than LOS D may reflect overcrowding, and the transit service provider may need to increase service frequency to improve LOS. In addition, a large number of passengers can cause the bus to dwell longer at stops resulting from crowded passenger boarding and alighting. The longer dwell time can negatively affect travel time and service reliability. Table 4-5 shows thresholds for each LOS level.

Table 4-5. Passenger Load LOS Thresholds

LOS	Load Factor (passenger per seat)	Comments
A	0.00–0.50	No passenger need sit next to another
B	0.51–0.75	Passengers can choose where to sit
C	0.76–1.00	All passengers can sit
D	1.01–1.25	Comfortable standee load for design
E	1.26–1.50	Maximum schedule load
F	>1.50	Crush load

Source: Transit Capacity and Quality of Service Manual

Reliability of Service LOS was analyzed at major transit hubs within the project corridor. The reliability LOS measures the degree to which a transit vehicle meets or misses the scheduled headway at its arrival station. This includes both a transit vehicle arriving late and also a transit vehicle leaving early from a stop. A bus leaving early would mean that some transit riders would miss their bus. Two methods were used to determine transit reliability. For transit routes with scheduled headways greater than 10 minutes, on-time reliability was evaluated in terms of on-time performance, defined as being 0 to 5 minutes late. For transit routes operating at scheduled headways of 10 minutes or less, headway adherence (calculated as the coefficient of variation) was used to determine reliability. Reliability was calculated using the TCQSM methodology, which compares the standard deviation of actual headways to scheduled headways of transit routes at major transit centers and park-and-ride lots within the project area. On-time performance for June 2012 was provided by Sound Transit staff for Sound Transit Express routes operating in the corridor. Table 4-6 shows the thresholds for each LOS level.

Table 4-6. Reliability of Service LOS Thresholds

LOS	On-Time Percentage	Comments[a]
A	95.0–100.0%	1 late transit vehicle every 2 weeks (no transfer)
B	90.0–94.9%	1 late transit vehicle every week (no transfer)
C	85.0–89.9%	3 late transit vehicles every 2 weeks (no transfer)
D	80.0–84.9%	2 late transit vehicles every week (no transfer)
E	75.0–79.9%	1 late transit vehicle every day (with a transfer)
F	<75.0%	1 late transit vehicle at least daily (with a transfer)

[a] Individual's perspective based on five round trips per week.

Source: Transit Capacity and Quality of Service Manual

4.2.2 Regional Transit

Service Characteristics

Transit services within the project area are provided by Community Transit, King County Metro, and Sound Transit. Bus routes along I-5 are operated by Sound Transit, Community Transit, and King County Metro, and they provide long-distance service between major transit centers in the project area and major urban centers in the region. Sound Transit's ST Express regional bus service provides two-direction, all-day service between major regional destinations. Community Transit and King County Metro services along I-5 in the project area are primarily peak-direction, peak-period, and oriented to commuters. *Swift,* Community Transit's bus rapid transit service, operates along the Snohomish County portion of the SR 99 corridor to the west of the study area. King County Metro RapidRide is expected to begin service on Aurora Avenue North in 2014. Local buses provide service to several transit centers, park-and-ride facilities, neighborhoods and activity centers. The frequency and number of bus routes in service increase during the peak periods, primarily in the peak direction of travel. These routes connect park-and-rides and transit centers in Snohomish and North King counties with major employment centers in Seattle. Table 4-7 lists the existing bus transit facilities in the project area.

Table 4-7. Existing Bus Routes Evaluated in the Project Area

Route	Stop Locations in Project Area	Service Area	Schedule (with headways)
CT 110	Mountlake Terrace Transit Center, 220th Street SW	Mountlake Terrace, Edmonds	Weekdays (6:00 am to 8:30 am, 3:45 pm to 6:15 pm) every 30 minutes
CT 111	Mountlake Terrace Transit Center	Mountlake Terrace, Brier	Weekdays (5:15 am to 7:30 am, 4:30 pm to 7:00 pm) every 30 minutes in peak direction
CT 112	Mountlake Terrace Transit Center	Mountlake Terrace, Brier, Lynnwood, Swamp Creek, Ash Way	Weekdays (6:00 am to 10:00 pm) every 30 minutes Saturdays (6:15 am to 9:15 pm) every 60 minutes
CT 115	Lynnwood Transit Center	Aurora Village, Edmonds, Lynnwood, Alderwood, Swamp Creek, Ash Way, Mill Creek, Mariner	Weekdays (5:15 am to 10:00 pm) every 30 minutes Saturdays (5:45 am to 10:30 pm) every 60 minutes
CT 116	Lynnwood Transit Center	Edmonds, Lynnwood, Alderwood, Swamp Creek, Ash Way, Mill Creek, Silver Firs	Weekdays (5:30 am to 10:30 pm) every 30 minutes Saturdays (6:00 am to 10:00 pm) every 60 minutes
CT 119	Mountlake Terrace Transit Center	Mountlake Terrace, Brier, Lynnwood, Ash Way	Weekdays (6:15 am to 10:15 pm) every 30 minutes Saturdays (6:15 am to 10:00 pm) every 60 minutes
CT 120	Lynnwood Transit Center	Lynnwood, Canyon Park	Weekdays (5:30 am to 9:45 pm) every 30 minutes Saturdays (6:15 am to 10:00 pm) every 60 minutes
CT 130	Mountlake Terrace Transit Center, Lynnwood Transit Center	Lynnwood, Mountlake Terrace, Aurora Village, Edmonds	Weekdays (5:30 am to 10:00 pm) every 30 minutes Saturdays (6:30 am to 10:00 pm) every 60 minutes
CT 201	Lynnwood Transit Center	Lynnwood, Alderwood, Swamp Creek, Ash Way, Mill Creek, Mariner, Everett, Marysville, Smokey Point	Weekdays (4:45 am to 11:00 pm) every 40 minutes Saturdays (6:15 am to 10:00 pm) every 60 minutes
CT 202	Lynnwood Transit Center	Lynnwood, Alderwood, Swamp Creek, Ash Way, Mill Creek, Mariner, Everett, Marysville, Smokey Point	Weekdays (5:00 am to 10:30 pm) every 40 minutes Saturdays (5:45 am to 9:30 pm) every 60 minutes
CT 402	Lynnwood Transit Center	Downtown Seattle, Lynnwood	Weekdays (5:15 am to 9:00 am, 2:30 pm to 7:15 pm) every 15 minutes in peak direction
CT 405	220th Street SW	Downtown Seattle, Mountlake Terrace, Edmonds	Weekdays (6:00 am to 8:30 am, 3:15 pm to 6:45 pm) every 30 minutes in peak direction
CT 413	Mountlake Terrace Transit Center	Downtown Seattle, Mountlake Terrace, Lynnwood	Weekdays (5:00 am to 9:00 am, 3:00 pm to 7:00 pm) every 15 minutes in peak direction
CT 415	Mountlake Terrace Transit Center	Downtown Seattle, Mountlake Terrace, Lynnwood	Weekdays (5:45 am to 9:00 am, 3:30 pm to 6:30 pm) every 15 minutes in peak direction
CT 417	Lynnwood Transit Center	Downtown Seattle, Lynnwood, Mukilteo	Weekdays (6:30 am to 9:15 am, 3:15 pm to 6:15 pm) every 30 minutes in peak direction

Table 4-7. Existing Bus Routes Evaluated in the Project Area

Route	Stop Locations in Project Area	Service Area	Schedule (with headways)
CT 421	Lynnwood Transit Center	Downtown Seattle, Lynnwood, Marysville	Weekdays (4:45 am to 8:15 am, 2:30 pm to 7:00 pm) every 30 minutes in peak direction
CT 422	Lynnwood Transit Center	Downtown Seattle, Lynnwood, Marysville, Stanwood	Weekdays (5:15 am to 8:00 am, 4:15 pm to 7:15 pm) every 60 minutes in peak direction
CT 425	Lynnwood Transit Center	Downtown Seattle, Lynnwood, Lake Stevens	Weekdays (5:30 am to 8:00 am, 3:30 pm to 6:30 pm) every 30 minutes in peak direction
CT 810	Mountlake Terrace Transit Center, Lynnwood Transit Center	University District, Mountlake Terrace, Lynnwood, Mill Creek, Everett	Weekdays (9:15 am to 11:15 am, 6:00 pm to 7:30 pm) every 30 minutes in peak direction
CT 821	Lynnwood Transit Center	University District, Lynnwood, Marysville	Weekdays (5:30 am to 8:15 am, 3:30 pm to 6:15 pm) every 30 minutes in peak direction
CT 855	Lynnwood Transit Center	University District, Mountlake Terrace, Lynnwood	Weekdays (6:15 am to 9:15 am, 12:30 pm to 6:00 pm) every 15 minutes in peak direction
CT 871	Mountlake Terrace Transit Center, 220th Street SW	University District, Mountlake Terrace, Edmonds	Weekdays (6:00 am to 10:15 am, 12:30 pm to 6:30 pm) every 15 minutes in peak direction
CT 885	Lynnwood Transit Center	University District, Mountlake Terrace, Lynnwood	Weekdays (5:45 am to 6:15 am, 3:00 pm to 5:30 pm) every 60 to 90 minutes in peak direction
KCM 41	NE 130th Street	Downtown Seattle, University District, Northgate, Lake City	Weekdays (4:45 am to 1:45 am) every 5 to 15 minutes Saturdays (5:45 am to 1:45 am) every 15 minutes Sundays (6:15 am to 1:45 am) every 30 minutes
KCM 242	NE 130th Street, NE 145th Street	Jackson Park, Northgate, Ravenna, Montlake, Bellevue, Overlake	Weekdays (5:45 am to 10:00 am, 3:30 pm to 7:15 pm) every 30 minutes in peak direction
KCM 243	NE 130th Street, NE 145th Street	Jackson Park, Lake City, Ravenna, Montlake, Bellevue	Weekdays (6:30 am to 8:30 am, 4:15 pm to 6:15 pm) every 30 to 60 minutes in peak direction
KCM 301	NE 145th Street	Downtown Seattle, University District, Jackson Park, Shoreline, Richmond Beach	Weekdays (4:30 am to 9:00 am, 3:00 pm to 6:30 pm) every 15 minutes
KCM 303	NE 145th Street	Downtown Seattle/First Hill, Northgate, Jackson Park Shoreline	Weekdays (5:30 am to 9:00 am, 3:30 pm to 8:00 pm) every 15 minutes in peak direction
KCM 304	NE 145th Street	Downtown Seattle, Jackson Park, Shoreline, Richmond Beach	Weekdays (6:15 am to 8:30 am, 3:30 pm to 6:30 pm) every 30 minutes in peak direction
KCM 308	NE 145th Street	Downtown Seattle, Jackson Park, Lake City, Lake Forest Park, Horizon View	Weekdays (5:45 am to 8:30 am, 4:00 pm to 6:45 pm) every 30 to 60 minutes in peak direction
KCM 316	None	Downtown Seattle, Northgate, Haller Lake, Meridian Park	Weekdays (6:00 am to 8:45 am, 4:00 pm to 7:00 pm) every 20 minutes in peak direction
KCM 330	NE 145th Street, NE 155th Street	Shoreline, Fircrest, Lake City	Weekdays (6:30 am to 9:15 am, 12:30 pm to 6:15 pm) every 30 to 60 minutes

Table 4-7. Existing Bus Routes Evaluated in the Project Area

Route	Stop Locations in Project Area	Service Area	Schedule (with headways)
KCM 345	None	Northgate, Greenwood, Shoreline	Weekdays (6:15 am to 11:15 am) every 30 minutes Saturdays (7:15 am to 10:45 pm) every 30 minutes Sundays (7:15 am to 10:45 pm) every 60 minutes
KCM 346	None	Northgate, Haller Lake, Meridian Park, Shoreline	Weekdays (5:15 am to 11:30 am) every 30 minutes Saturdays (6:00 am to 12:00 pm) every 30 minutes Sundays (6:30 am to 12:00) every 60 minutes
KCM 347	NE 145th Street, Mountlake Terrace Transit Center	Northgate, Jackson Park, North City, Ballinger Terrace, Mountlake Terrace	Weekdays (5:15 am to 12:15 am) every 30 minutes Saturdays (7:00 am to 11:00 pm) every 30 minutes Sundays (6:30 am to 10:30 pm) every 30 minutes
KCM 348	NE 185th Street	Northgate, Shoreline, Richmond Beach	Weekdays (5:30 am to 11:30 pm) every 30 minutes Saturdays (6:00 am to 12:15 am) every 30 minutes Sundays (6:00 am to 12:15 am) every 30 minutes
KCM 373	NE 145th Street	University District, Ravenna, Jackson Park, Shoreline, Aurora Village	Weekdays (6:15 am to 10:15 am, 1:30 pm to 7:30 pm) every 15 to 30 minutes in peak direction
ST 510	NE 145th Street, Mountlake Terrace Transit Center, Lynnwood Transit Center	Downtown Seattle, University District, Jackson Park, Mountlake Terrace, Lynnwood, Ash Way	Weekdays (4:15 am to 12:45 am) every 10 minutes in peak direction; every 30 minutes in off-peak direction. (No stop at Jackson Park in peak direction.) Saturdays (5:45 am to 12:45 am) every 30 minutes
ST 511	NE 145th Street, Mountlake Terrace Transit Center, Lynnwood Transit Center	Downtown Seattle, University District, Jackson Park, Mountlake Terrace, Lynnwood, Ash Way	Weekdays (4:15 am to 12:15 am) every 15 minutes Saturdays (5:45 am to 12:15 am) every 30 minutes
ST 512	NE 145th Street, Mountlake Terrace Transit Center, Lynnwood Transit Center	Downtown Seattle, University District, Jackson Park, Mountlake Terrace, Lynnwood, Ash Way, Everett	Sundays (5:30 am to 1:00 am) every 30 minutes
ST 513	Mountlake Terrace Transit Center	Downtown Seattle, Mountlake Terrace, Everett	Weekdays (5:30 am to 9:00 am, 3:45 pm to 7:00 pm) every 30 minutes in peak direction
ST 535	Lynnwood Transit Center	Lynnwood, Alderwood, Canyon Park, UW Bothell, Totem Lake, Downtown Bellevue	Weekdays (4:45 am to 11:00 pm) every 30 minutes Saturdays (7:15 am to 11:00 pm) every 60 minutes

Note: Transit routes are from spring 2012 schedules obtained from King County Metro and Sound Transit Web sites: http://www.kingcounty.gov and http://www.soundtransit.org.
Source: Community Transit (2012); King County Metro (2012); Sound Transit (2012).
CT = Community Transit
KCM = King County Metro
ST = Sound Transit

The major transfer points within the project area are transit centers and park-and-ride facilities. Community Transit, King County Metro, and Sound Transit provide service to these facilities. There are three transit centers within the I-5 corridor at Northgate, Mountlake Terrace, and in downtown Lynnwood. Northgate Transit Center is accessed by general purpose ramps to and from the I-5 mainline and express lanes (to and from the south only). There are freeway flyer stops at NE 145th Street that are accessed from the outside lanes. Regional buses serving the flyer stops leave the inside HOV lane and weave through congested general purpose lanes to exit to the flyer stops and then weave again to re-enter the inside HOV lanes. Regional transit accesses the Mountlake Terrace Transit Center using the in-line freeway station. Regional transit serves the Lynnwood Transit Center from the HOV lanes to direct access ramps that lead to 44th Avenue West.

Within Segment A there are two small park-and-ride lots. These facilities connect adjacent neighborhoods with King County Metro buses running along I-5 and regional arterials. These King County Metro routes provide service to a variety of destinations, including downtown Seattle, the University District, Northgate Transit Center, Aurora Village, and Mountlake Terrace Transit Center. Snohomish County has 40 park-and-ride lots, ranging in size from 10 spaces to almost 1,400 spaces, which provide connections to regional transit centers and employment areas, such as downtown Seattle, the University District, and Northgate Transit Center. Table 4-8 lists the existing transit facilities in the project area.

Table 4-8. Existing Bus Transit Facilities in the Project Area

Transit Facility	Type of Facility	Rider Amenities	Served by Routes	Park-and-Ride Stalls
Northgate Transit Center (includes adjacent facilities at Northgate Mall and Thornton Place)	Transit Center, Park-and-Ride	Bicycle Lockers	ST 555, 556 KCM 16, 40, 41, 66, 67, 68, 75, 242, 303, 345, 346, 347, 348, 995	1,513
South Jackson Park Park-and-Ride (I-5 at NE 130th Street)	Park-and-Ride		KCM 242, 243	46
North Jackson Park Park-and-Ride (I-5 at NE 145th Street)	Park-and-Ride		ST 510, 511, 512 KCM 242, 243, 301, 303, 304, 308, 347, 373	68
Mountlake Terrace Transit Center (I-5 at 236th Street SW)	Transit Center, Park-and-Ride	Bicycle Lockers	ST 511, 512, 513 CT 110, 111, 112, 119, 130, 413, 415, 810, 871	880
Lynnwood Transit Center	Transit Center, Park-and-Ride	Bicycle Lockers	ST 511, 512, 535 CT 115, 116, 120, 130, 201, 202, 402, 417, 421, 422, 425, 810, 821, 855, 885	1,378

Note: Transit routes and park-and-ride stalls listed as of summer 2012.
Sources: http://www.communitytransit.org/parking/,
http://metro.kingcounty.gov/tops/parknride/pr-north-seattle.html
CT = Community Transit
ST = Sound Transit
KCM = King County Metro

Community Transit commuter express routes serve regional trips between Snohomish County and urban centers in King County, including downtown Seattle, the University District, and the Eastside. Service is oriented to commuter travel, with higher frequencies provided in the peak period in the peak direction. In addition, Community Transit and Everett Transit provide local service between park-and-ride lots and transit centers throughout Snohomish County. King County Metro provides regional and local service between north Seattle and the county's urban centers. Sound Transit provides regional express bus service in the corridor between major urban centers and transit centers. Table 4-8 lists regional and local bus routes serving the project area.

In general, during the peak periods, the frequency of buses in the peak direction is greater than the frequency of buses running in the opposite "reverse-peak" direction. Midday, off-peak, and weekend transit service is less frequent than during the peak periods. On weekdays, Sound Transit Route 511 operates every 15 minutes in both directions between downtown Seattle and Ash Way Park-and-Ride in Lynnwood.

Ridership

Table 4-9 shows the daily bus ridership for regional bus routes on I-5 north of Northgate, in comparison with various locations on other key transit corridors in the region. Ridership on I-5 at the Ship Canal Bridge includes riders from north of Northgate, in addition to those boarding farther south between Northgate and the Ship Canal. This information shows that the project corridor currently carries the highest bus ridership volumes in the region, and provides a point of comparison with future year (2035) alternatives.

Table 4-9. Daily Bus Ridership on Selected Regional Corridors —Existing Year (2011)

Route	Bus Ridership
I-5, North of Northgate Way	19,400
I-5, Ship Canal	33,400
I-5, South of West Seattle Bridge	16,400
I-5, South of I-405	9,200
SR 520, Midspan	16,000
I-90, between Seattle and Mercer Island	11,600
I-90, East of 148th/150th Avenue SE Interchange	4,000
I-405, North of SR 520	4,400
I-405, South of SR 520	4,000

Source: Sound Transit Ridership Forecasting Model

Transit Travel Times

Table 4-10 shows scheduled peak-period transit travel times from Shoreline (I-5 at NE 145th Street) and Lynnwood (Lynnwood Transit Center) to regional destinations. As shown in Table 4-10, the southbound transit trips from Shoreline during the AM peak period are 16 minutes to Northgate and 66 minutes to Sea-Tac Airport. Transit trips from Lynnwood are 36 minutes to downtown Seattle and 79 minutes to Sea-Tac Airport. The transit travel times from Lynnwood to Northgate exceed the travel time from Lynnwood to the University District (a longer distance) due to the lack of direct service between Lynnwood and Northgate; therefore, passengers must make inefficient transfers.

Table 4-10. Transit Travel Times—AM Peak Period Southbound (minutes)

Destination	From Shoreline	From Lynnwood
Northgate	16	52
University of Washington	25	37
Capitol Hill	30	48
Downtown Seattle	18	36
Sea-Tac Airport	66	79
Downtown Bellevue	49	46
Overlake	65	71

Source: Scheduled transit travel times from King County Metro Trip Planner, http://metro.kingcounty.gov/

Table 4-11 shows the transit trip travel times during the PM peak period from regional destinations to Shoreline and Lynnwood. There is a wide variation in the morning southbound travel time shown in Table 4-10 compared to the evening northbound travel time, even though both describe peak direction trips. This situation reflects the congestion in the I-5 general purpose and HOV lanes causing inconsistency in travel time.

Table 4-11. Transit Travel Times—PM Peak Period Northbound (minutes)

Origin	To Shoreline	To Lynnwood
Northgate	7	70
University of Washington	30	32
Capitol Hill	62	60
Downtown Seattle	22	41
Sea-Tac Airport	75	93
Downtown Bellevue	51	58
Overlake	63	78

Source: Scheduled transit travel times from King County Metro Trip Planner, http://metro.kingcounty.gov/

Table 4-12 shows the southbound transit travel times during the PM peak period to regional destinations from Shoreline and Lynnwood. The travel times are only slightly faster than those described previously, which reflects the heavy traffic volumes in the I-5 corridor during the PM peak period. Southbound congestion is exacerbated when the I-5 express lanes are operating in the northbound direction.

Table 4-12. Transit Travel Times—PM Peak Period Southbound (minutes)

Destination	From Shoreline	From Lynnwood
Northgate	17	55
University of Washington	47	39
Capitol Hill	40	66
Downtown Seattle	23	35
Sea-Tac Airport	66	79
Downtown Bellevue	60	46
Overlake	58	61

Source: Scheduled transit travel times from King County Metro Trip Planner, http://metro.kingcounty.gov/

These transit travel times reflect the current conditions on existing bus routes (and light rail service to Sea-Tac Airport) and include wait times associated with transfers when the trip requires more than one route. All trips to and from Sea-Tac Airport are assumed to include travel by bus to downtown Seattle and a transfer to Link light rail to the airport. In addition to these travel times, the total transit trip travel time would include the time to access the bus as a pedestrian, bicyclist, passenger, or driver, as well as the wait time for the initial bus boarding. The wait time for a bus would be dependent on the service reliability (adherence to schedule). If a bus arrival is unreliable, then the riders must arrive prior to the scheduled time and wait until the bus arrives on time or late. The bus reliability is an LOS factor discussed in Section 4.2.1 above. The analysis of transfers is presented below.

Transfers

The number of transfers being made from bus-to-bus or bus-to-rail can be measured by a systemwide transfer rate, which is the average number of transit boardings per transit trip. As shown in Table 4-13, the systemwide transfer rate for the existing year (2011) is 1.39. As with other systemwide measures, this transfer rate will be useful as a comparison both for future transfer rates and how transfer rates would change with the project.

Table 4-13. Transit Transfer Rate

Measure	Existing Year (2011)
Transfer Rate	1.39
Total Daily (24 hours) Transit Trips	384, 200
Total Daily Transit Boardings	533,200

Source: Sound Transit Ridership Forecasting Model

Level of Service for Transit Service Frequency

Figure 4-15 presents the existing PM peak hour LOS for service frequency between selected key locations. Many pairs of destinations to and from station areas in the corridor currently operate at LOS C or better. Destination pairs with bus service frequency at LOS D or worse with travel to or from the project corridor are:

- Downtown Bellevue to north Seattle and Lynnwood Transit Center
- Downtown Seattle to 220th Street SW
- Northgate to Shoreline
- Shoreline to Northgate
- 220th Street SW to Mountlake Terrace Transit Center
- Lynnwood Transit Center to downtown Bellevue

There are also potential station areas that do not have direct bus service to or from the other potential station areas or urban centers. The trip pairs without direct bus service are:

- Downtown Bellevue to Shoreline, Mountlake Terrace Transit Center, and 220th Street SW
- Sea-Tac Airport to all station areas in the project area
- Downtown Seattle to Shoreline
- Capitol Hill to all station areas in the project area
- University District to Shoreline
- Northgate to 220th Street SW
- North Seattle to downtown Bellevue, Sea-Tac Airport, Capitol Hill, Shoreline, and 220th Street SW
- Shoreline to all station areas and urban centers, except Northgate
- Mountlake Terrace Transit Center to downtown Bellevue, Sea-Tac Airport, Capitol Hill, and Shoreline
- 220th Street SW to all station areas in the project area, except downtown Seattle and Mountlake Terrace Transit Center
- Lynnwood Transit Center to Sea-Tac Airport, Capitol Hill, Shoreline, and 220th Street SW

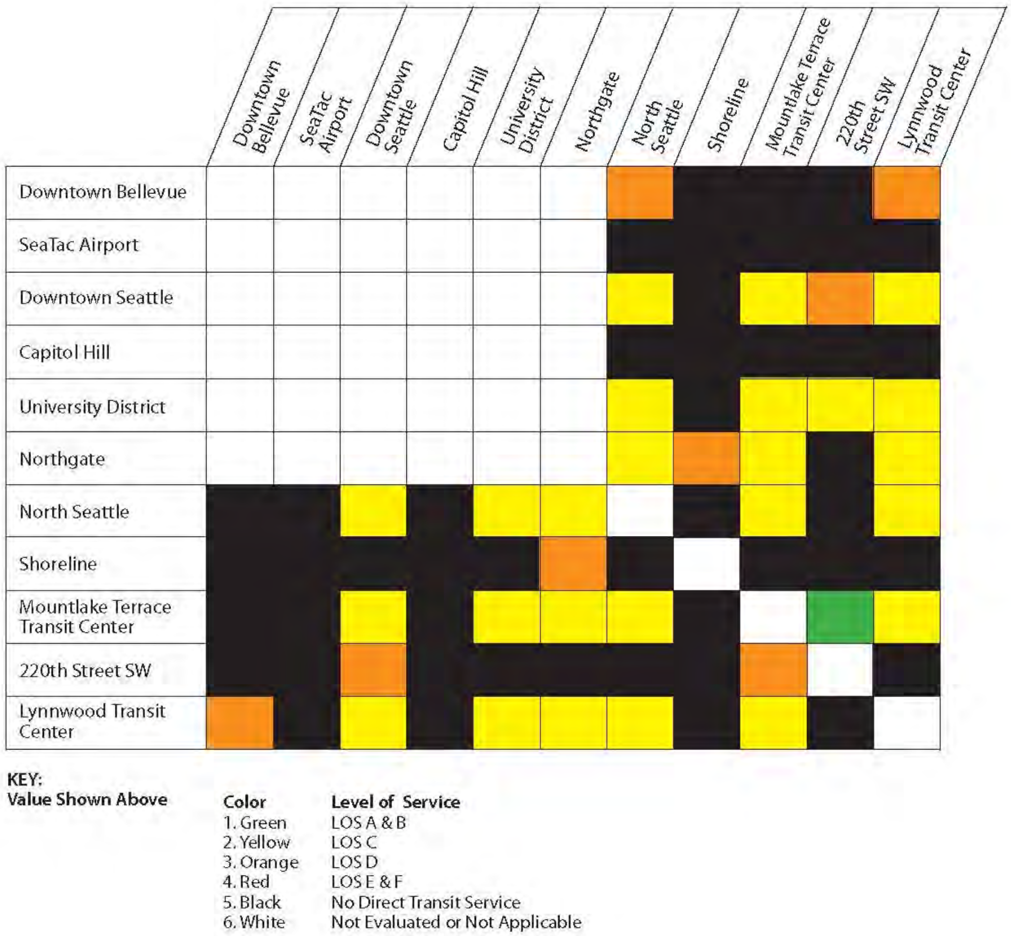


Figure 4-15. Existing PM Peak Hour Service Frequency Level of Service

Level of Service for Hours of Service

Figure 4-16 presents the LOS for hours of service for existing conditions. Hours of service LOS were evaluated between potential station areas and key regional locations. Many pairs of destinations are at LOS A or B, but none are at LOS C or D. The following are at LOS E or worse:

- Downtown Bellevue to North Seattle
- Downtown Seattle to 220th Street SW
- University District to 220th Street SW
- North Seattle to downtown Bellevue
- Shoreline to downtown Bellevue
- Mountlake Terrace Transit Center to 220th Street SW
- 220th Street SW to Mountlake Terrace Transit Center

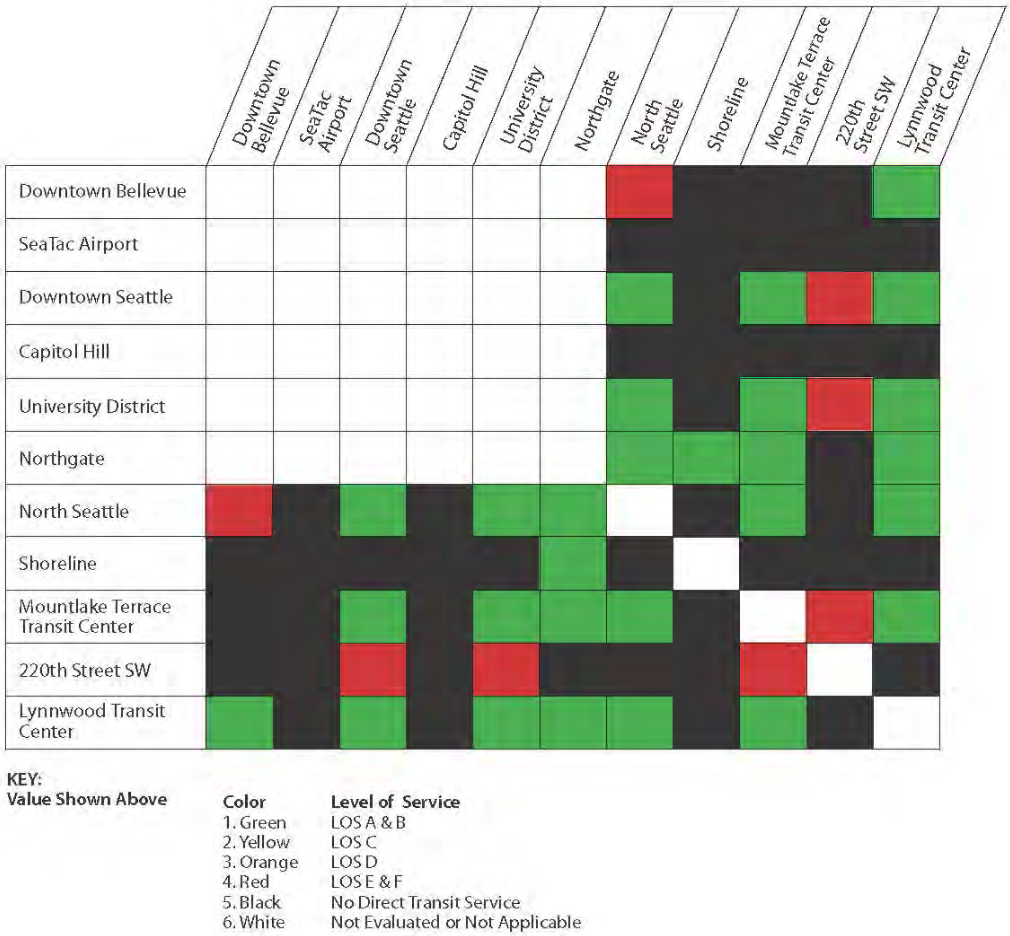


Figure 4-16. Existing Hours of Service Level of Service

Level of Service for Passenger Load

Passenger load data were available for Sound Transit Express and King County Metro transit routes. While reliable data for Community Transit routes were not readily available, the data shown for other operators are indicative of operating conditions in the corridor. Load factors were evaluated at three screenlines. The screenlines are used in the analysis to capture all north-south trips across an imaginary east-west line. The load factor represents the number of riders relative to the total number of seats available. The load factor will vary depending on the quantity of service provided. When buses are overloaded, the transit agency may re-structure routes or add service to reduce overcrowding. For example, as ridership increased following the opening of the Mountlake Terrace Freeway Station in 2011, service on two Sound Transit Express routes was increased in February 2012 to relieve overcrowding.

Table 4-14 shows PM peak period passenger load factors and the corresponding LOS on bus routes traveling on I-5, SR 99, and other north-south facilities shown on the three screenlines. The load factor is at LOS A or LOS B at each screenline.

Table 4-14. PM Peak Period Load Factors

Location and Direction	Average Passengers per Seat[a]	LOS
Screenline 1: North of NE Northgate Way		
Northbound	0.54	B
Southbound	0.28	A
Screenline 2: South of 205th Street		
Northbound	0.59	B
Southbound	0.21	A
Screenline 3: North of 212th Street SW		
Northbound	0.58	B
Southbound	0.23	A

[a] Based on 58 seats per bus.
Source: Sound Transit Ridership Model, 2011

Table 4-15 shows passenger load factors and the corresponding LOS for the AM and PM peak periods on King County Metro bus routes on I-5 at NE Northgate Way. The load factor LOS is A or B, meaning that all passengers have a seat on the bus. Note that the passenger data collection methods do not necessarily capture the number of passengers on a given bus at every location, at every time of day, or the peak load along a given route.

Table 4-15. AM and PM Peak Period Load Factors—King County Metro Routes, I-5 at NE Northgate Way

Direction	Average Passengers per Seat[a]	LOS
AM Peak Period		
Northbound	0.11	A
Southbound	0.62	B
PM Peak Period		
Northbound	0.45	A
Southbound	0.17	A

[a] Based on 58 seats per bus.
Source: King County Metro, Fall 2011

Level of Service for Reliability and On-time Performance

Table 4-16 shows on-time performance and the corresponding LOS for all-day service provided by Sound Transit Regional Express routes serving the Lynnwood Link Extension corridor. On-time is defined as 0 to 5 minutes late from the scheduled time. These Sound Transit Regional Express routes operate at LOS B and

LOS C averaged across the entire day. With an on-time percentage of 90 percent, this means that 10 percent of the trips on that route are at least 5 minutes late.

Table 4-16. On-Time Performance—Sound Transit Regional Express Routes

Route	On-Time Percentage	LOS
510	87.4%	C
511	90.0%	B
512	92.7%	B
513	85.3%	C

Source: Sound Transit, June 2012 Monthly Report

4.2.3 Local and Sub-Regional Transit

The affected environment for local transit is presented by the proposed station area. A few routes that travel within the corridor segment, but do not travel in the vicinity of a station area, are presented under the segment summary.

Segment A: Seattle to Shoreline

Two local King County Metro bus routes operate within Segment A but not in the vicinity of a station area. Route 41 operates between downtown Seattle and Lake City. This route uses I-5 between downtown Seattle and the Northgate Transit Center, travels on 5th Avenue NE to NE 125th Street, and then to Lake City. Route 301 operates between downtown Seattle and Firdale Avenue/North 195th Street in Shoreline. Route 301 operates on I-5 with a stop at the NE 145th Street flyer stop and then uses the NE 175th Street interchange to and from Firdale Avenue/North 195th Street.

There are two small park-and-ride lots in Segment A, in addition to the park-and-ride stalls at the Northgate Transit Center. The South Jackson Park Park-and-Ride lot at 5th Avenue NE and NE 133rd Street is approximately 1,000 feet north of NE 130th Street and has 46 parking stalls. The North Jackson Park Park-and-Ride lot is approximately 500 feet north of NE 145th Street with 68 parking stalls.

NE 130th Street/I-5 Area

Two local King County Metro bus routes operate within the NE 130th Street/I-5 area and link the Eastside to north Seattle. Route 242 operates between the Overlake Park-and-Ride in Redmond to NE 165th Street in Seattle's Ridgecrest neighborhood. Route 242 travels on 5th Avenue NE between the Northgate Transit Center and NE 165th Street, with stops at NE 130th Street and NE 145th Street. Route 243 operates between the Wilburton Park-and-Ride in Bellevue, using the Evergreen Point Bridge to Lake City Way and then on NE 125th Street. Locally, the bus travels on NE 125th Street, Roosevelt Way NE to NE 130th Street, and then on 5th Avenue NE between NE 130th Street and NE 145th Street.

There are three King County Metro 900 series, Dial-a-Ride routes that operate between the Lakeside School and the South Kirkland Park-and-Ride, Seward Park neighborhood, and Laurelhurst neighborhood. Routes 986 and 987 operate on Roosevelt Way and NE 130th Street, crossing over I-5. Route 995 operates on 5th Avenue NE, NE 130th Street, and NE 145th Street.

NE 145th Street/I-5 Area

King County Metro Routes 242 and 243 described above include stops in the NE 145th Street area.

King County Metro routes that travel between downtown Seattle/First Hill and north Seattle neighborhoods using the NE 145th Street freeway flyer stop and exiting I-5 at the 175th Street interchange include Routes 301 and 303. Route 304 operates between downtown Seattle using I-5 and the NE 145th Street interchange to travel west and serve the Shoreline and Richmond Beach areas. Route 308 uses I-5 between downtown Seattle and the NE 145th Street interchange to travel east towards Lake City and the Horizon View neighborhoods.

King County Metro Route 347 travels on 15th Avenue NE, NE 145th Street, 5th Avenue NE, and NE 175th Street to North City, Ballinger Terrace, and the Mountlake Terrace Transit Center. Route 373 is a local route operating between the University of Washington and Aurora Village along 15th Avenue NE, with a stop at NE 145th Street.

NE 155th Street/I-5 Area

King County Metro Route 330 operates between Lake City and Shoreline Community College traveling on NE 155th Street.

NE 185th Street/I-5 Area

King County Metro Route 348 operates between Northgate and the Richmond Beach neighborhood, traveling on 15th Avenue NE, NE 175th Street, 5th Avenue NE, and then west on NE 185th Street over I-5.

Segment B: Shoreline to Mountlake Terrace

The local bus routes within Segment B access the Mountlake Terrace Transit Center, or are in the vicinity of the 220th Street SW area. These local bus routes are described by station area below. The Mountlake Terrace Transit Center has 880 park-and-ride stalls, bicycle lockers, two bus bays for local routes, and two bus stops on 236th Street SW.

Mountlake Terrace Transit Center Area

Six Community Transit routes (110, 111, 112, 119, 810, and 871) use Bus Bays 1 and 2 within the transit center. Two Community Transit routes operate between the Mountlake Terrace Transit Center and the Edmonds multimodal station. Route 110 travels on 236th Street SW, 56th Avenue West, 228th Street SW over I-5, 66th Avenue West, and then 220th Street SW toward Edmonds. Route 130 uses bus stops on 236th Street SW, operating between the Lynnwood Transit Center and the Edmonds multimodal station. Route 130 travels on Lakeview Drive toward Edmonds.

Two Community Transit routes connect the Mountlake Terrace and Ash Way Park-and-Ride lots. Route 112 operates between the Mountlake Terrace Transit Center, the Lynnwood Transit Center, and Ash Way Park-and-Ride traveling on 236th Street SW to the east. Route 119 operates between the Mountlake Terrace Transit Center and the Ash Way Park-and-Ride traveling on 236th Street SW, 56th Avenue West, over I-5 on 228th Street SW, then on 66th Avenue West and 220th Street SW.

Community Transit Routes 810 and 871 provide service to the University of Washington. These routes access I-5 from the 236th Street SW interchange.

Community Transit Route 111 operates between the Mountlake Terrace Transit Center and Brier east of I-5. King County Metro Route 347 from Northgate also enters the transit center to access the bus bays. From 15th Avenue NE, Route 347 travels on NE 205th Street, 48th Avenue West, and 236th Street SW to the transit center.

220th Street SW/I-5 Area

Community Transit Routes 110 and 119 described above operate along 220th Street SW.

Segment C: Mountlake Terrace to Lynnwood

The local bus routes within Segment C use the Lynnwood Transit Center, which is described below. The Lynnwood Transit Center has 1, 378 park-and-ride stalls, bicycle lockers, and 20 bus bays.

Lynnwood Transit Center Area

The local Community Transit routes provide connections between Community Transit park-and-rides throughout Snohomish County. The local routes access the Lynnwood Transit Center on 200th Street SW and then circulate on 48th Avenue West and 46th Avenue West to enter and exit the transit center. Route 112 travels on 44th Avenue West with bus stops on this street.

Route 115 connects the Aurora Village Transit Center, Edmonds Park-and-Ride, Edmonds Community College Transit Center, Lynnwood Transit Center, Swamp Creek Park-and-Ride, Ash Way Park-and-Ride, McCollum Park Park-and-Ride, and the Mariner Park-and-Ride. Route 116 connects the Edmonds multimodal station to Mill Creek, traveling through the Lynnwood, Swamp Creek, and Ash Way Park-and-Rides. Route 120 connects the Lynnwood Transit Center to the Canyon Park Park-and-Ride in Bothell. Route 130 connects the Edmonds multimodal station, Aurora Village Transit Center, Mountlake Terrace Transit Center, and the Lynnwood Transit Center. Route 130 travels on 52nd Avenue West to 200th Street SW and into the Lynnwood Transit Center. Routes 201 and 202 connect the Lynnwood Transit Center to park-and-rides to the north and then the Everett multimodal station and Smokey Point in Arlington. Route 196 travels between the Edmonds multimodal station to Alderwood Mall Parkway/184th Street SW, along 196th Street SW north of the Lynnwood Transit Center.

4.3 Freeway Operations

This section discusses current I-5 operations through the NE 130th Street and NE 145th interchange areas. Key observations and findings of the freeway operations analysis include the following:

- During the AM peak hour, average speeds on southbound I-5 (the peak direction of travel) range from 23 mph to 41 mph, with very congested conditions operating at LOS F through the NE 145th Street and NE 130th Street interchange areas. In the northbound direction, speeds are approximately 55 mph with operations at LOS B or C.
- During the PM peak hour, average speeds on northbound I-5 through the NE 130th Street and NE 145th Street interchange areas range from 18 mph to 35 mph, with very congested conditions operating at LOS F. In the southbound direction, speeds range from 40 mph to 58 mph with operations at LOS C; however, congestion is typically encountered from the Northgate area south through downtown Seattle.

4.3.1 Evaluation Methodology

Existing freeway conditions were evaluated using VISSIM software—a widely accepted micro-simulation tool. VISSIM assesses the roadway network in a dynamic fashion and provides a method of simulating the movement of vehicles in the traffic stream as they respond to the influences of other vehicles. Performance measures used in the VISSIM simulation analysis included travel times, mainline speeds, and LOS. An I-5 VISSIM model was developed to focus the analysis on the NE 130th Street/ and NE 145th Street/I-5 interchanges because potential ramp modifications are proposed at these interchanges as part of the project.

An existing conditions model was developed for the AM and PM peak periods to establish a baseline condition to compare future no build and build scenarios. In addition to modeling the freeway ramps at these two interchanges, 14 intersections were included in the model to capture queuing and spill-back effects within the interchange areas.

A Synchro model was used for analyzing and reporting intersection operations. Refer to Section 4.4.1 for the results of that analysis. The intersections incorporated in the VISSIM model are listed below.

Study Intersections

NE 130th Street interchange

- 5th Avenue NE at NE 127th Street (PM peak hour only)
- 5th Avenue NE at I-5 northbound off-ramp south of NE 130th Street (AM and PM peak hours)
- 5th Avenue NE at NE 130th Street/Roosevelt Way NE (AM and PM peak hours)
- I-5 southbound on-ramp at NE 130th Street (AM and PM peak hours)
- 3rd Avenue NE at NE 130th Street (PM peak hour only)
- 1st Avenue NE at NE 130th Street (AM and PM peak hours)

NE 145th Street interchange

- 5th Avenue NE at I-5 northbound off-ramp south of NE 145th Street (AM and PM peak hours)
- 5th Avenue NE at I-5 northbound off-ramp south of NE 130th Street (AM and PM peak hours)
- 5th Avenue NE at I-5 northbound on- and off-ramp (AM and PM peak hours)
- 5th Avenue NE at North Jackson Park-and-Ride (AM and PM peak hours)
- I-5 southbound on- and off-ramp at NE 145th Street (AM and PM peak hours)
- 4th Avenue NE at NE 145th Street (PM peak hour only)
- 3rd Avenue NE at NE 145th Street (PM peak hour only)
- 1st Avenue NE at NE 145th Street (PM peak hour only)

The VISSIM model includes Segment A and extends from the interchange at NE Northgate Way to north of the 175th Street interchange. I-5 north of NE Northgate Way consists of four general purpose lanes and an inside HOV lane in each direction. The freeway interchanges analyzed are described from south to north below.

NE 130th Street has ramps to and from the south only. There is an add-lane to exit to NE 130th Street. The northbound off-ramp crosses 5th Avenue NE south of NE 130th Street with stop-sign control on the ramp. The next interchange to the north is NE 145th Street/SR 523.

There is a full interchange at NE 145th Street. The ramps have special purpose supplemental ramps for buses to access the freeway flyer stops. The northbound off-ramp traffic merges with northbound 5th Avenue NE traffic. Southbound 5th Avenue NE crosses the northbound ramp and has stop-sign control. The northbound bus ramp intersects 5th Avenue NE north of NE 145th Street. The northbound on-ramp begins at this same location. Northbound vehicles on NE 145th Street travel northbound on 5th Avenue NE to access the northbound ramp.

4.3.2 Freeway Volumes

The existing traffic volumes on the I-5 ramp were taken from the WSDOT 2010 Ramp and Roadway counts and then balanced along I-5. The VISSIM model was calibrated to have modeled volume throughput within +/- 5 percent of the observed traffic counts. Figures 4-17 and 4-18 show the I-5 traffic volumes for the AM and PM peak hours, respectively.

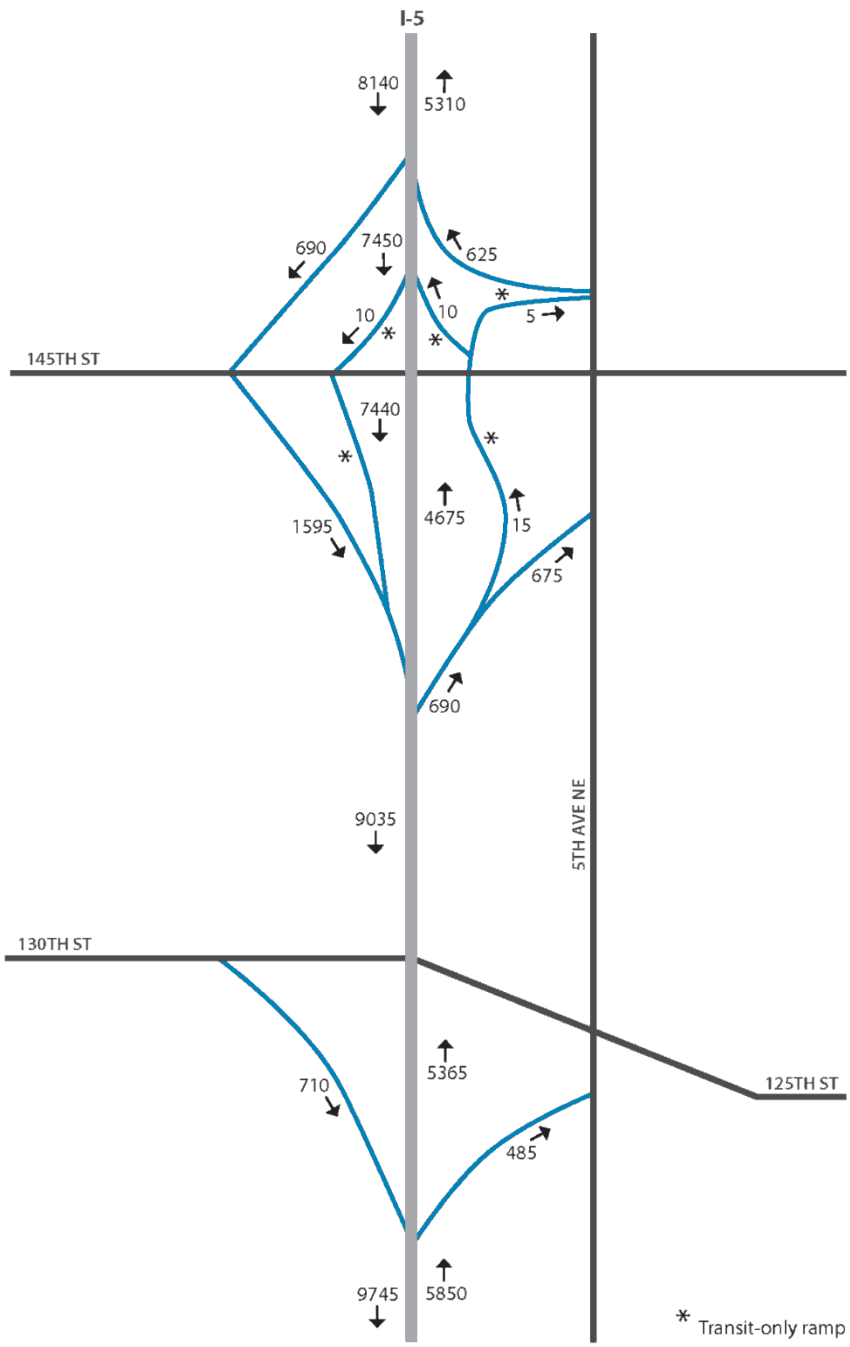


Figure 4-17. Freeway Mainline and Ramp Volumes—Existing Conditions AM Peak Hour

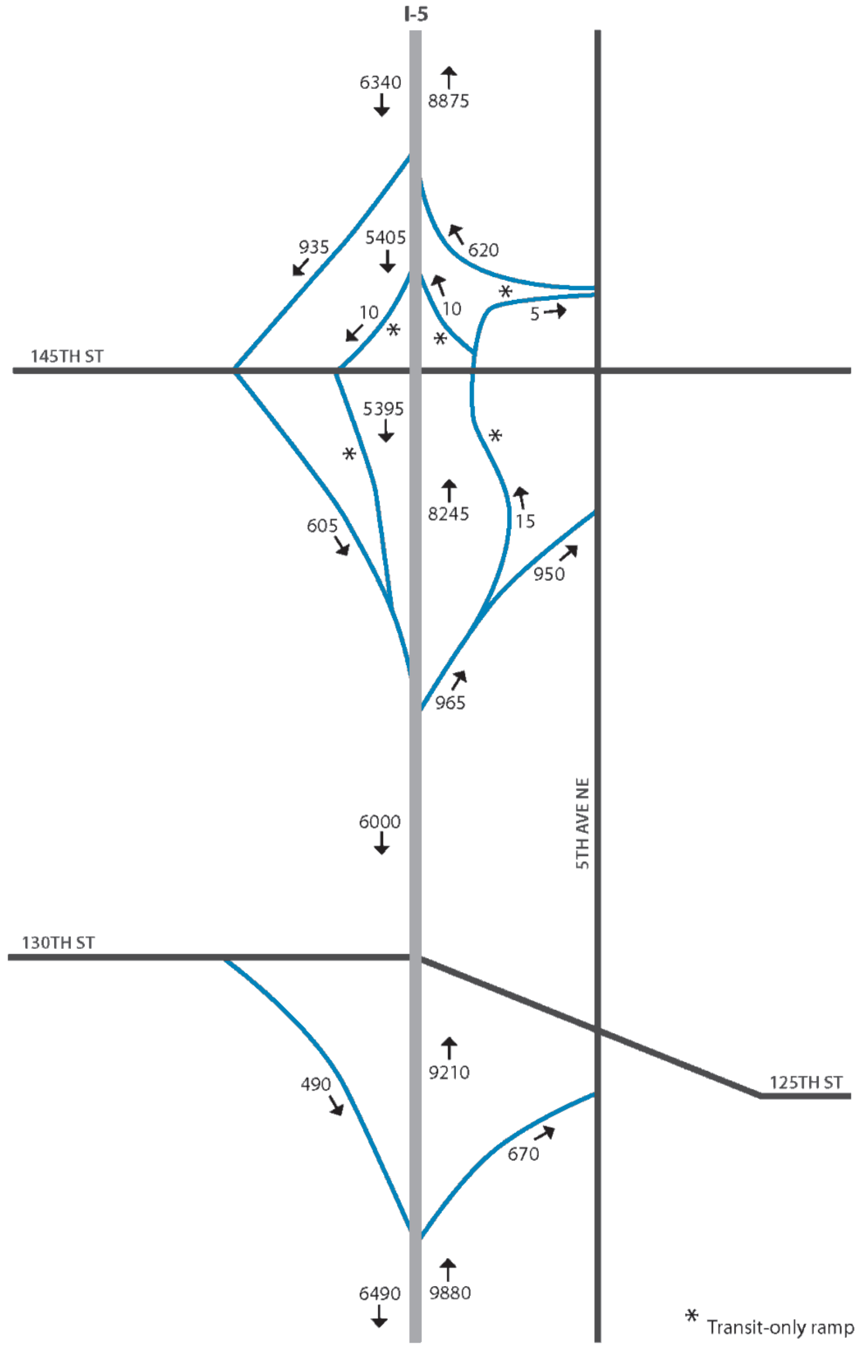


Figure 4-18. Freeway Mainline and Ramp Volumes—Existing Conditions PM Peak Hour

4.3.3 Freeway Speeds and Level of Service

Current freeway mainline speeds were obtained from existing WSDOT traffic data and were used to calibrate the simulation to represent current operating conditions on I-5 for the NE 130th Street and NE 145th Street interchanges, where ramp modifications are proposed with the light rail alternatives. Figures 4-19 and 4-20 show the calibrated freeway speeds and LOS for existing conditions in the AM and PM peak hours, respectively.

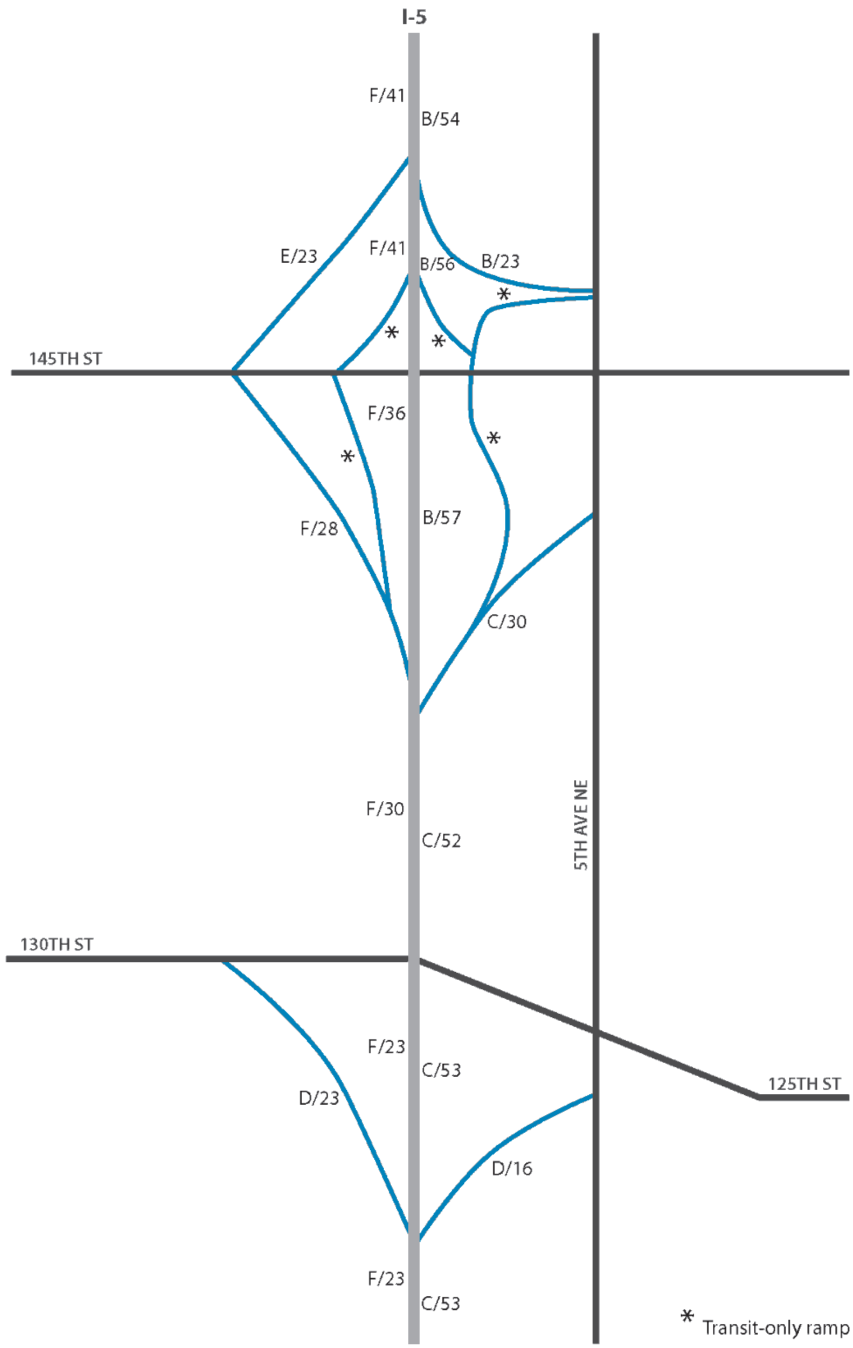


Figure 4-19. Freeway LOS and Speeds—Existing Conditions in AM Peak Hour

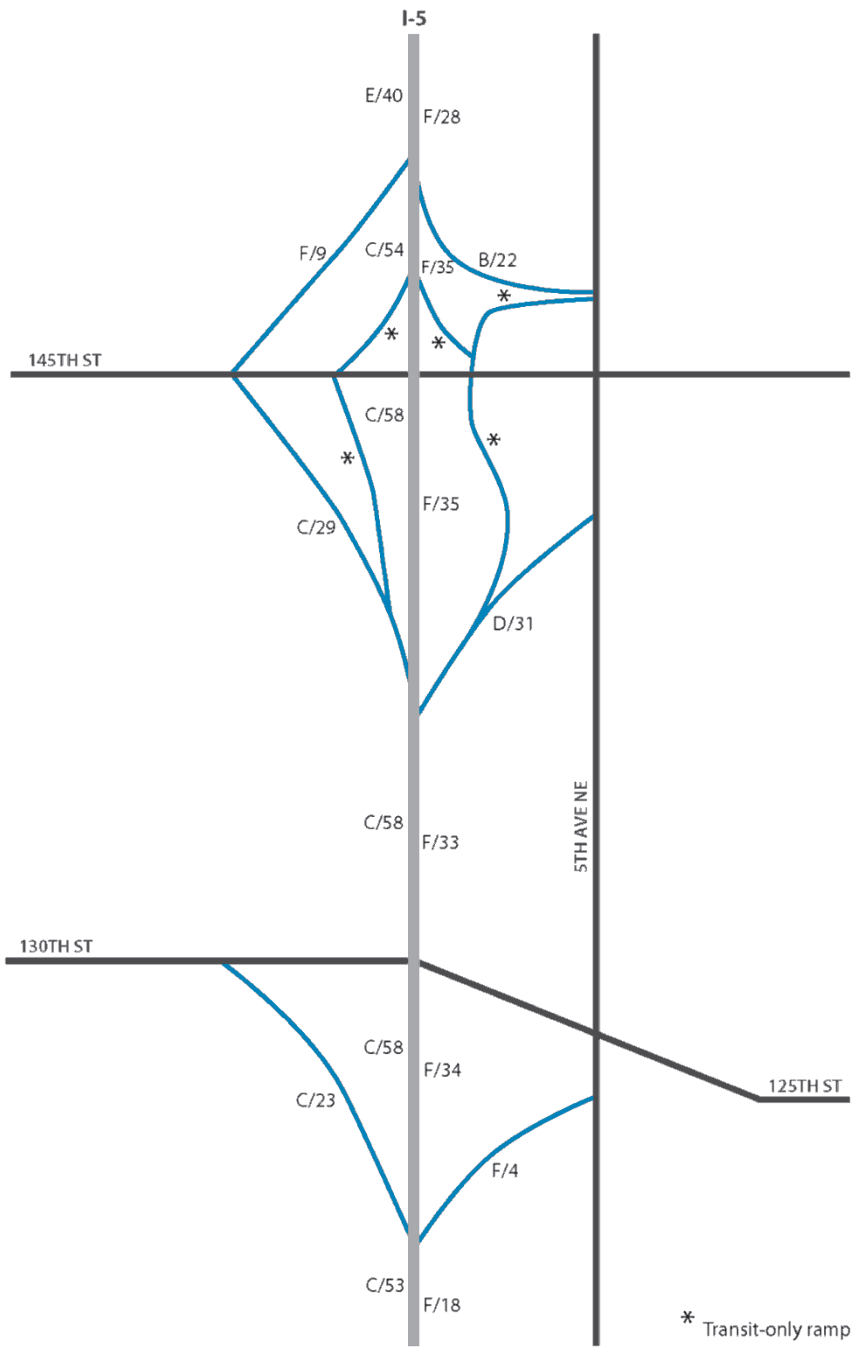


Figure 4-20. Freeway LOS and Speeds—Existing Conditions in PM Peak Hour

In the AM peak hour, the average speeds along southbound I-5, the peak direction of travel, range from 23 mph to 41 mph. For northbound I-5, the off-peak direction, speeds are approximately 55 mph. The LOS shows that southbound I-5 is operating under very congested conditions in the AM peak hour, with a LOS F within this freeway segment. This congestion is due to high volumes of merging traffic at NE 130th Street and NE 145th Street as well as conditions farther south. The northbound LOS ranges from a B to a C, indicating that operations are generally acceptable in that direction.

In the PM peak hour, the average speeds along northbound I-5, the peak direction of travel, range from 18 mph to 35 mph. The southbound I-5 speeds, in the off-peak direction, range from 40 mph to 58 mph through the NE 130th Street interchange. The LOS indicates that northbound I-5 is operating under very congested conditions, with a LOS F within this study area. This congestion is due to high volumes of diverging traffic at NE 130th Street and diverging and merging traffic at NE 145th Street. The southbound LOS ranges from a C to an E within this segment, indicating that operations are generally acceptable, except when traffic diverges to the southbound NE 145th Street off-ramp. The congestion at the NE 145th Street off-ramp is caused by heavy volumes exiting at NE 145th Street, causing delays and some spill-back onto the freeway. Also, while not explicitly analyzed, south of the NE 130th Street interchange, at the Northgate interchange, and farther south, I-5 typically slows down in the PM peak hour due to congestion caused by a variety of factors. This segment of I-5 can often be congested from this location through downtown Seattle and extending into areas farther south.

Approximately 50 bus trips operate in the HOV lane in the northbound direction during the PM peak hour. With an assumed passenger car equivalent of 2.5 cars per bus vehicle, these buses represent the capacity equivalent of approximately 125 passenger cars in the HOV lane.

4.4 Arterials and Local Streets

This section describes current operational conditions for the arterial and local street network within the project area. Key observations and findings include the following:

- Intersections near each proposed light rail station were analyzed to determine whether they are currently operating at acceptable levels or failing according to the governing jurisdiction's intersection LOS standard. In Segment A, City of Shoreline arterial segments were also evaluated to ensure consistency with City concurrency standards.
- In Segment A, 7 out of the 69 intersections evaluated in Seattle and Shoreline for intersection LOS currently do not meet agency standards for acceptable operations during the AM and/or PM peak hour. These intersections are located near the I-5/NE 130th Street and I-5/NE 145th Street interchanges, along NE 145th Street, and on Aurora Avenue North. In addition, one northbound arterial segment currently does not meet the City of Shoreline's concurrency standard during the PM peak hour.

- In Segment B, 1 intersection out of the 19 intersections analyzed within the City of Mountlake Terrace, located near the existing Mountlake Terrace Transit Center, currently operates below standards during the AM peak hour.
- In Segment C, all 20 of the intersections evaluated for intersection LOS currently meet City of Lynnwood LOS standards.

4.4.1 Traffic Operations

The arterial and local street analysis includes locations most likely to be affected by the project alternatives. The evaluation includes a description of the physical characteristics of all major road facilities in each segment. These characteristics include functional classification, number of lanes, speed limits, and daily traffic volumes. The focus of the arterial and local street analysis, however, is on intersection operations in areas most directly affected, such as by a change in channelization or signal control, as well as those indirectly affected by changes in volume due to trips accessing the light rail system. The latter includes intersections surrounding transit stations with proposed increases in park-and-ride lot capacity and passenger pick-up and drop-off activity.

Existing peak-hour turning movement counts for 2010 through 2012 were collected from WSDOT and the Cities of Seattle, Shoreline, Mountlake Terrace, and Lynnwood for all intersections where data were readily available. Where recent turning movement counts were not available, new counts were taken in May and June 2012. Additional information used in the operational analysis includes the roadway's functional use, lane geometry, traffic signal timing and phasing patterns, on-street parking, proximity to bus stops, and speed limits.

The quality of traffic operations is described in terms of LOS. Traffic operations were analyzed using the Transportation Research Board's *Highway Capacity Manual* methodology to calculate peak hour LOS at signalized and unsignalized intersections. Intersection results at signalized intersections are provided for the average delays of all vehicles as they approach the intersection. However, at selected intersections key movements that are operating significantly different from the overall intersection LOS are also called out. Figure 4-21 shows the locations of all the evaluated intersections.

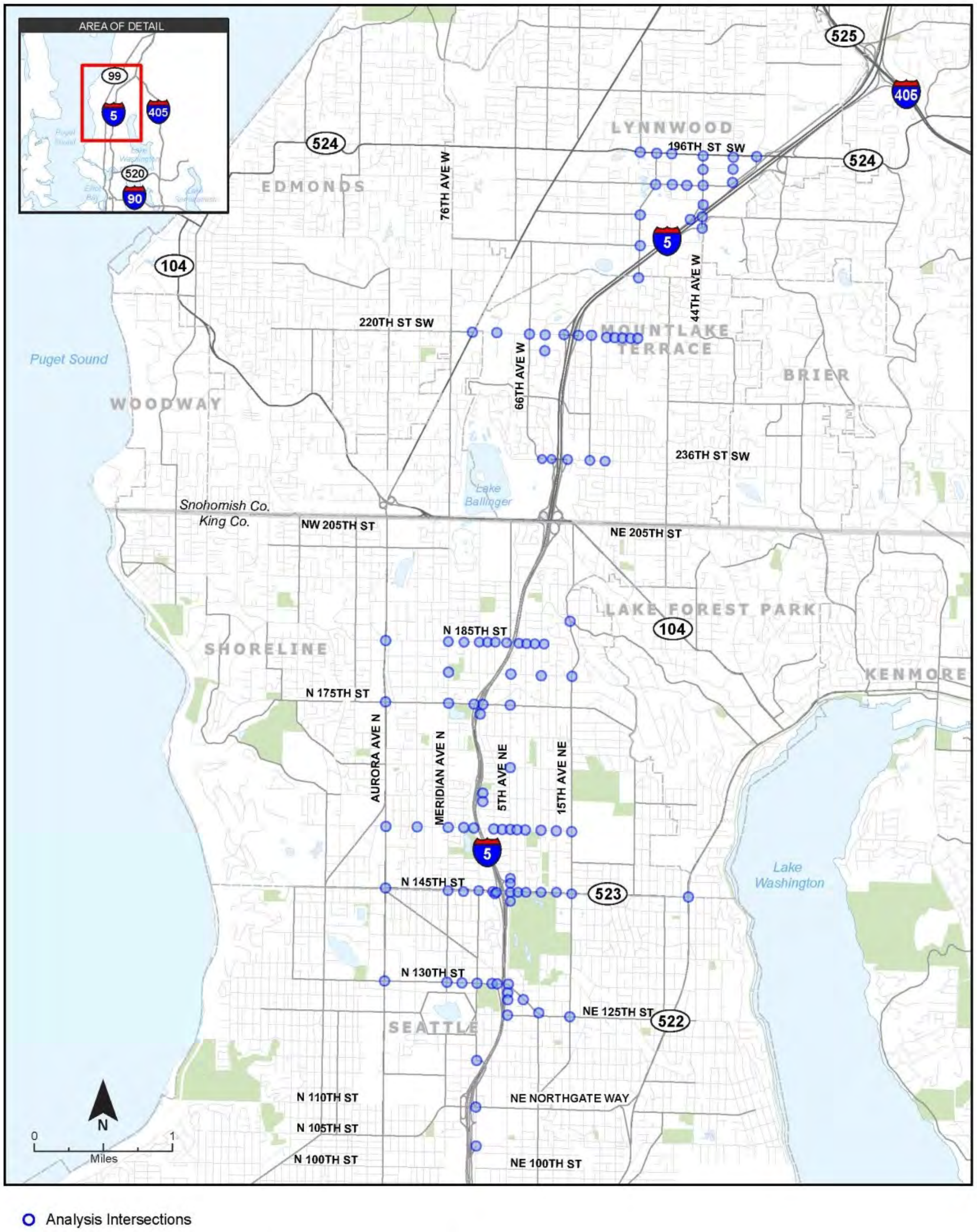


Figure 4-21. Analysis Intersections

Intersection results at unsignalized intersections are provided for the average delays for all vehicles at all-way stop-controlled intersections, and the leg that would experience the greatest delay, or worst LOS, for two-way stop-controlled intersections. LOS ratings, shown in Table 4-17, range from LOS A to LOS F; LOS A represents the best operation and LOS F the poorest operation. LOS was calculated for all study area intersections. Detailed LOS analysis reports for each intersection are provided in Appendix C.

Table 4-17. Level of Service Definitions for Signalized and Unsignalized Intersections

LOS	Average Control Delay (seconds per vehicle) Signalized Intersection	Unsignalized Intersection	Traffic Flow Characteristics
A	≤ 10	≤ 10	Virtually free flow; completely unimpeded.
B	> 10 and ≤ 20	> 10 and ≤ 15	Stable flow with slight delays; less freedom to maneuver.
C	> 20 and ≤ 35	> 15 and ≤ 25	Stable flow with delays; less freedom to maneuver.
D	> 35 and ≤ 55	> 25 and ≤ 35	High density but stable flow.
E	> 55 and ≤ 80	> 35 and ≤ 50	Operating conditions at or near capacity; unstable flow.
F	> 80	> 50	Forced flow; breakdown conditions.

Source: *2010 Highway Capacity Manual,* Transportation Research Board.

Segment A: Seattle to Shoreline

Link light rail within Segment A is projected to run along the east side of I-5 from the Northgate Station (currently under construction) to a proposed station at NE 185th Street. The six alternatives considered in this segment are either at-grade with elevated sections or mostly elevated, and have intermediate stations at NE 145th Street, NE 130th Street, and NE 145th Street, or NE 130th Street and NE 155th Street. Table 4-18 lists the arterials or roadways potentially affected by the project, including classification, number of lanes, speed limit, and daily traffic volumes.

Table 4-18. Segment A Existing Roadway Facilities

Roadway	Arterial Classification	Number of Lanes	Speed Limit	Daily Traffic Volume[a]
I-5	Interstate	6–8	60	171,000–211,000
SR 99	Principal Arterial	4–7	30–50	28,000–34,000
SR 522/Lake City Way NE	Principal Arterial	2–5	30–35	32,000–46,000
SR 523/North 145th Street	Principal Arterial	4	35	21,000–28,000
NE Northgate Way	Principal Arterial	4	30	17,500–31,700
NE 115th Street	Collector Arterial	2	20	1,200
NE 125th Street	Principal Arterial	2–3	30	18,000
North/NE 130th Street	Principal Arterial	4	30	19,900
North/NE 155th Street	Minor Arterial	2	35	7,200–11,800
North/NE 165th Street	Local Primary Street or Collector Arterial	2	25	600–1,900
North/NE 175th Street	Principal Arterial	4	35	18,000–30,800
North/NE 185th Street	Minor Arterial	2–4	35	7,200–17,300
Ashworth Avenue North	Local Primary Street or Collector Arterial	2	25	400–1,800
Meridian Avenue North	Collector Arterial	2	35	3,900–12,100
1st Avenue NE	Principal/Collector	2–5	25–30	3,000–5,300

Table 4-18. Segment A Existing Roadway Facilities

Roadway	Arterial Classification	Number of Lanes	Speed Limit	Daily Traffic Volume[a]
	Arterial			
5th Avenue NE	Minor Arterial	2–4	30	3,400–19,300
Roosevelt Way North/NE	Principal/Collector Arterial	4	30	18,400
10th Avenue NE	Collector Arterial or Local Primary Street	2	30	1,300–5,000
15th Avenue NE	Principal/Minor Arterial	4	35	14,100–15,700

[a] Year 2011 to 2012 daily traffic volumes are based on the latest available daily traffic count information available, including average annual daily traffic (AADT) volumes from the WSDOT Annual Traffic Report (2011), average annual weekday traffic (AAWT) volumes from 2010 Seattle Traffic Flow Map (2011), ADT counts from the Seattle Department of Transportation traffic count database (2011-2012), and average weekday traffic (AWDT) volumes from the Shoreline Master Plan (2011).

For Segment A, PM peak hour analysis was conducted for 31 intersections in Seattle and 38 intersections in Shoreline. AM peak hour analysis was also conducted at 15 of the intersections in Seattle and 11 of the intersections in Shoreline. Existing intersection analysis results, shown in Figures 4-22 and 4-23, were compared with the relevant jurisdiction's adopted LOS standard to determine whether the intersection operates at an acceptable LOS. The relevant jurisdictions and their established LOS standards are:

- WSDOT
  - LOS D for highways of statewide significance, including I-5, SR 522, and SR 99 in King County
  - LOS E/mitigated for regionally significant state highways, including SR 523 (N/NE 145th Street)
- City of Seattle: LOS D (goal)
- City of Shoreline: LOS D for signalized intersections on arterial streets and at unsignalized intersecting arterials

Figures 4-22 and 4-23 are color coded to indicate where LOS standards are met or are not met. Green and yellow indicate the LOS standards are met; red indicates operations fall below LOS standards.

As shown in Figures 4-22 and 4-23, seven intersections in Segment A currently do not meet LOS standards during the PM peak hour, and two intersections do not meet LOS standards in the AM peak hour:

- 1st Avenue NE and I-5 ramps/Northgate Mall Driveway (PM)
- 1st Avenue NE and NE Northgate Way (PM)
- 5th Avenue NE and I-5 northbound off-ramp south of NE 130th Street—eastbound approach (AM and PM)

- North 130th Street and Aurora Avenue North (PM)
- NE 145th Street and Bothell Way NE/Lake City Way NE (PM)
- NE 145th Street and 12th Avenue NE—northbound approach (PM)
- 5th Avenue NE and I-5 northbound off-ramp south of NE 145th Street—northbound approach (AM and PM)

For Shoreline, the following arterials were also evaluated for PM peak hour v/c ratios to determine whether they meet City of Shoreline concurrency standards:

- NE 155th Street—Westminster Way North to 15th Avenue NE
- NE 185th Street—Aurora Avenue North to 10th Avenue NE
- 5th Avenue NE/7th Avenue NE—NE 145th Street to NE 185th Street
- Meridian Avenue North—North 145th Street to North 205th Street
- 15th Avenue NE—NE 145th Street to NE 205th Street
- NE 175th Street—Aurora Avenue North to 15th Avenue NE

The v/c ratio ranges for these arterials are shown in Figure 4-24. The majority of these arterials were compared with the City's v/c standard of 0.90 or lower for principal and minor arterials. Exceptions to the 0.90 standard include 5th Avenue NE from NE 145th Street to the I-5 on-ramps, which is exempt from City concurrency standards, and 15th Avenue NE between NE 150th Street and NE 175th Street, which has a v/c standard of 1.10. In Figure 4-24, green and yellow indicate that the v/c ratio is within the City of Shoreline's v/c standard of 0.90; red indicates that arterial v/c ratio falls below 0.90.

As shown in Figure 4-24, the following arterial segments currently have v/c ratios that are higher than 0.90 during the PM peak hour:

- Meridian Avenue North from North 175th Street to North 185th Street—northbound (does not meet concurrency standard)
- 5th Avenue NE north of North 145th Street—northbound (exempt from concurrency)
- 15th Avenue NE south of NE 155th Street—northbound (v/c is below 1.10, does not exceed concurrency standard,)

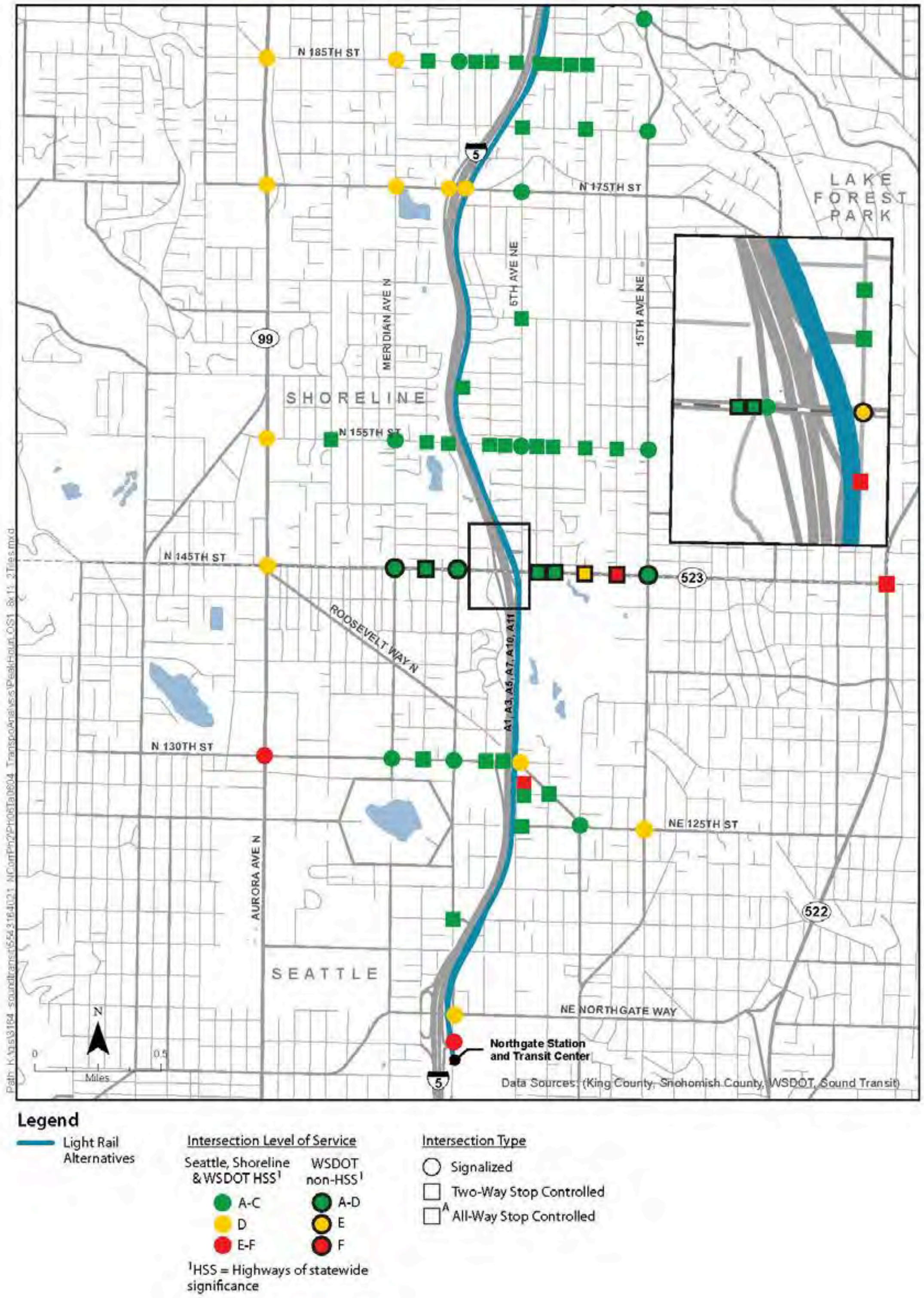


Figure 4-22. Existing PM Peak Hour Intersection LOS—Segment A

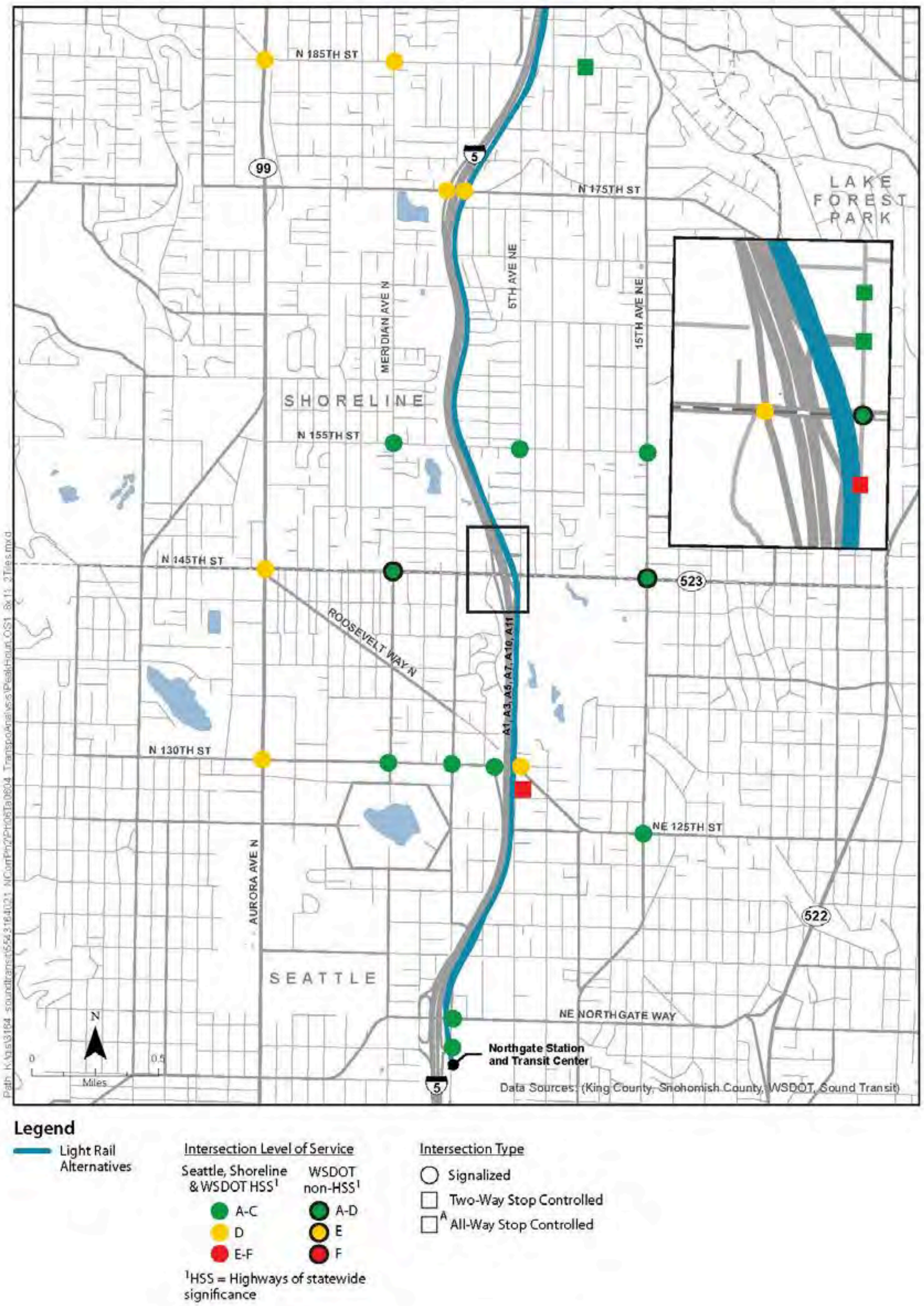


Figure 4-23. Existing AM Peak Hour Intersection LOS—Segment A

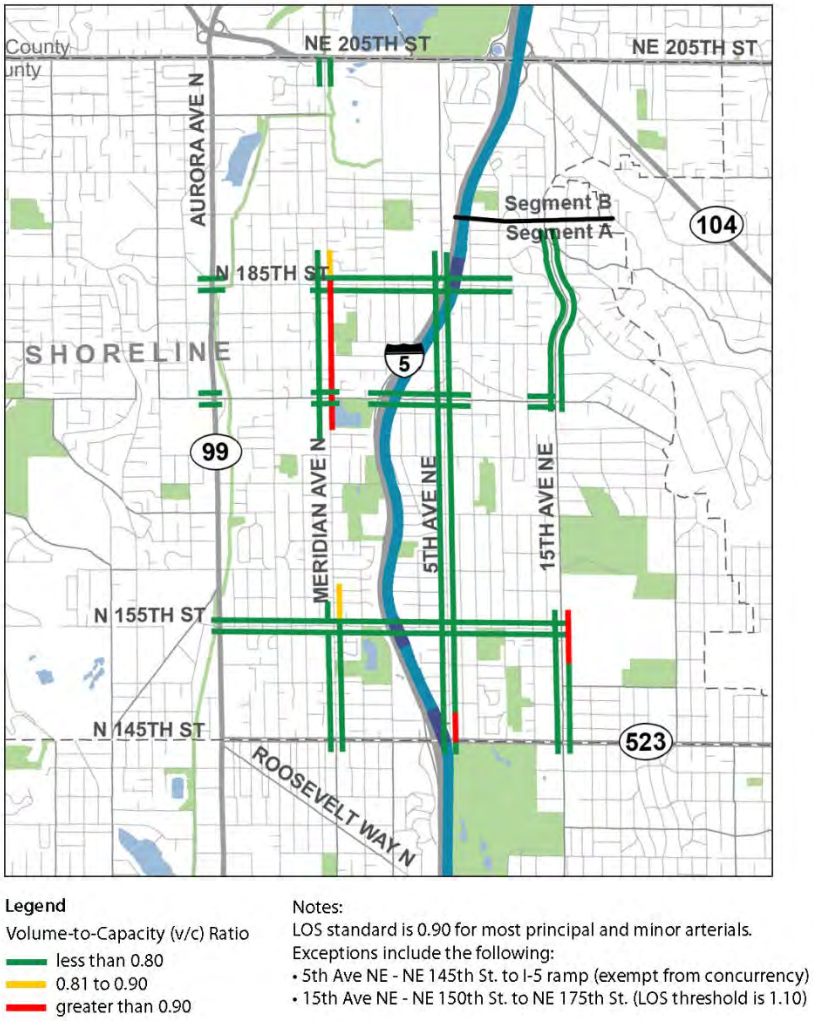


Figure 4-24. Existing PM Peak Hour Arterial LOS—City of Shoreline Arterials

Segment B: Shoreline to Mountlake Terrace

Segment B extends north of NE 185th Street to 212th Street SW. The proposed light rail alternatives closely follow I-5, all beginning at the east side of the interstate, connecting to the Mountlake Terrace Transit Center or the Mountlake Terrace Freeway Station, then either crossing the interstate to a west side station, or continuing down the center of I-5 to a median station. One alternative includes an additional station at 220th Street SW. Table 4-19 lists the arterials or roadways potentially affected by the project.

Table 4-19. Segment B Existing Roadway Facilities

Roadway	Arterial Classification	Number of Lanes	Speed Limit	Daily Traffic Volume[a]
I-5	Interstate	6–8	60	163,000–190,000
SR 99	Principal Arterial	4–7	30–50	28,000–31,000
Ashworth Avenue North	Collector Arterial or Local Primary Street	2	25	1,700–1,800
Meridian Avenue North	Minor Arterial	2	35	9,000–10,800
1st Avenue NE	Collector Arterial	2	25	4,200
5th Avenue NE	Collector Arterial	2	30	2,100
10th Avenue NE	Collector Arterial	2	30	4,300
15th Avenue NE	Principal Arterial	4	35	13,500
SR 104/North 205th Street	Primary Arterial	5	40	52,300
244th Street SW	Primary Arterial/Minor Arterial	2	30	10,200–20,700
236th Street SW	Minor Arterial	2–3	30	10,400*
220th Street SW	Principal Arterial/Minor Arterial	2–5	35	31,700*
212th Street SW	Minor Arterial	2	35	11,100*
66th Avenue West	Minor Arterial/Collector Arterial	2–4	30	11,100*
58th Avenue West	Collector Arterial	2	25	2,100*
56th Avenue West	Minor Arterial	2	25	8,000*
52nd Avenue West	Minor Arterial/Collector Arterial	2	25	6,500*

[a] Except where noted with an asterisk (*), year 2011 to 2012 daily traffic volumes are based on the latest available daily traffic count information available, including average annual daily traffic (AADT) volumes from the WSDOT Annual Traffic Report (2011) and average weekday traffic (AWDT) volumes from the Shoreline Master Plan (2011). Daily traffic volumes for locations noted with an asterisk were estimated by multiplying existing 2012 PM peak hour volumes by a factor of 10.

The PM peak-hour intersection analysis for Segment B was conducted for 19 intersections in the city of Mountlake Terrace. The AM peak-hour intersection analysis was also conducted at six of the intersections. Existing intersection analysis results, shown in Figures 4-25 and 4-26, were compared with the relevant jurisdiction's adopted LOS standard to determine whether the intersection operates at an acceptable LOS. The relevant jurisdictions and their established LOS standards are:

- WSDOT
  - LOS D for highways of statewide significance, includes I-5
  - LOS E/mitigated for regionally significant state highways, includes SR 99 in Snohomish County

- Mountlake Terrace
  - LOS E for signalized intersections along 244th Street SW, 220th Street SW, and 212th Street SW
  - LOS D for all other signalized intersections
  - LOS E for unsignalized intersections

As shown in Figures 4-25 and 4-26, the 236th Street SW and 56th Avenue West intersection currently does not meet LOS standards during the AM peak hour: All Segment B intersections meet LOS standards during the PM peak hour.

Segment C: Mountlake Terrace to Lynnwood

Segment C extends along an elevated track north of 212 Street SW to a terminus near the existing Lynnwood Transit Center. Each alternative is initially aligned with I-5, then diverges to the west, either along 52nd Avenue West to 200th Street SW, west of the transit center, or close to I-5 south of the transit center. Table 4-20 lists the arterials or roadways potentially affected by the project.

Table 4-20. Segment C Existing Roadway Facilities

Roadway	Arterial Classification	Number of Lanes	Speed Limit	Daily Traffic Volume[a]
I-5	Interstate	6–8	60	190,000
52nd Avenue West	Minor Arterial	2–3	30	6,500*
48th Avenue West	Collector Arterial	2	25	6,500*
40th Avenue West	Collector Arterial	2	25	5,800*
36th Avenue West	Minor Arterial	2–5	35	12,700*
208th Street SW	Collector Arterial	2	30	5,100*
204th Street SW	Collector Arterial	2	15	1,900*
200th Street SW	Minor Arterial	2–4	30	16,100*
198th Street SW	Collector Arterial	2	25	700*
SR 524/196th Street SW	Principal Arterial	4–5	35	24,000–40,000

[a] Except where noted with an asterisk (*), year 2011 to 2012 daily traffic volumes are based on the latest available daily traffic count information available, including average annual daily traffic (AADT) volumes from the WSDOT Annual Traffic Report (2011). Daily traffic volumes for locations noted with an asterisk were estimated by multiplying existing 2012 PM peak hour volumes by a factor of 10.

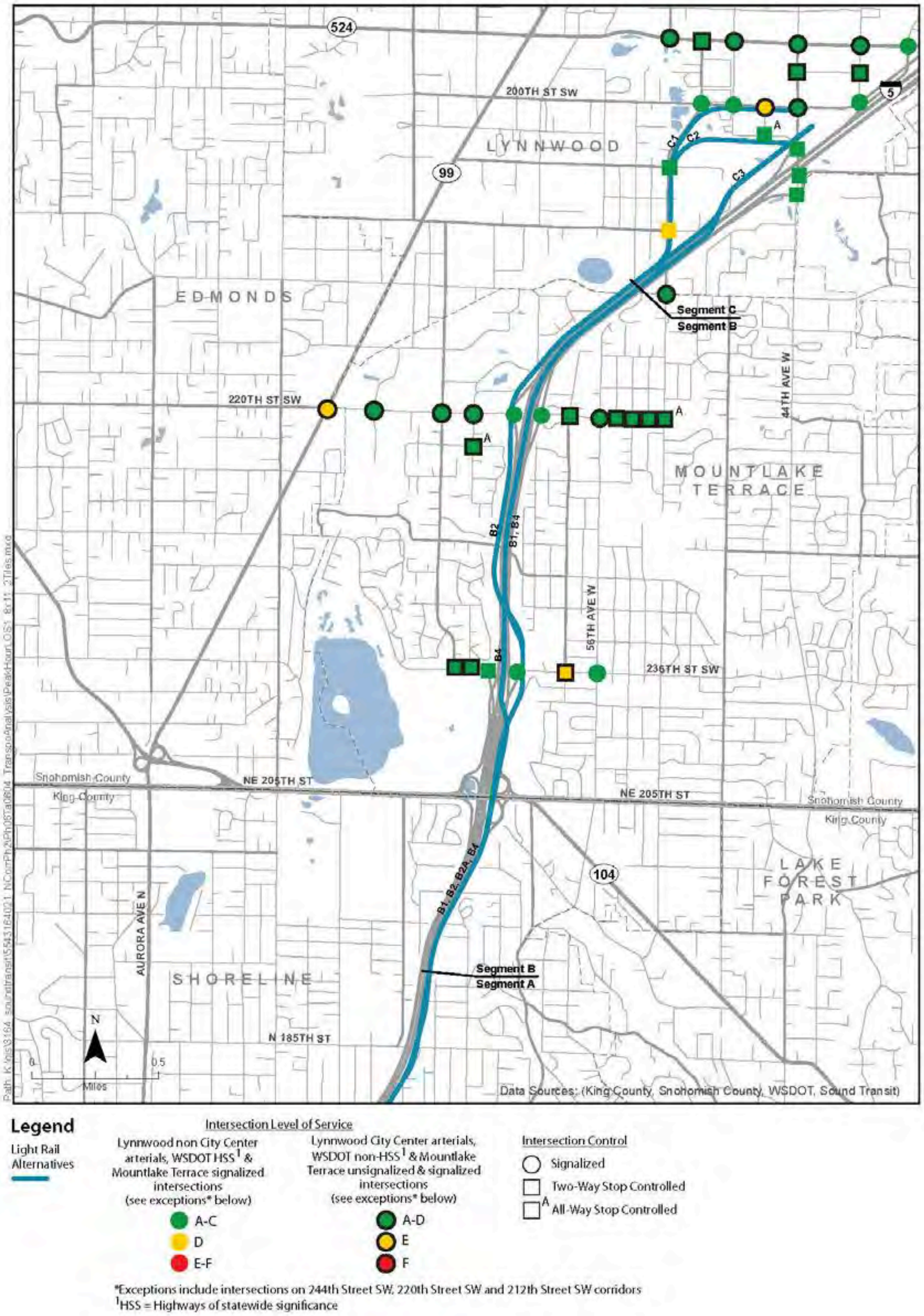


Figure 4-25. Existing PM Peak Hour Intersection LOS—Segments B and C

Figure 4-26. Existing AM Peak Hour Intersection LOS—Segments B and C

The PM peak-hour operations analysis for Segment C was conducted for 20 intersections in Lynnwood. The AM peak-hour intersection analysis was also conducted at 10 of the intersections. Existing intersection analysis results, shown in Figures 4-25 and 4-26, were compared with the relevant jurisdiction's adopted LOS standard to determine whether the intersection operates at an acceptable LOS. The relevant jurisdictions and their established LOS standards are:

- WSDOT
  - LOS D for highways of statewide significance, including I-5
  - LOS E/mitigated for regionally significant state highways, including SR 524 (196th Street SW)
- Lynnwood
  - LOS E for City Center arterials
  - LOS D for non-City Center arterials

As shown in Figures 4-25 and 4-26, all intersections in Segment C currently meet LOS standards during the PM and AM peak hours.

4.4.2 Property Access and Local Circulation

The property access and local circulation analysis focuses on streets, driveways, and connections most likely to be affected by the project alternatives. The evaluation of existing conditions includes a description of the physical characteristics of local street facilities near the proposed stations and along the guideway in each segment. These characteristics include the number of lanes, sidewalks, driveways, and cul-de-sacs where property access may be constrained or changed with the light rail project. The focus of the property access and local circulation analysis is on areas that would be most directly affected by the project, such as by a change in driveway operation (right turns only), street modifications, and connections.

Segment A: Seattle to Shoreline

The following is a description of the roadways most likely to be affected by the Segment A light rail alignments and stations.

1st Avenue NE, Northgate Way NE to NE 117th Street

1st Avenue NE, north of Northgate Way NE, runs along the east side of I-5 with a transition to NE 117th Street, which crosses I-5. The posted speed limit on this roadway is 30 mph. The west side of 1st Avenue NE has no development, but north of Northgate Way NE, 1st Avenue NE provides exclusive access to a set of apartment buildings (Northgate Apartments). To the east of 1st Avenue NE, NE 112th Street connects to 2nd Avenue NE and thus to Northgate Way.

North of NE 112th Street, there is one driveway with access to 1st Avenue NE. No other property access is available to 1st Avenue NE or to North 117th Street up to and across I-5 until the all-way stop-controlled intersection at 1st Avenue NE/NE 117th Street. A multi-use trail intersects 1st Avenue NE at the NE 116th Street alignment with connection to 3rd Avenue NE. Apartments east of 1st Avenue NE and north of NE 112th Street are accessed from the north via NE 115th Street.

NE 130th Street/I-5 Area

5th Avenue NE is on the east side of I-5 within the limited access boundaries at the NE 130th Street interchange between NE 127th Street and a church driveway, north of NE 131st Place. There is no development on the west side of 5th Avenue NE. Northbound and southbound traffic on 5th Avenue NE is separated by a raised median or curb, in the limited access area, thereby limiting property access to right turns only into and out of properties between NE 127th Street and NE 131st Place along 5th Avenue NE. Four properties have limited driveway access to 5th Avenue NE between NE 127th Street and NE 130th Street. There are two little-used driveways on 5th Avenue NE between NE 130th Street and NE 131st Place.

5th Avenue NE is the connecting street for NE 131st Place access to the arterial network. Properties along 5th Avenue NE within the limited access boundaries are constrained to right turns into and out of the driveway.

NE 125th Street and NE 127th Street connect 5th Avenue NE with 8th Avenue NE and Roosevelt Way NE.

5th Avenue NE, NE 130th Street to NE 145th Street

5th Avenue NE is an arterial serving a limited number of properties and travels between NE 130th Street and NE 145th Street. Two residences have driveways to 5th Avenue NE north of NE 130th Street—both driveways appear to be little-used. One side street, NE 131st Place, is a cul-de-sac serving 10 homes that intersect 5th Avenue NE, between NE 130th Street and NE 145th Street. The North Seattle Church of the Nazarene has driveways to 5th Avenue NE, serving the approximately 80-space parking lot. The South Jackson Park Park-and-Ride lot is located on the west side of 5th Avenue NE, with two driveways and a southbound bus stop. The Jackson Park Golf Course lies on the east side of 5th Avenue NE, and there is one gated driveway for maintenance access to the park/golf course from the west. City plans include construction of a perimeter trail along 5th Avenue NE for pedestrian access.

NE 145th Street/I-5 Area

A northbound freeway off-ramp from I-5 flows into 5th Avenue NE just south of NE 145th Street. Northbound and southbound traffic on 5th Avenue NE stops at the ramp intersection. Northbound and southbound traffic are separated on 5th

Avenue NE with a raised median and curb within the limited access area of the interchange, extending just south of the northbound off-ramp to just north of the northbound on-ramp from 5th Avenue NE (approximately NE 146th Street). The North Jackson Park Park-and-Ride lot is located on the west side of 5th Avenue NE north of the northbound on-ramp to I-5. There are side-by-side left-turn pockets on 5th Avenue NE to accommodate left-turn storage for southbound left-turning traffic to NE 145th Street, and for northbound left-turning traffic to the northbound on-ramp to I-5.

5th Avenue NE is within the limited access area of the interchange, extending from approximately NE 138th Street to NE 146th Street. South of NE 145th Street, there are no driveways or access points within the limited access area. North of NE 145th Street, there are a few residences with driveway access within the limited access area, with right-turn access only. 5th Avenue NE has bus service with a northbound bus stop just north of NE 145th Street and a southbound bus stop adjacent to the North Jackson Park Park-and-Ride lot.

NE 155th Street/I-5 Area

NE 155th Street is a three-lane arterial with marked bicycle lanes and sidewalks on both sides in the vicinity of the NE 155th Street Station. This east-west street passes under I-5, with 1st Avenue NE located just west of I-5. On the south side of NE 155th Street, from 1st Avenue NE to 2nd Avenue NE, two driveways provide property access to the Shoreline Fire Department Station 65 and associated parking, and to one house west of 2nd Avenue NE. Between 2nd Avenue NE and 4th Avenue NE, two driveways serve residences on the south side of NE 155th Street. 2nd Avenue NE is a cul-de-sac to NE 155th Street and serves as access for 10 homes. 4th Avenue NE is a cul-de-sac to NE 155th Street and serves as access for nine homes. From 4th Avenue NE to 5th Avenue NE, there are two residential driveways and one driveway to a church (Shoreline Full Gospel Fellowship) on the south side of NE 155th Street. The church has alternative access to 5th Avenue NE.

On the north side of NE 155th Street, from 1st Avenue NE and 3rd Avenue NE, there is one residential driveway. From 3rd Avenue NE to 5th Avenue NE, there are seven residential driveways along the north side of NE 155th Street.

Access to the Twin Ponds playground and parking lot is from 1st Avenue NE just south of NE 155th Street. A driveway on the north side of NE 155th Street serves St. Barnabas Church, just west of 1st Avenue NE.

NE 185th Street/I-5 Area

NE 185th Street is a two-lane street with sidewalks on both sides. NE 185th Street crosses over I-5. East of I-5, there is one driveway access from NE 185th Street on the south side between 7th Avenue NE and 8th Avenue NE. 7th Avenue NE is a cul-de-sac north of NE 185th Street that serves eight homes.

South of NE 185th Street, 5th Avenue NE extends to connect to NE 180th Street, with two cul-de-sacs to the east (NE 182nd Court with seven homes and NE 183rd Court with five homes) and 12 homes with driveways to 5th Avenue NE.

West of I-5 along NE 185th Street, 5th Avenue NE connects to the north, serving the Shoreline School District properties. On the north side of NE 185th Street, from 3rd Avenue NE to 5th Avenue NE, there are six residential driveways and one driveway to the parking lot adjacent to the school sports field. On the south side of NE 185th Street from 3rd Avenue NE to the bridge over I-5, there are eight residential driveways.

Segment B: Shoreline to Mountlake Terrace

The following is a description of the roadways most likely to be affected by the Segment B light rail alignments and stations.

Mountlake Terrace Transit Center Area

236th Street SW is the arterial adjacent to the Mountlake Terrace Transit Center, with a sidewalk on the north side of the street through the study area (west of I-5 extending east of 58th Avenue West). A south sidewalk extends east from the I-5 northbound off-ramp to beyond 58th Avenue West. The transit center and park-and-ride lot access to 236th Street SW is at the signalized intersection with the I-5 northbound off-ramp. This is the sole vehicle access to the transit center and park-and-ride facility. Eight homes have driveway access to the south side of 236th Street SW, between the Mountlake Terrace Transit Center and 58th Avenue West. On the north side of 236th Street SW, between the Mountlake Terrace Transit Center and 58th Avenue West, there is a cul-de-sac (59th Place West serving nine homes) and three residential driveways.

West of I-5 along 236th Street SW, there are no driveway access points until the intersection at 68th Avenue West.

Access to I-5 at 236th Street SW is provided via a half-diamond interchange with a northbound off-ramp and southbound on-ramp.

220th Street SW/I-5 Area

220th Street SW is a major east-west arterial with interchange connection to I-5, sidewalks along both sides, but no driveway access points on the south side between the I-5 interchange and 64th Avenue West. A channelized access driveway to the north provides right-in and right-out access for businesses on the north side of 220th Street SW. Residential development on the south side of 220th Street SW has property access via 220th Place SW and 64th Avenue West. The intersection of 220th Street SW at 64th Avenue West is signalized with full access to all quadrants.

222nd Street SW is a local street that serves residential and school properties. This street connects to the arterial network at 64th Avenue West where the intersection has all-way stop control.

Ten homes access 222nd Street SW directly with driveways between 62nd Avenue West and 64th Avenue West. A secondary local street access to the arterial network is south via 62nd Avenue West and west along 224th Street SW to 64th Avenue SW.

Segment C: Mountlake Terrace to Lynnwood

The following is a description of the roadways most likely to be affected by the Segment C light rail alignments and stations.

52nd Avenue West/Cedar Valley Road

52nd Avenue West is a three- to five-lane arterial with sidewalks on both sides from its route under I-5 (four lanes) to 208th Street SW (five lanes) and continuing as Cedar Valley Road (three-lane roadway) to 200th Street SW. Property access along 52nd Avenue West, from I-5 to 208th Street SW, includes five residential driveways and two driveways at a church on the west side and one residential driveway plus two commercial/industrial driveways on the east side. From 208th Street SW to the Interurban Trail crossing, there is only one driveway on the east side of the street. From the Interurban Trail to 206th Street SW, there are six residential driveways on the west side and one commercial/industrial driveway on the east side. This property only has access to 52nd Avenue West.

Between 206th Street SW and 204th Street SW, driveways on 52nd Avenue West serve the Grange Hall and two residences on the west side of the street; no access points are provided along the east side. From 204th Street SW to where 52nd Avenue West transitions to Cedar Valley Road, there are three residential driveways and one cul-de-sac with five homes on the west side of the street. One driveway on the east side of 52nd Avenue West serves WorkSource Lynnwood with an auxiliary access to 204th Street SW.

Cedar Valley Road south of 200th Street SW has four driveways serving professional office buildings on the west side. On the east side, there are two driveways serving business park developments as well as a driveway and parking lot at Scriber Creek Park (with trail). These driveways are not interconnected; each driveway on the east side is a sole access point for the property.

Lynnwood Transit Center Area

200th Street SW is a three-lane street west of 46th Avenue West with sidewalks on both sides of the street. Driveways provide access to apartment complex developments on the north side of the street (two driveways between 46th Avenue West and 48th Avenue West, three driveways between 48th Avenue West and 50th Avenue West). On the south side of 200th Street SW, two driveways serve apartments between 50th Avenue West and 48th Avenue West, and one driveway serves business park development between 48th Avenue West and 46th Avenue West. Commercial land uses have access to 200th Street SW between 46th Avenue West and 44th Avenue West via four commercial driveways on the north side and two commercial driveways on the south side. Additional property access to these commercial properties is provided via 48th Avenue West, 46th Avenue West, and 44th Avenue West. Additional property access to the apartment developments is provided via 50th Avenue West and 48th Avenue West.

48th Avenue West serves multifamily residential developments north and south of 200th Street SW. This roadway also provides access on the east side to commercial buildings, the Lynnwood Park-and-Ride, and the Lynnwood Transit Center.

South of 200th Street SW, 46th Avenue West provides access to business and commercial properties with driveways on the west and east sides of the street. It also provides access to the Lynnwood Park-and-Ride and Lynnwood Transit Center.

The Lynnwood direct access interchange with I-5 provides access to and from the HOV lanes in both directions along I-5, with a connection into the Lynnwood Park-and-Ride.

4.5 Nonmotorized Facilities

This section describes the existing and no build conditions for pedestrian and bicycle travel facilities within the study area. Without the project, pedestrians and bicyclists would continue to use the existing facilities near bus stops. Some station areas have missing sidewalks and do not meet standards outlined in the Americans with Disabilities Act (ADA). Key observations and findings related to nonmotorized travel in the project area include the following:

- Streets in Seattle surrounding proposed station areas are generally old and lacking ADA-accessible walkways at intersections. Sidewalks are typically 5 feet wide.
- Streets in Shoreline are generally without sidewalks.
- Pedestrian volumes are low throughout the corridor except in Lynnwood, where there are a moderate number of pedestrians.
- Bicycle lanes are sporadic. Bicycles generally share a lane with traffic.

- The Interurban multi-use trail is approximately 1 mile west of the 145th Street, 155th Street, 185th Street, and Mountlake Terrace Station areas. It then reaches within 0.50 mile of the 220th Street Station area and is between the existing Lynnwood Transit Center/Park-and-Ride and I-5.

4.5.1 Pedestrian Facilities

Existing pedestrian facilities were inventoried on all arterials within 0.50 mile of each station for all light rail alternatives. Arterials were identified based on each jurisdiction's transportation plans. The inventory includes streets classified as arterials, collector arterials, and collectors, so that all streets connecting the station to activity centers are those included in the existing conditions inventory. Typical pedestrian facilities are sidewalks, pedestrian walkways and paths, and multi-use trails.

A pedestrian LOS was evaluated for intersections within 300 feet of proposed stations where intersection data were collected for the traffic analysis. Existing pedestrian volumes were gathered from PM peak hour intersection data, collected primarily in May 2012. The LOS analysis was based on a pedestrian flow rate in pedestrians per minute and the sidewalk width. The resulting LOS is based on the *Highway Capacity Manual* methodology. Pedestrian LOS for sidewalks was analyzed using the methodology from the *Highway Capacity Manual* (Transportation Research Board 2000) and the TCQSM. Pedestrian LOS is a measure of walking conditions on a sidewalk.

Segment A: Seattle to Shoreline

Streets that would be affected by one or more project alternatives along Segment A include 1st Avenue NE, NE 117th Street, and 5th Avenue NE. There are sidewalks on the east side of 1st Avenue NE and the north side of NE 117th Street. There are sidewalks on the east side of 5th Avenue NE south of NE 130th Street, but no sidewalks between NE 130th Street and NE 145th Street.

The pedestrian facilities within 0.50 mile of NE 130th Street, NE 145th Street, NE 155th Street, and NE 185th Street Station areas are presented in Figures 4-27, 4-28, 4-29, and 4-30, respectively. The pedestrian environment at each station is described below for each station area.

NE 130th Street/I-5 Area

The NE 130th Street Station would be located in the northeast quadrant of the I-5 interchange in Seattle. The streets in this area of Seattle are generally old and lacking ADA-accessible walkways at intersections. Sidewalks are typically 5 feet wide without planting strips. There are pedestrian paths adjacent to arterials that consist of an at-grade asphalt path separated from the edge of the street by a gravel and grass strip.

Figure 4-27 shows these types of paths along NE 130th Street, the west side of 1st Avenue NE, and the collector arterials around Haller Lake. The bus stop at Meridian Avenue North, south of NE 130th Street, has no sidewalk or curb.

Pedestrian activity is generated at the bus stops located on each leg of the NE 130th Street/5th Avenue NE intersection. Pedestrian volumes were one to two pedestrians per hour at the intersection of NE 130th Street and 5th Avenue NW, resulting in LOS A conditions on existing sidewalks.

NE 145th Street/I-5 Area

The NE 145th Street Station would be located in the northeast quadrant of the I-5 interchange. The city of Seattle is south of NE 145th Street, and the city of Shoreline is north of NE 145th Street. The streets in the vicinity are generally old and lacking ADA-accessible sidewalks at intersections. Some intersection locations have been upgraded to current ADA standards, but most have not yet been upgraded. Sidewalks are typically 5 feet wide without planting strips. This condition occurs all along NE 145th Street.

There are pedestrian paths adjacent to arterials that consist of an at-grade asphalt path separated from the edge of the street by a gravel and grass strip. These are located along the west side of Meridian Avenue North, south of NE 145th Street, on the east side of 1st Avenue NE. There are asphalt pedestrian paths at the interchange to provide pedestrian access to the existing bus-transit freeway flyer stops. These are shown on Figure 4-28.

Pedestrian activity is generated at the bus stops located on each leg of the NE 145th Street/5th Avenue NE intersection, the freeway flyer stops, and other periodic pedestrian movements. Pedestrian volumes were six to eight pedestrians per hour in the east-west direction at NE 145th Street and 5th Avenue NW, resulting in LOS A conditions on existing sidewalks.

NE 155th Street/I-5 Area

The NE 155th Street Station would be located in the northeast quadrant of NE 155th Street and I-5. As shown on Figure -29, there are sidewalks on all of the arterials within 0.50 mile of the station. The sidewalks are in variable conditions.

Pedestrian activity is generated at the bus stops located on NE 155th Street near 5th Avenue NE and 6th Avenue NE, as well as other periodic pedestrian movements. Pedestrian volumes were two to eight pedestrians per hour along NE 155th Street from 1st Avenue NE to 3rd Avenue NE, resulting in LOS A conditions on existing sidewalks.

NE 185th Street/I-5 Area

The NE 185th Street Station would be located in the northeast quadrant of the I-5 interchange in Shoreline. The sidewalks are in variable conditions. Some intersection locations have been upgraded to current ADA standards.

The sidewalks on 9th Avenue, a local street, were included in the inventory because it is one of the few local streets with sidewalks. In addition, 9th Avenue may provide a pedestrian route from the potential light rail station to the North City commercial and multifamily housing area at 15th Avenue NE and NE 180th Street.

10th Avenue NE, north of NE 185th Street, is an arterial street with no sidewalks. Sidewalks are on the parallel street of 8th Avenue NE and along NE 180th Street, and therefore were included in the inventory. NE Perkins Way has a striped paved shoulder/walkway on the north side. The roadway is steep and winding with concrete barriers along curves to protect pedestrians.

A paved multi-use trail exists along NE 195th Street between 1st Avenue NE and Meridian Avenue North. There is no vehicle access along this segment of street right-of-way. See Figure 4-30 for an inventory of the NE 185th Street Station area pedestrian facilities.

Pedestrian activity is generated at the bus stops located on each leg of NE 185th Street between the bridge and 7th Avenue NE, as well as other neighborhood pedestrian activity. Pedestrian volumes were one to six pedestrians per hour along NE 185th Street from 5th Avenue NE to 8th Avenue NE, resulting in LOS A conditions on existing sidewalks.

Segment B: Shoreline to Mountlake Terrace

There is a pedestrian and bicycle overcrossing of I-5 at NE 195th Street, located north of the proposed NE 185th Street Station and south of the Mountlake Terrace Transit Center. The pedestrian facilities within 0.50 mile of the proposed Mountlake Terrace Transit Center Station and 220th Street SW Station are presented in Figures 4-31 and 4-32. The pedestrian environment at these station areas is described below.

Mountlake Terrace Transit Center Area

The Mountlake Terrace Transit Center Station would be located at the existing Mountlake Terrace Park-and-Ride facility, while the Mountlake Terrace Freeway Station would be located in the I-5 median adjacent to the park-and-ride. A pedestrian trail through Veteran's Memorial Park connects the existing Mountlake Terrace Park-and-Ride facility to the Mountlake Terrace Town Center. This trail is a soft-surface wooded trail used by pedestrians to access the Mountlake Terrace Park-and-Ride and as a shorter path from the Town Center to neighborhoods west of I-5.

Pedestrian activity is generated at the bus stops located on each leg of 236th Street SW between the I-5 bridge and the transit center entrance, including other periodic pedestrian movements. Pedestrian volume counts indicated about six pedestrians per hour in the east and west directions on 236th Street SW at the transit center entrance, resulting in LOS A conditions on existing sidewalks.

220th Street SW/I-5 Area

The 220th Street SW Station would be located in the southwest quadrant of the I-5 interchange. Local streets within 0.5 mile of this proposed station generally have sidewalks on only one side. The Interurban Trail is within 1 mile of the station site to the west and northwest.

Pedestrian volume counts show one to three pedestrians per hour at 220th Street SW and the I-5 off-ramps. Pedestrian volumes were counted at one to six pedestrians per hour in the vicinity of 220th Street SW and 64th Avenue West. Pedestrian LOS is A on existing sidewalks at these locations.

Segment C: Mountlake Terrace to Lynnwood

No pedestrian facilities would be affected by the light rail alignment along Segment C. The pedestrian facilities within 0.50 mile of the Lynnwood Transit Center, and future station areas are presented in Figure 4-33. The pedestrian environment is described below.

There are sidewalks on all of the streets in downtown Lynnwood and in the vicinity of the station alternatives. The Interurban Trail extends through the station areas. This trail is an on-street facility adjacent to 52nd Avenue West between 208th Street SW and the power line segments. To the north, the trail follows the Snohomish County Public Utility District (PUD) power line right-of-way, crosses over 44th Avenue West on a pedestrian/bicycle bridge, and then continues adjacent to the west side of I-5.

Pedestrian volumes are generated by the downtown activity, transit center, and park-and-ride lots. Pedestrian volumes at 200th Street SW and 46th Avenue West ranged from 32 to 48 pedestrians per hour, resulting in LOS A conditions for pedestrians. At 46th Avenue West and 48th Avenue West/Interurban Trail, there were 154 pedestrians per hour crossing the north leg of this intersection. During the PM peak hour, pedestrians are leaving the transit center via a plaza and entering the park-and-ride lot to the southeast. Pedestrians either traverse directly into the park-and-ride lot or travel on 48th Avenue West/Interurban Trail, which has 10-foot-wide sidewalks on the south side at this location. A 10-foot-wide sidewalk with 154 pedestrians per hour results in LOS B conditions.

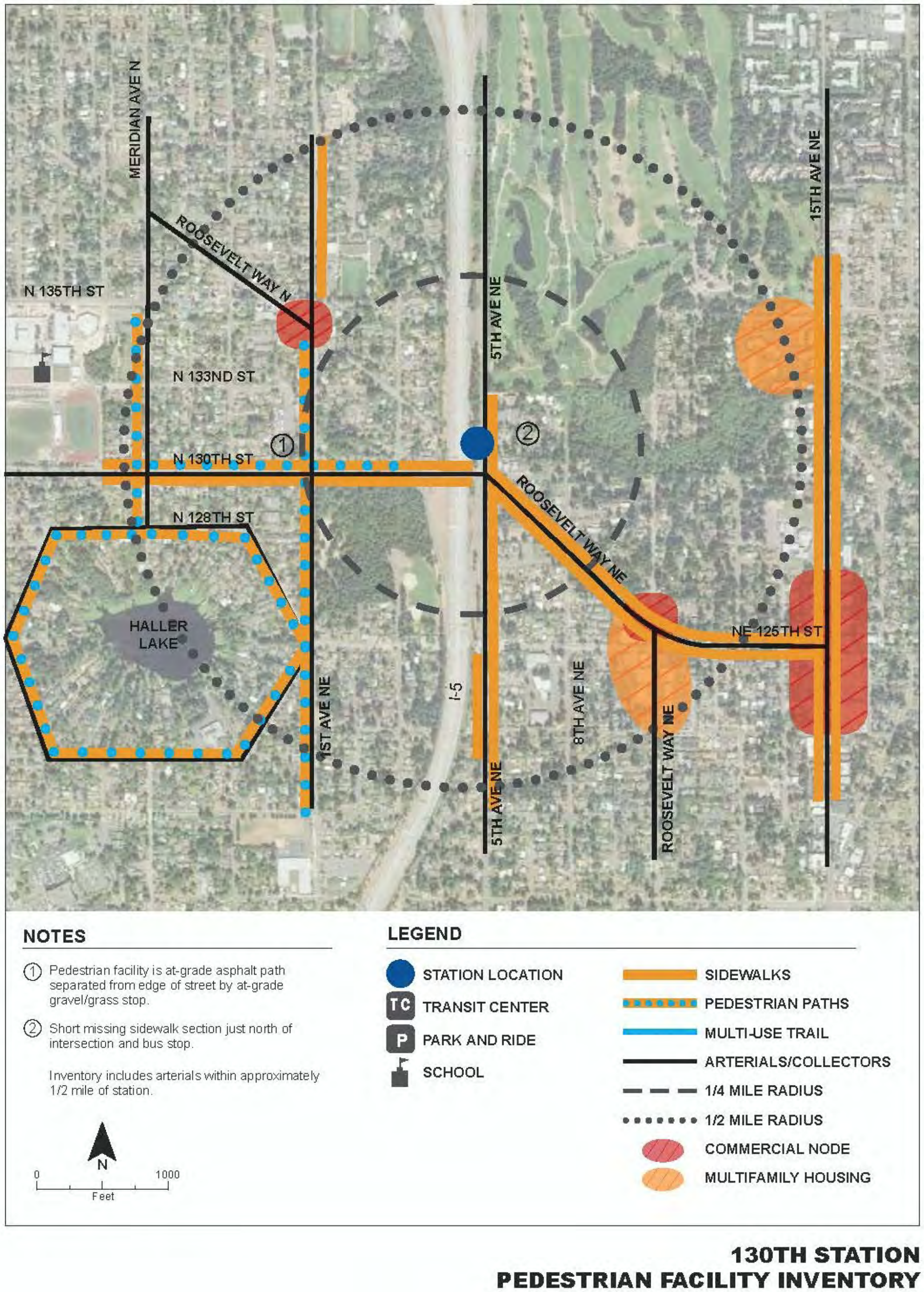


Figure 4-27. NE 130th Street Station Pedestrian Facility Inventory

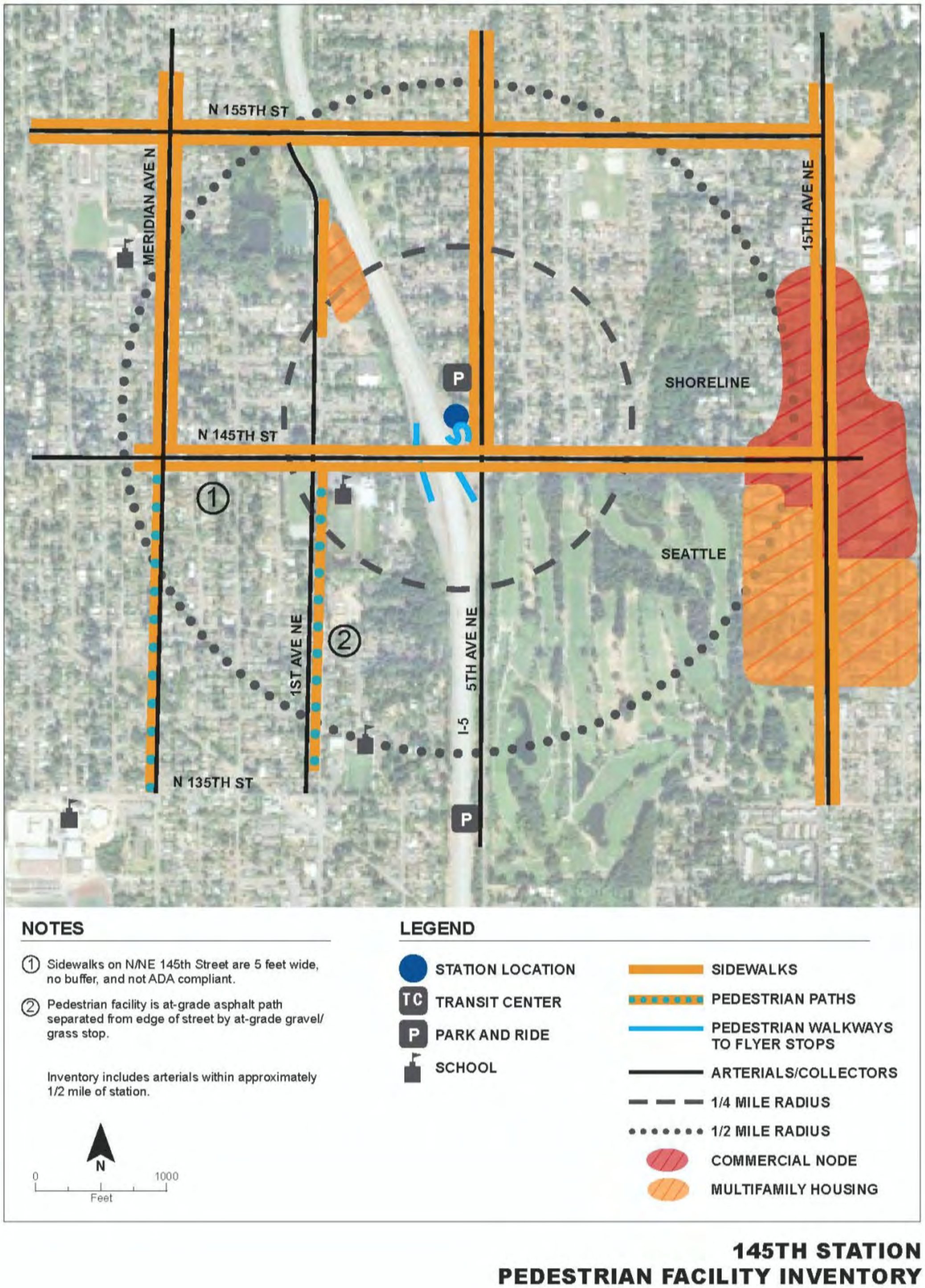


Figure 4-28. NE 145th Street Station Pedestrian Facility Inventory

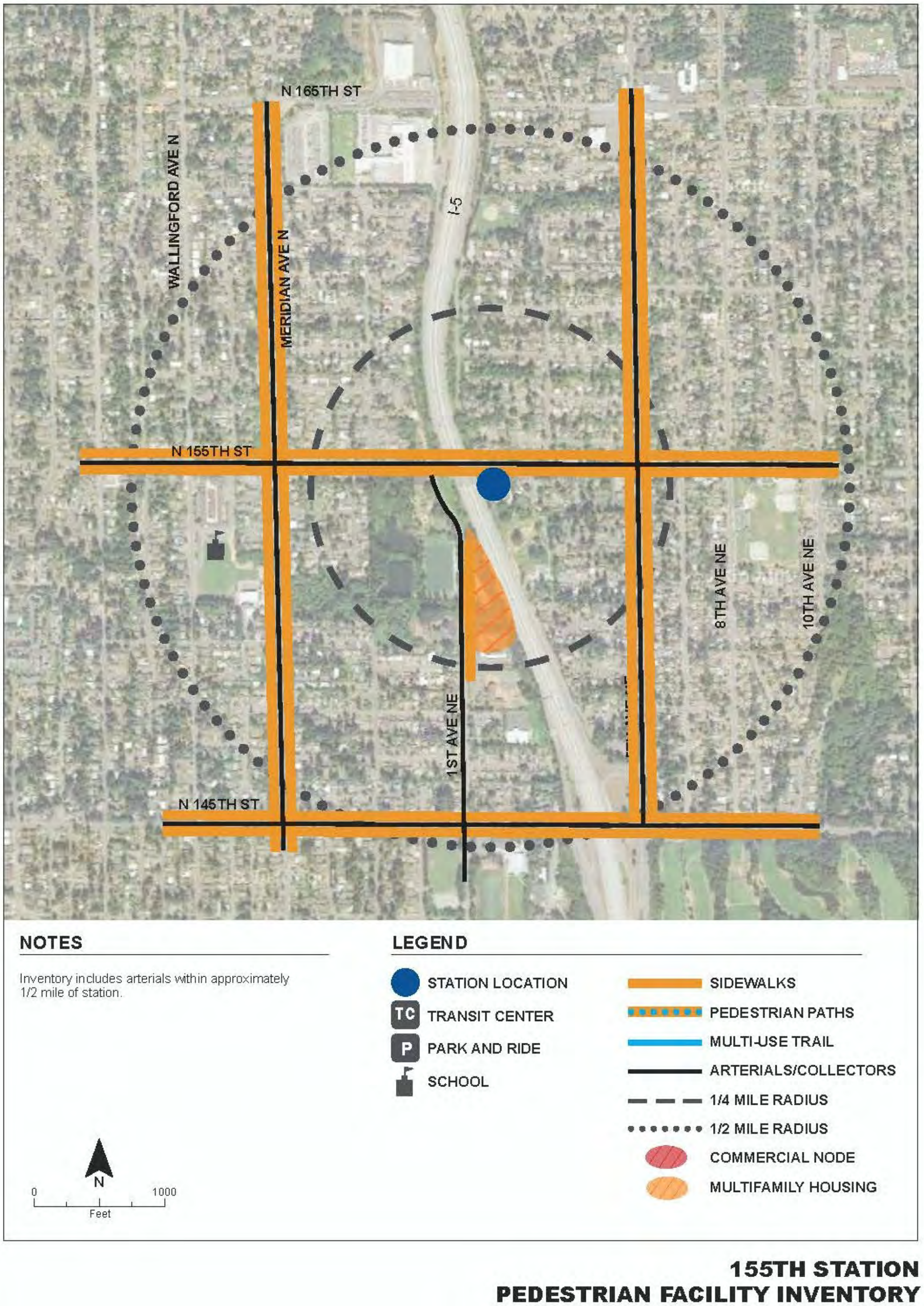


Figure 4-29. NE 155th Street Station Pedestrian Facility Inventory

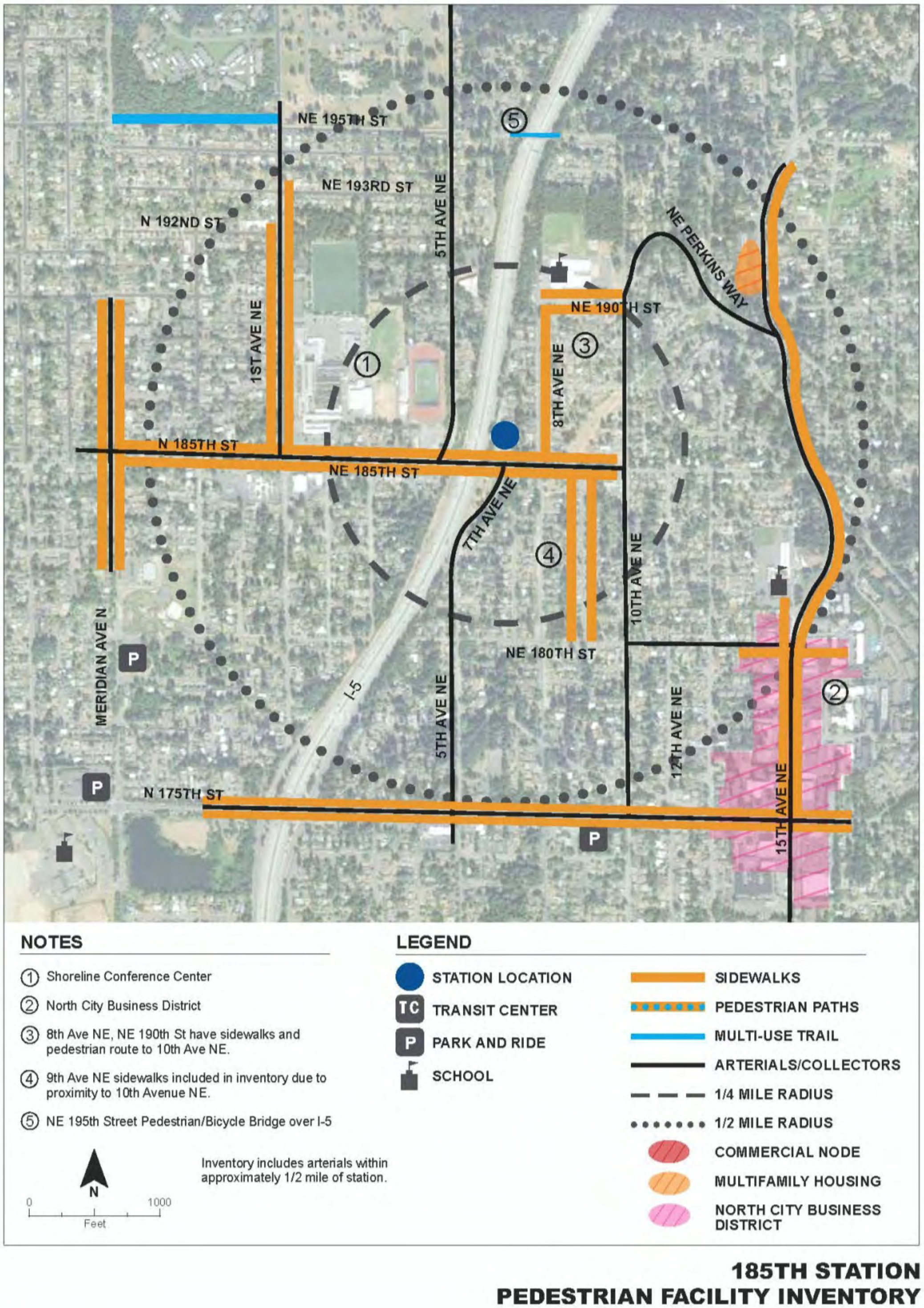


Figure 4-30. NE 185th Street Station Pedestrian Facility Inventory

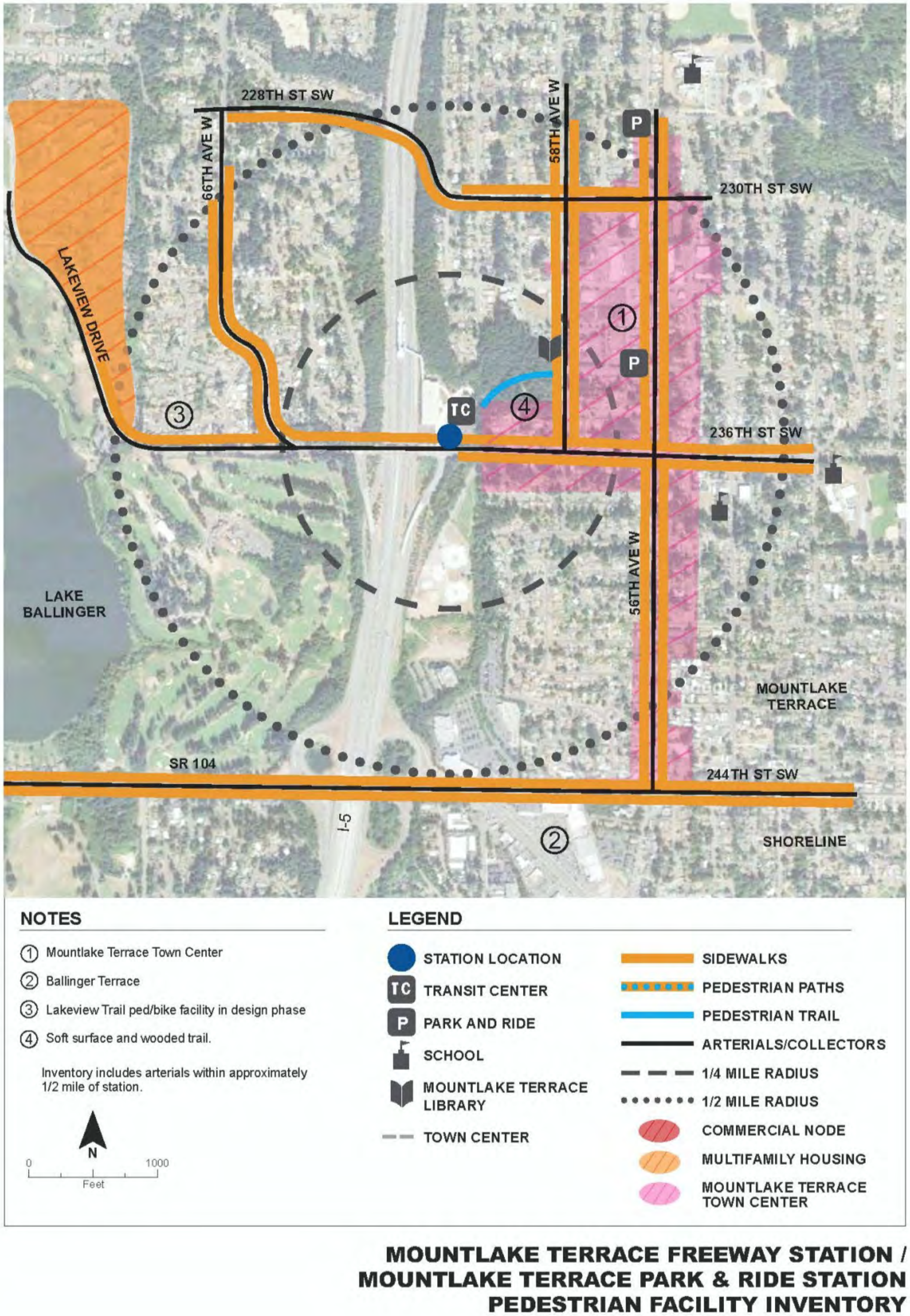


Figure 4-31. Mountlake Terrace Transit Center Station Pedestrian Facility Inventory

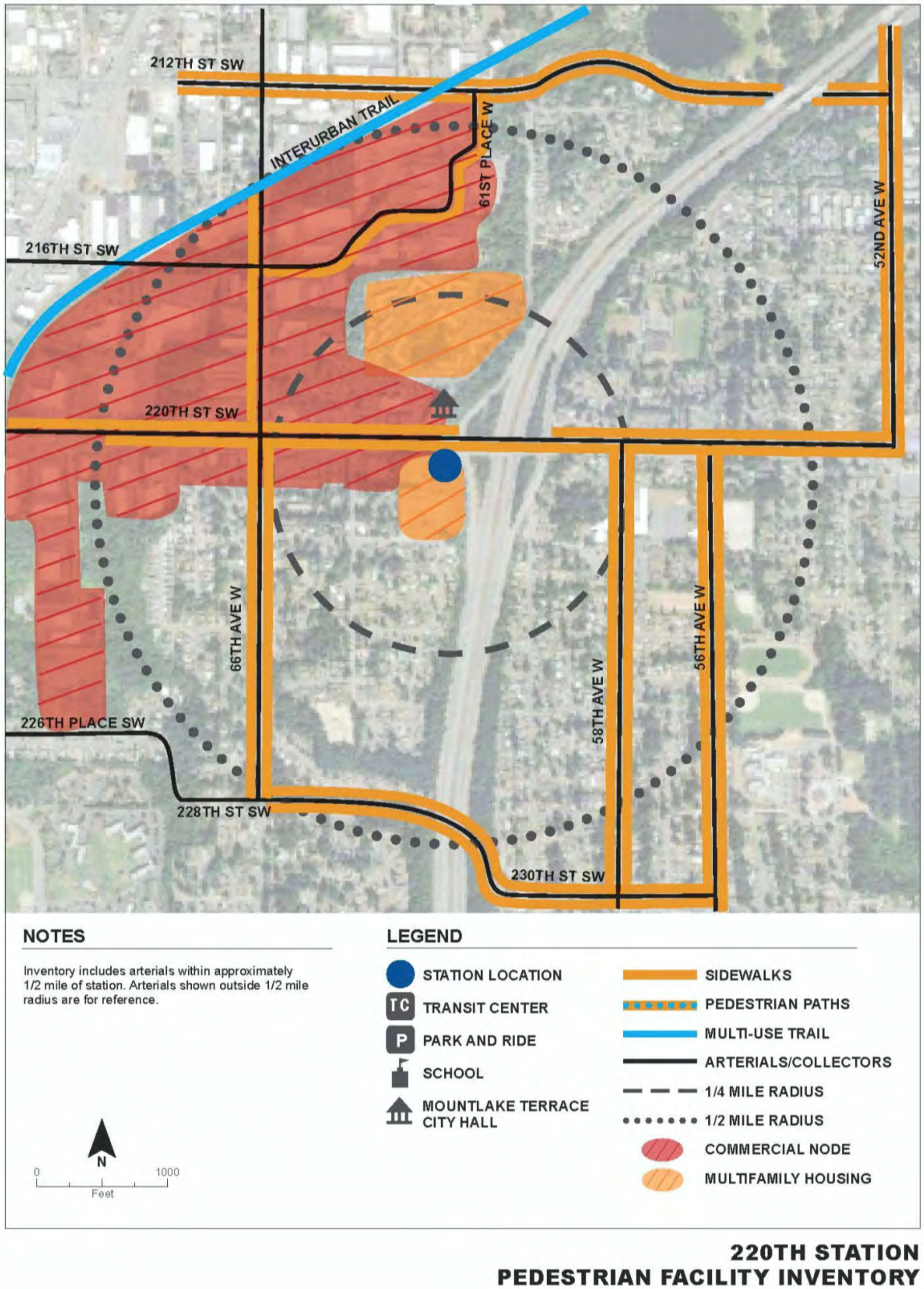


Figure 4-32. 220th Street SW Station Pedestrian Facility Inventory

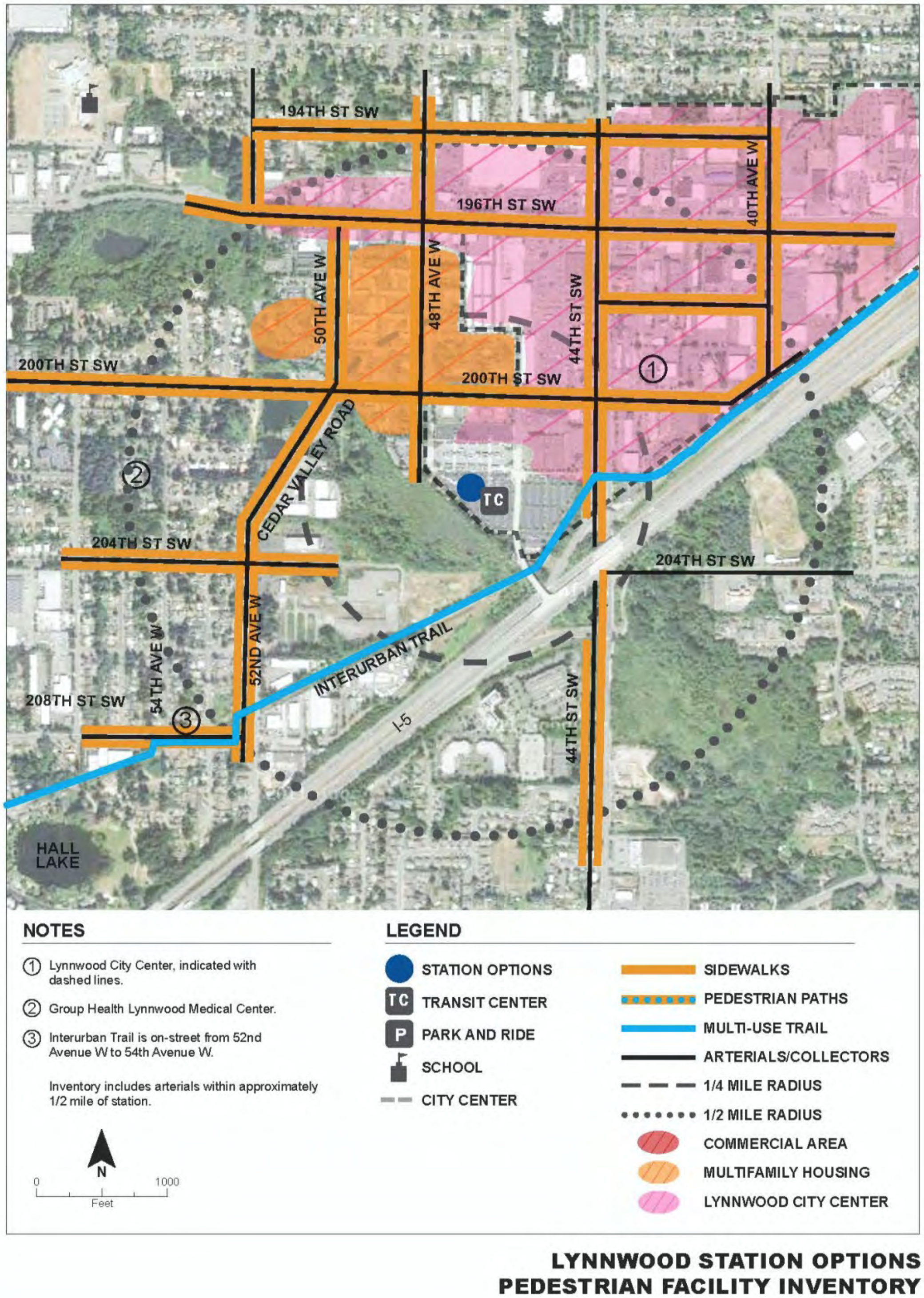


Figure 4-33. Lynnwood Transit Center Station Pedestrian Facility Inventory

4.5.2 Bicycle Facilities

Existing bicycle facilities were inventoried on all arterials within 1 mile of each proposed station location for all light rail alternatives. Arterials were identified based on each jurisdiction's transportation plans. Arterials include streets classified as arterials, collector arterials, and collectors. Typical bicycle facilities are bicycle lanes, multi-use trails, and streets with wide lanes or wide paved shoulders that are identified as shared-use facilities.

Segment A: Seattle to Shoreline

Streets that would be affected by one or more project alternatives along Segment A include 1st Avenue NE, NE 117th Street, and 5th Avenue NE. There are wide curb lanes adjacent to sidewalks or paved shoulders on these streets.

The bicycle facilities within 1 mile of the NE 130th Street, NE 145th Street, NE 155th Street, and NE 185th Street Stations are presented in Figures 4-34, 4-35, 4-36, and 4-37, respectively.

The bicycle environment at each station is described below.

NE 130th Street/I-5 Area

The NE 130th Street Station would be located in the northeast quadrant of the I-5 interchange in Seattle. The streets in this area of Seattle are generally old and lacking in constructed bicycle facilities. The City of Seattle uses a pavement marking called a sharrow to define streets that should be shared by vehicles and bicycles. The existing bicycle facility inventory is shown in Figure 4-34. There are sharrows along 1st Avenue NE from 0.50 mile south of NE 130th Street, north to Roosevelt Way NE, and for a short segment on Roosevelt Way NE through a small commercial area. Sharrows also occur on the collector streets that surround Haller Lake and to the west on NE 125th Street. East of I-5 there is a bicycle lane on NE 125th Street, from Roosevelt Way NE going east beyond the 1-mile radius from the station location.

NE 145th Street/I-5 Area

The NE 145th Street Station would be located in the northeast quadrant of the I-5 interchange. The city limits of Seattle and Shoreline are along the center line of NE 145th Street. The existing bicycle facility inventory is shown in Figure 4-35.

Bicycle lanes are provided on NE 155th Street from 5th Avenue NE going west beyond the 1-mile radius from the station location. There is also a segment of bicycle lane on 15th Avenue NE from approximately NE 150th Street going north beyond the 1-mile radius.

NE 155th Street/I-5 Area

The NE 155th Street Station would be located over NE 155th Street along the east side of I-5. The existing bicycle facility inventory is shown in Figure 4-36. There are bicycle lanes on NE 155th Street from 5th Avenue NE to the west beyond the 1-mile radius from the station. There are also bicycle lanes on 15th Avenue NE, a north-south arterial approximately 1 mile from the station. These bicycle lanes begin at approximately NE 150th Street and extend northward.

NE 185th Street/I-5 Area

The NE 185th Street Station would be located in the northeast quadrant of the I-5 interchange in Shoreline. The existing bicycle facility inventory is shown in Figure 4-37. Bicycle lanes are provided on NE 185th Street from 1st Avenue NE to the west. There are sharrows on 10th Avenue E from NE 175th Street to NE 190th Street . North of NE 190th Street, 10th Avenue NE becomes NE Perkins Way whichs has has a striped paved shoulder/walkway on the north side. The roadway is steep and winding, with concrete barriers along curves to protect pedestrians.

At NE 195th Street, there is a bridge over I-5 for pedestrians and bicycles. Farther to the west, a paved multi-use trail exists along NE 195th Street between 1st Avenue NE and Meridian Avenue North. No vehicle access is available along this segment of street right-of-way.

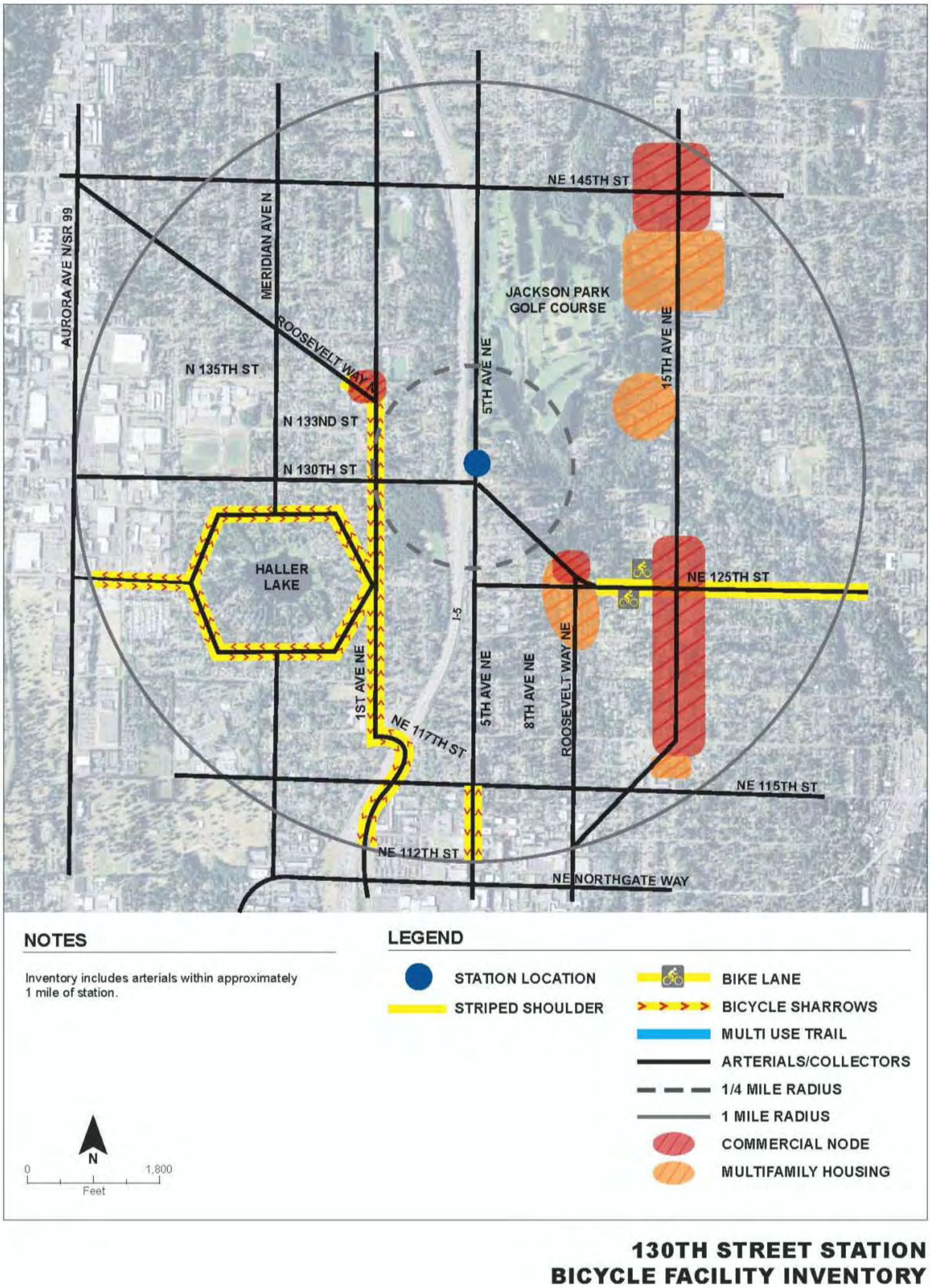


Figure 4-34. NE 130th Street Station Bicycle Facility Inventory

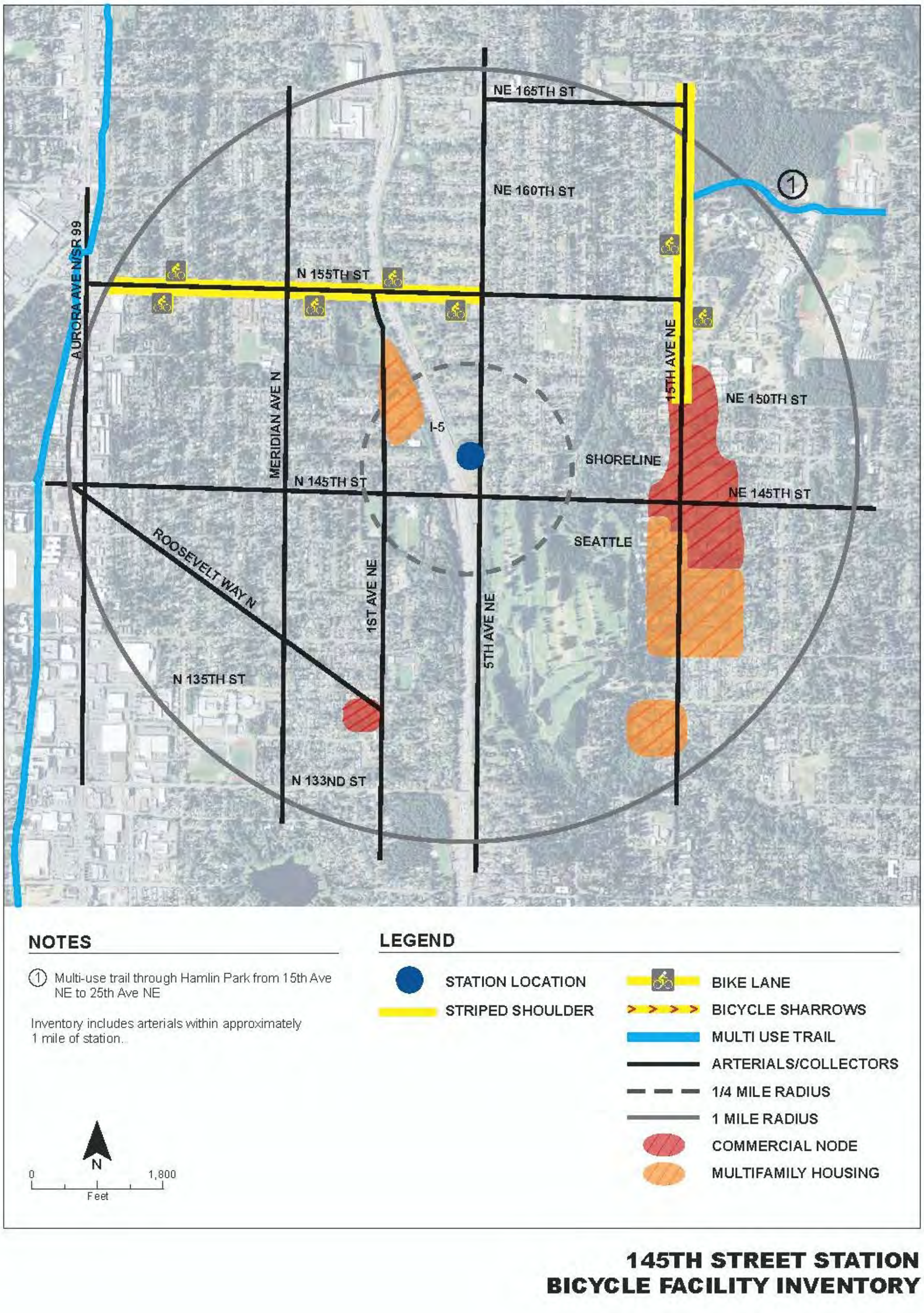


Figure 4-35. NE 145th Street Station Bicycle Facility Inventory

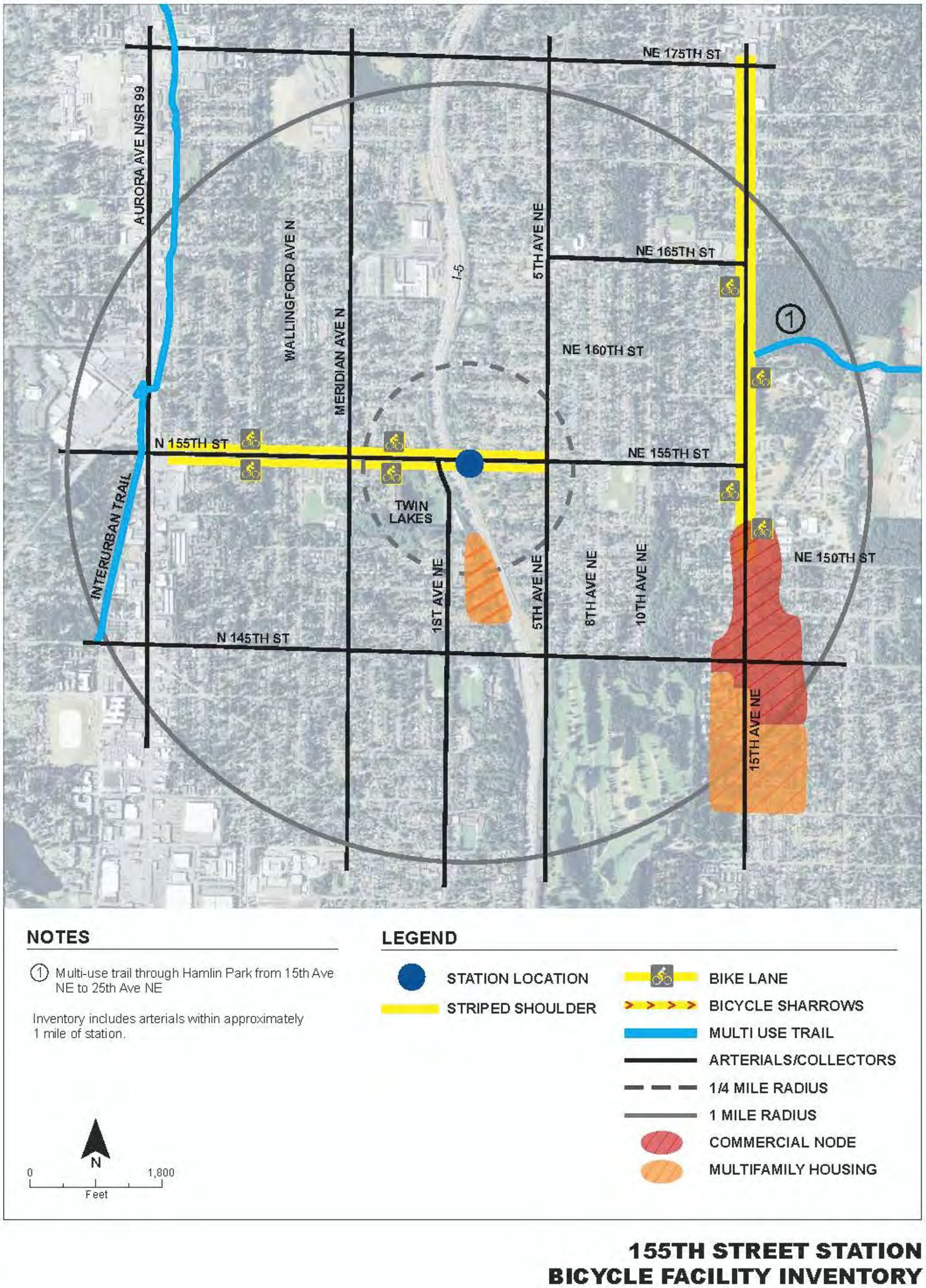


Figure 4-36. NE 155th Street Station Bicycle Facility Inventory

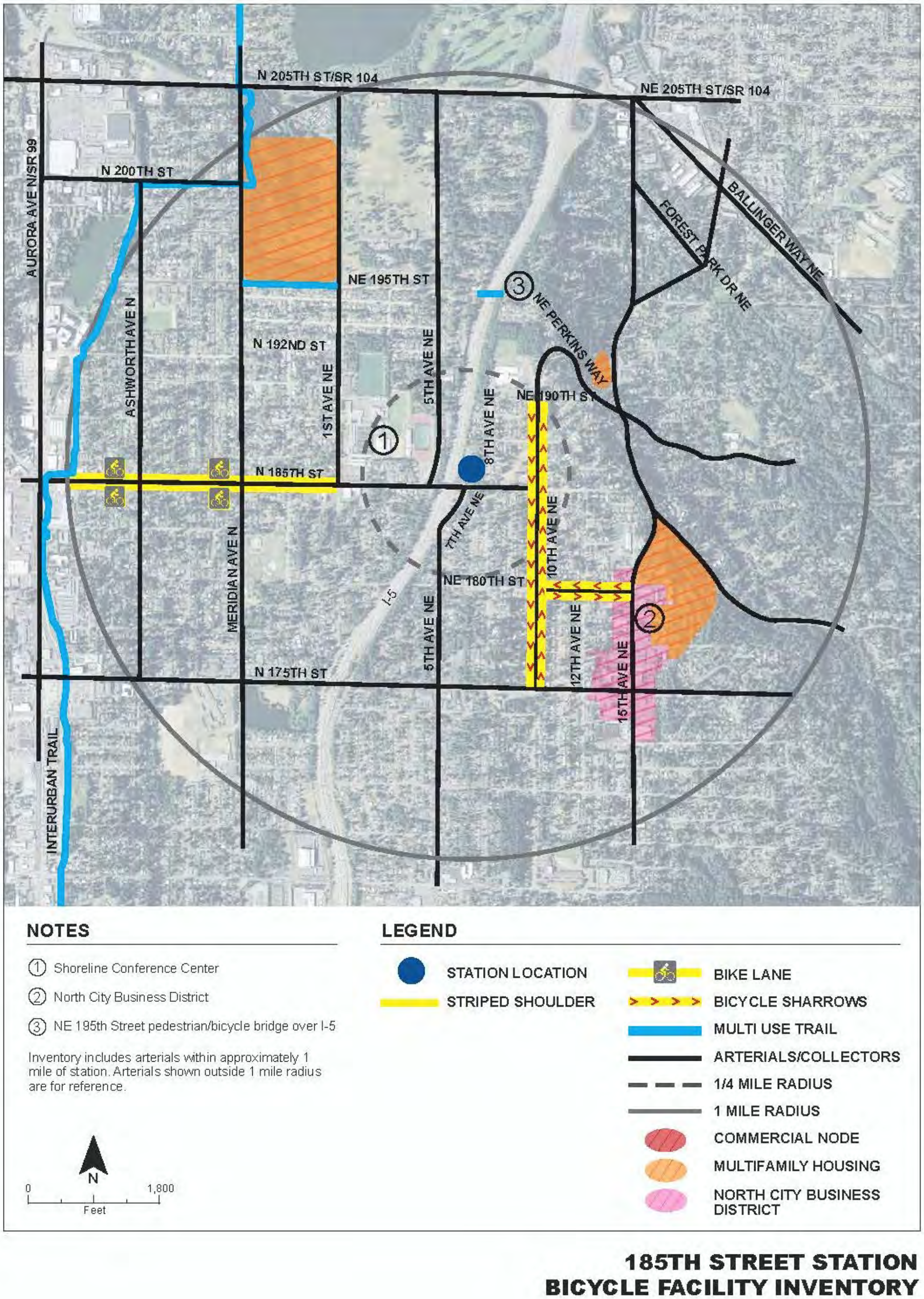


Figure 4-37. NE 185th Street Station Bicycle Facility Inventory

Segment B: Shoreline to Mountlake Terrace

A pedestrian and bicycle overcrossing of I-5 is located at NE 195th Street, north of the NE 185th Street Station and south of the Mountlake Terrace Transit Center.

The Interurban Trail is approximately 1 mile west of the Mountlake Terrace Transit Center. The Interurban Trail is a regional facility and connects Lynnwood with Mountlake Terrace within the proposed light rail corridor.

The bicycle facilities within 1 mile of the Mountlake Terrace Transit Center Station are presented in Figure 4-38. The bicycle environment at this station is summarized below.

Mountlake Terrace Transit Center Area

A bicycle lane is available on both sides of 230th Street SW north of the Mountlake Terrace Transit Center. The lane extends from 56th Avenue West to I-5. The arterial extends across I-5 but without the bicycle lanes. On the south side, the eastbound bicycle lane begins immediately after the arterial overcrossing and provides space for bicycles to climb the eastbound uphill grade.

The Interurban Trail crosses 228th Street SW, at a little more than 1 mile from the Mountlake Terrace Transit Center. Bicycle volumes on the trail at this location during one PM peak hour were approximately nine northbound and four southbound. During the AM peak hour there were four northbound and two southbound (PSRC 2010).

A multi-use pedestrian/bicycle facility is under design along the north side of 236th Street and Lakeview Drive, from the west side of the freeway interchange to the Interurban Trail.

220th Street SW/I-5 Area

Bicycle facilities are not available on arterials in the 220th Street SW area (Figure 4-39). The Interurban Trail is near the 220th Street SW Station (0.50 mile) and connects to the Lynnwood Transit Center to the north.

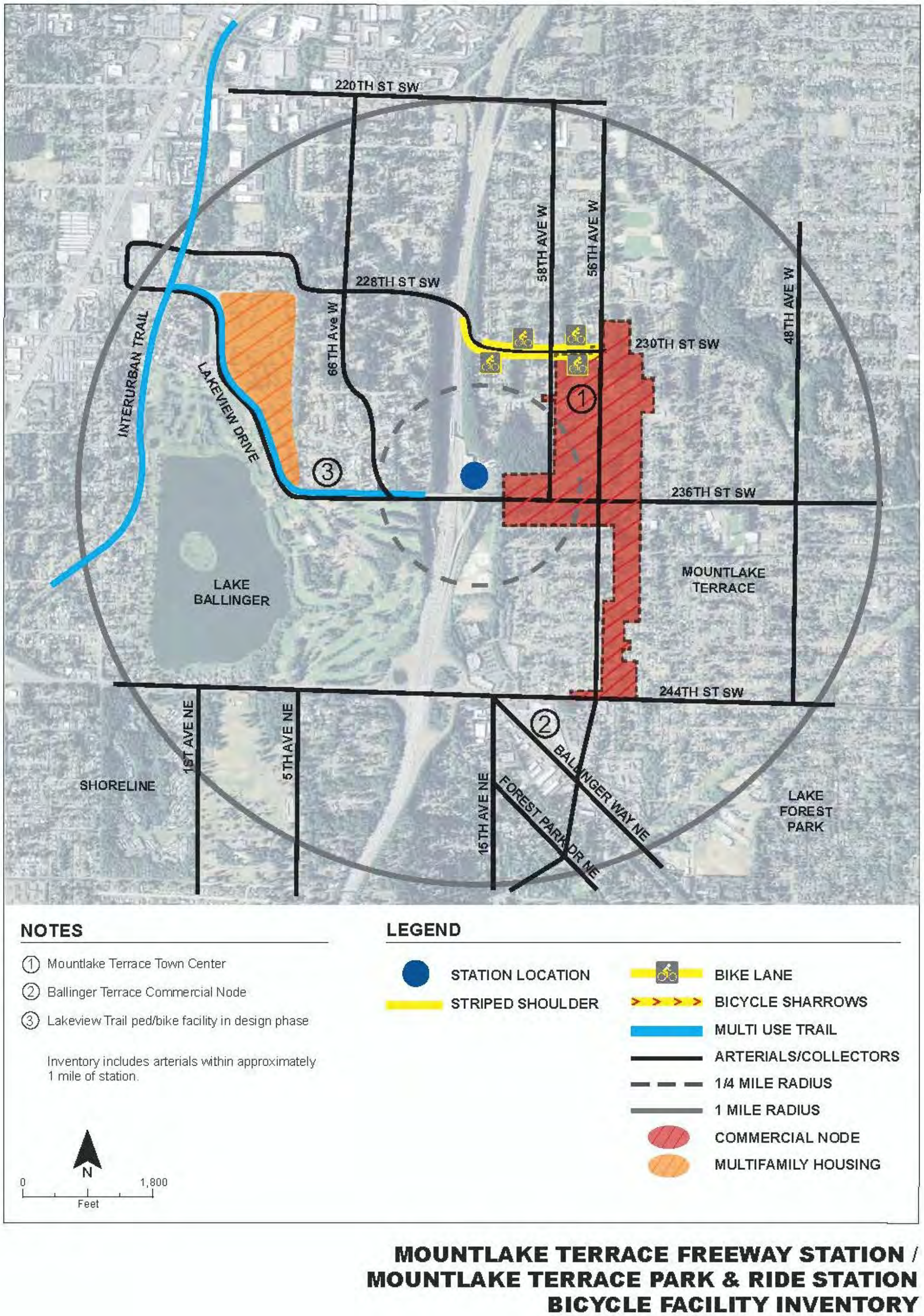


Figure 4-38. Mountlake Terrace Transit Center Station Bicycle Facility Inventory

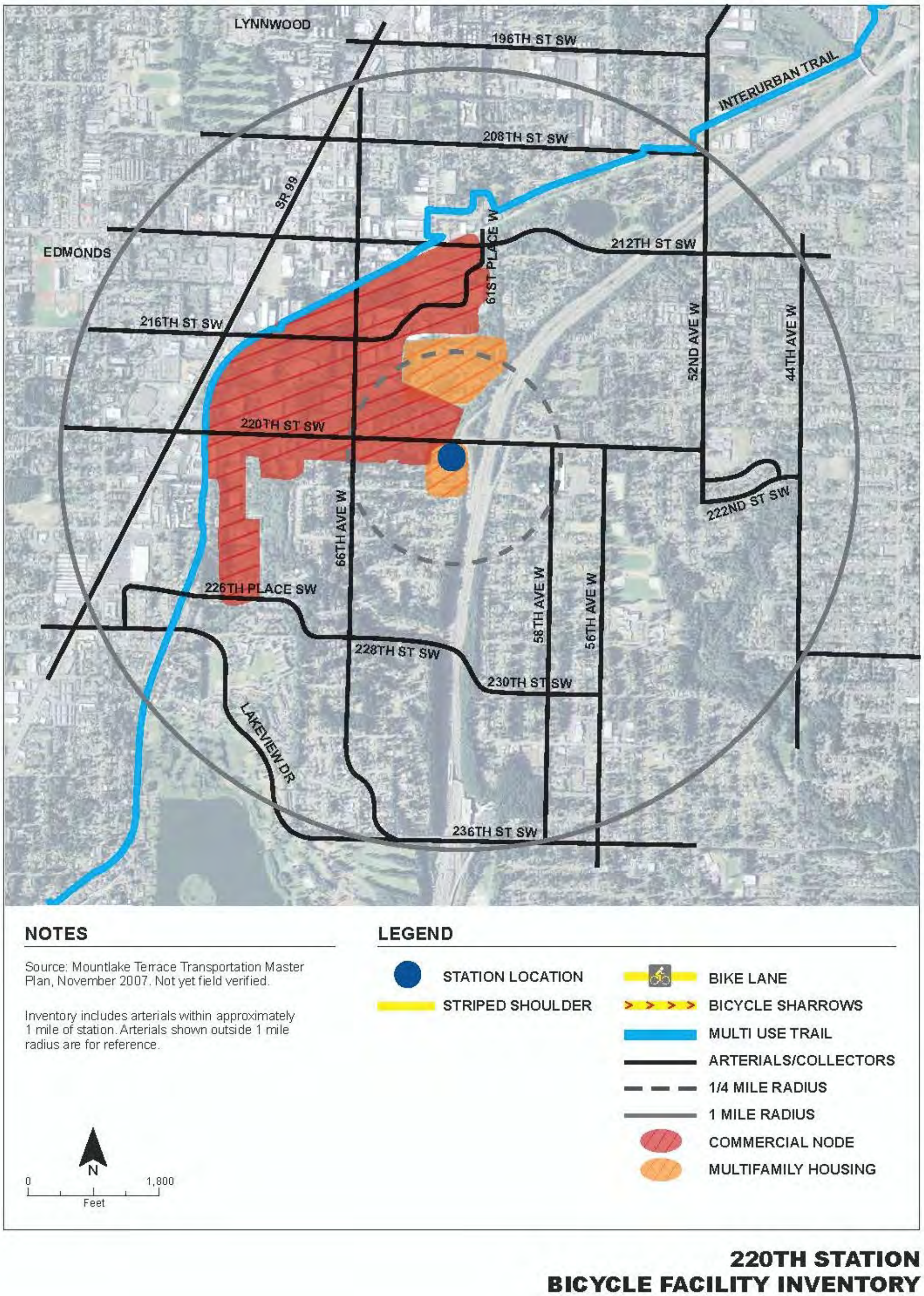


Figure 4-39. 220th Street SW Station Bicycle Facility Inventory

Segment C: Mountlake Terrace to Lynnwood

Bicycle lanes are on 52nd Avenue West and Cedar Valley Road from 208th Street SW, in the vicinity of the Interurban Trail, north to 200th Street SW (Figure 4-40). A shared-lane bicycle facility also is on 200th Street SW from 50th Avenue West, through the 1-mile inventory area.

The Interurban Trail extends through the station areas. It is an on-street facility adjacent to 52nd Avenue West between 208th Street SW and the power line segments. To the north, the trail follows the Snohomish County PUD power line right-of-way, then crosses over 44th Avenue West on a pedestrian/bicycle bridge, and continues on the west side of I-5.

Bicycle volumes on the Interurban Trail were available north and south of the Lynnwood Transit Center. During one hour of the PM peak period, there were 18 bicycles on the trail at 37th Avenue West and Alderwood Mall Boulevard. On 208th Street SW, east of 52nd Avenue West where the Interurban Trail is on-street for a short segment, there were five bicycles on the trail during one PM peak hour (PSRC 2010).

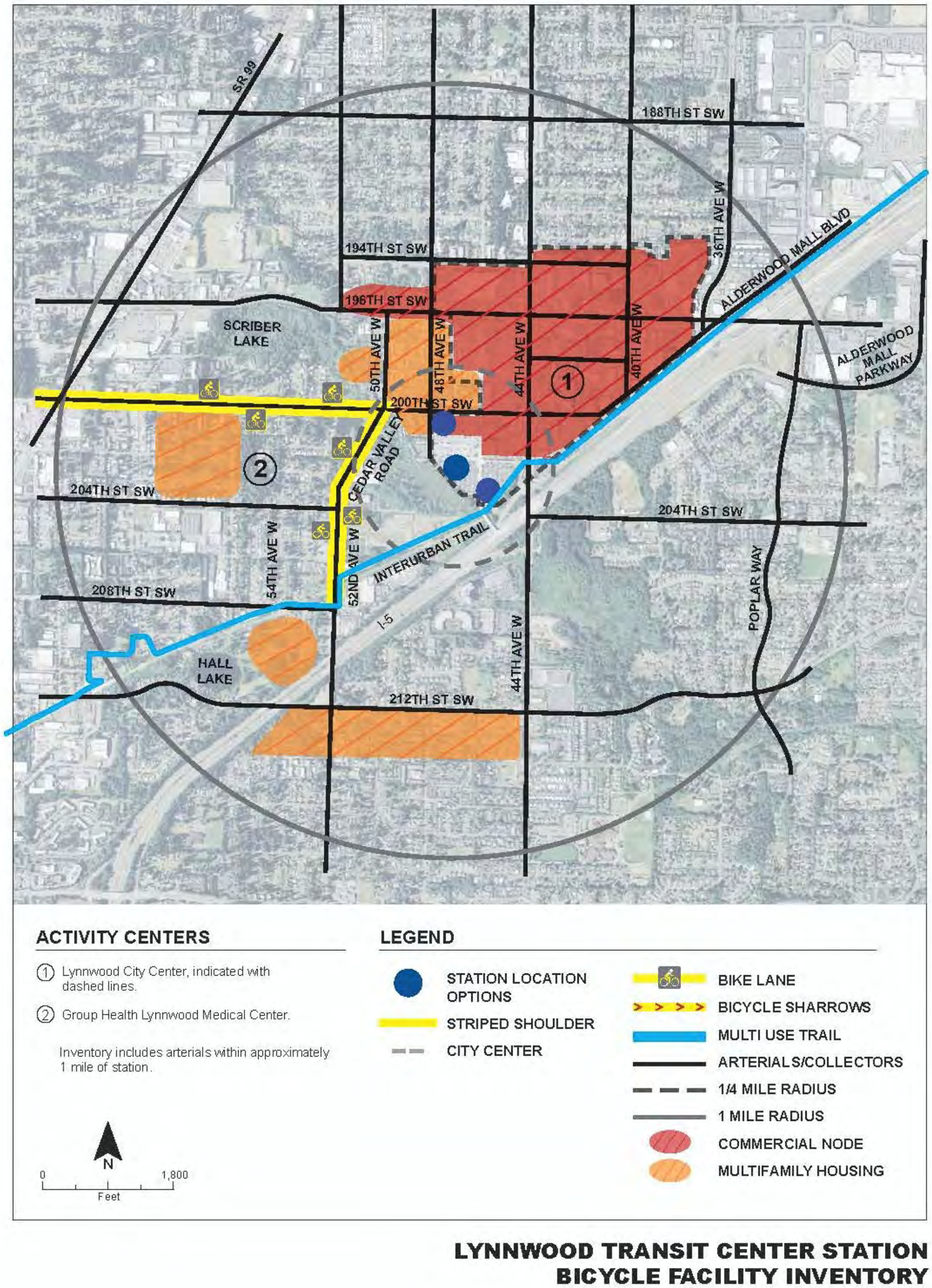


Figure 4-40. Lynnwood Transit Center Station Bicycle Facility Inventory

4.6 Freight Mobility and Access

Freeways, arterials, and local roadways throughout the project vicinity are vital to the movement of freight and goods between major transportation hubs, such as the Port of Seattle and Sea-Tac Airport, and other business and customer destinations. Within the Lynnwood Link Extension study area, only roadways are used for freight transportation. West of the study area, the Burlington Northern Santa Fe (BNSF) Railroad owns and operates a dual-track mainline, which connects Portland, Oregon, to Everett, Washington, and carries greater than 5 million tons of goods per year. Also located west of the Lynnwood Link Extension study area, Puget Sound is classified as a freight waterway, carrying more than 25 million tons of goods a year.

- Only roadways are used for freight transportation within the Lynnwood Link study area, though the BNSF Railroad mainline and Puget Sound waterway, both located west of the study area, also provide mobility for freight and goods outside of the Lynnwood Link study area.
- I-5 is the principal freight route through the Puget Sound region and is located within the Lynnwood Link Extension study area. In addition, many arterial streets throughout the corridor are also identified as truck routes

4.6.1 Key Freight Roadways

The Washington State Freight and Goods Transportation System (FGTS) is used to classify highways, county roads, and city streets according to the average annual gross truck tonnage they carry. Truck tonnage values are derived from actual or estimated truck traffic count data that are converted into average weights by truck type. Classifications range from T-1, which includes roadways that carry over 10 million tons per year, to T-5, which includes roadways that carry over 20,000 tons in 60 days. Table 4-21 summarizes the classifications and the corresponding tonnage.

Table 4-21. Freight and Goods Transportation System Classifications

FGTS Classification	Annual Gross Tonnage
T-1	More than 10 million tons
T-2	4 to 10 million tons
T-3	300,000 to 4 million tons
T-4	100,000 to 300,000 tons
T-5	At least 20,000 tons in 60 days and less than 100,000 tons per year

Source: Washington State Freight and Goods Transportation System 2011 Update, March 2012.

The principal freight route (classified as T-1) through the Puget Sound region is I-5, which is located within the study area. About 186,000 vehicles travel on the I-5 mainline every day. Of this number, about 11,000 are trucks, or 6 percent of the total vehicles.

The following sections describe the specific freight roadways and corresponding classifications for each segment of the project corridor.

Segment A: Seattle to Shoreline

In addition to routes identified by WSDOT as part of the FGTS, truck routes in Segment A include arterial streets identified as major truck streets within Seattle and truck routes in Shoreline.

Figure 4-41 shows the location of existing FGTS-classified freight routes in Segment A, in addition to truck routes identified by the Cities of Seattle and Shoreline.

Key roadways classified as T-1 in Segment A are:

- I-5
- NE Northgate Way from I-5 to Lake City Way NE (SR 522)

Key roadways classified as T-2 are:

- North Northgate Way west of I-5
- NE 175th Street
- NE 185th Street
- Greenwood Avenue North
- Lake City Way NE (SR 522)

Key roadways classified as T-3 are:

- NE 125th Street
- North 130th Street
- North 145th Street
- North 155th Street
- NE 175th Street/5th Avenue NE
- Lake City Way NE/SR 522
- Aurora Avenue North (SR 99)
- Meridian Avenue North
- 15th Avenue NE
- 25th Avenue NE

Key study area roadways classified as T-4 are:

- 5th Avenue North
- NE 175th Street
- Roosevelt Way NE

No other roadways in Segment A are designated as freight or truck routes by the City of Seattle or the City of Shoreline in addition to the routes identified by the FGTS.

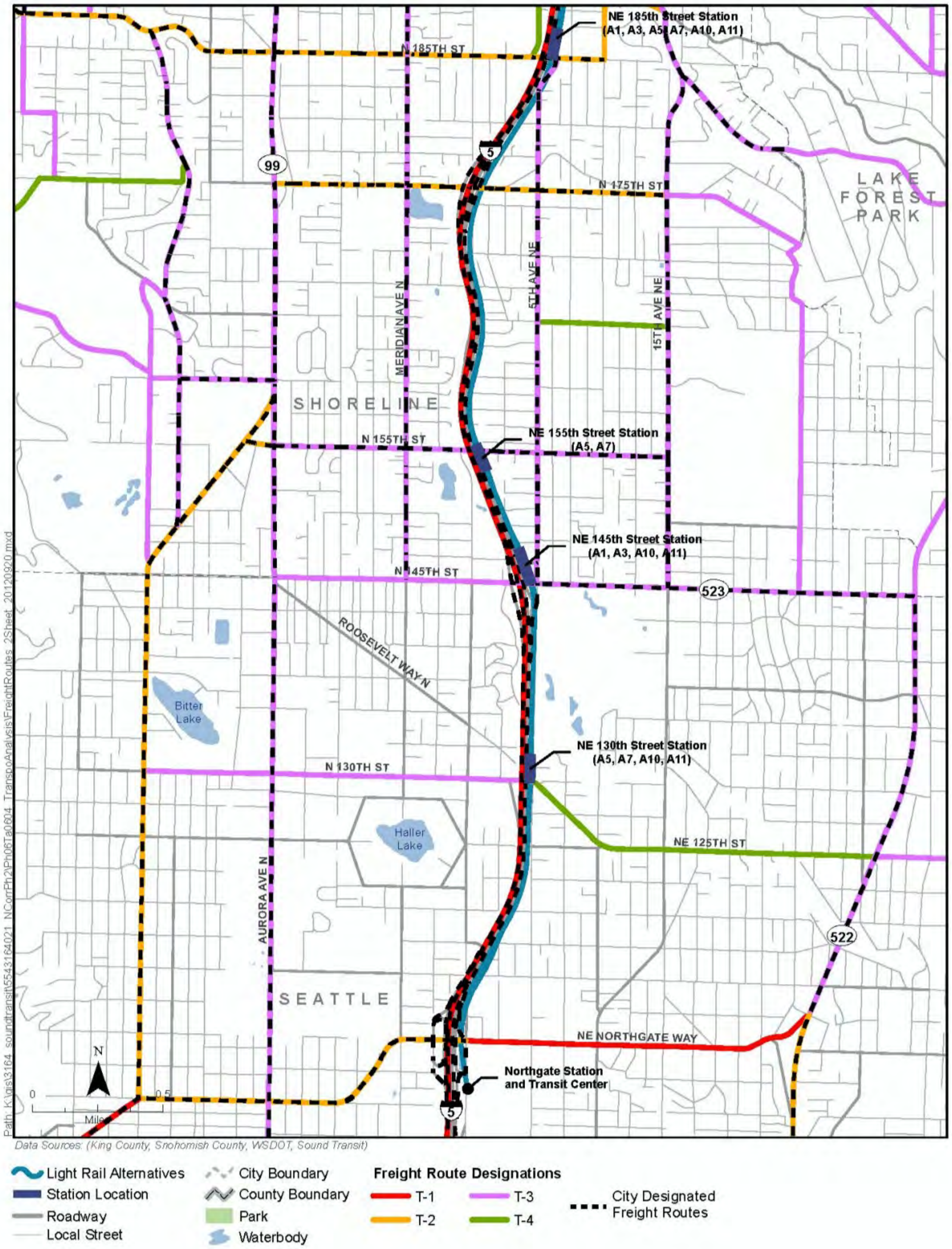


Figure 4-41. FGTS and City Freight Route Classifications in Segment A

Segment B: Shoreline to Mountlake Terrace

In addition to routes identified by the FGTS, truck routes in Segment B include arterial streets identified as truck routes in Shoreline and truck routes in Mountlake Terrace. Existing freight routes in Segment B, identified by the FGTS and the Cities of Shoreline and Mountlake Terrace, are shown in Figure 4-42.

As shown in Figure 4-42, I-5 is the only roadway classified as T-1 in Segment B. Key roadways classified as T-2 are:

- 220th Street SW
- 66th Avenue West

Key roadways classified as T-3 are:

- Ballinger Way NE (SR 104)
- NE 205th Street
- 244th Street SW
- 236th Street SW
- 212th Street SW
- Aurora Avenue North/Pacific Highway (SR 99)
- Meridian Avenue North
- 15th Avenue NE
- 19th Avenue North/56th Avenue West
- 52nd Avenue West

No additional roadways are designated as freight or truck routes by the City of Shoreline or the City of Mountlake Terrace in addition to those identified by the FGTS.

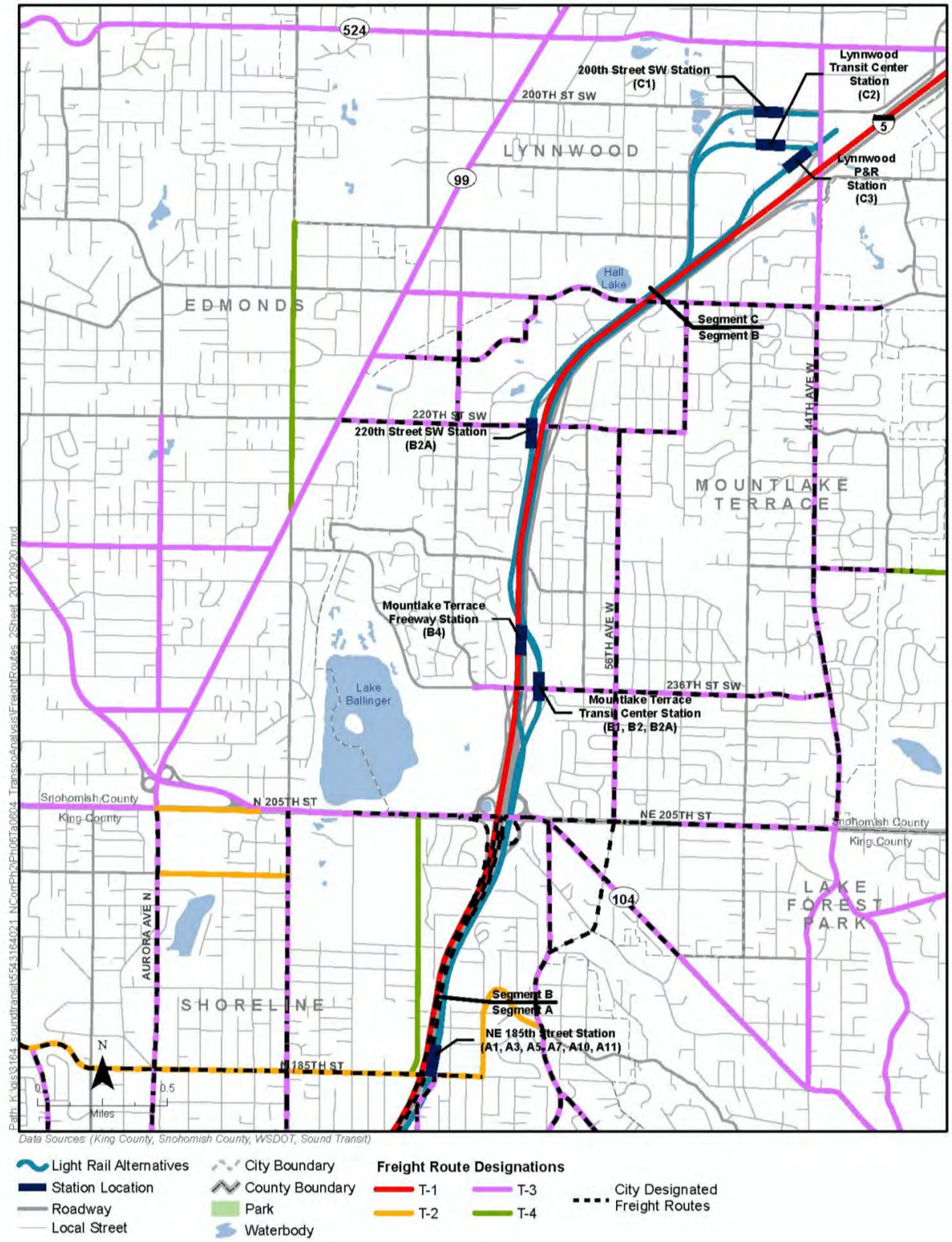


Figure 4-42. FGTS Classifications in Segments B and C

Segment C: Mountlake Terrace to Lynnwood

Freight routes in Segment C are identified by the FGTS. FGTS-classified freight routes within Lynnwood are shown in Figure 4-42. I-5 is the only roadway in Segment C designated as a T-1 route. Key roadways designated as T-3 routes are:

- 212th Street SW
- 196th Street SW (SR 524)
- 44th Avenue West

No additional roadways are designated as freight or truck routes by the City of Lynnwood.

4.7 Parking

Parking surveys were conducted to inventory the supply, parking restrictions, and midday use of on- and off-street parking, including both private parking lots and park-and-ride lots. The survey was conducted within 0.25 mile of the proposed station locations. Between stations, the parking survey was conducted within the footprint of the light rail alignments. Overall key observations and findings include the following:

- Existing parking utilization in the NE 130th Street/I-5 area is approximately 14 percent for both on-street and off-street parking, including the South Jackson Park Park-and-Ride lot, which is 24 percent utilized.
- Existing parking utilization in the NE 145th Street/I-5 area is approximately 27 percent for on-street and 71 percent for off-street parking, including the North Jackson Park Park-and-Ride lot, which is 94 percent utilized.
- Existing parking utilization in the NE 155th Street/I-5 area is approximately 17 percent for on-street and 25 percent for off-street parking.
- Existing parking utilization in the NE 185th Street/I-5 area is approximately 11 percent for on-street and 43 percent for off-street parking.
- Existing parking utilization in the Mountlake Terrace Transit Center and freeway station area is approximately 8 to 16 percent for on-street and 88 percent for off-street parking, including the Mountlake Terrace Park-and-Ride garage and surface lot, which is 93 percent utilized.
- Existing parking utilization in the 220th Street SW/I-5 area is approximately 11 percent for on-street and 52 percent for off-street parking.
- Existing parking utilization in the Lynnwood Transit Center area is approximately 44 to 100 percent for on-street and 57 to 68 percent for off-street parking, including the Lynnwood Park-and-Ride lot, which is 100 percent utilized.

4.7.1 Segment A: Seattle to Shoreline

Table 4-22 summarizes the results of the survey within Segment A along the light rail alignment, which consists of NE 113th Street to NE 185th Street along the east side of I-5.

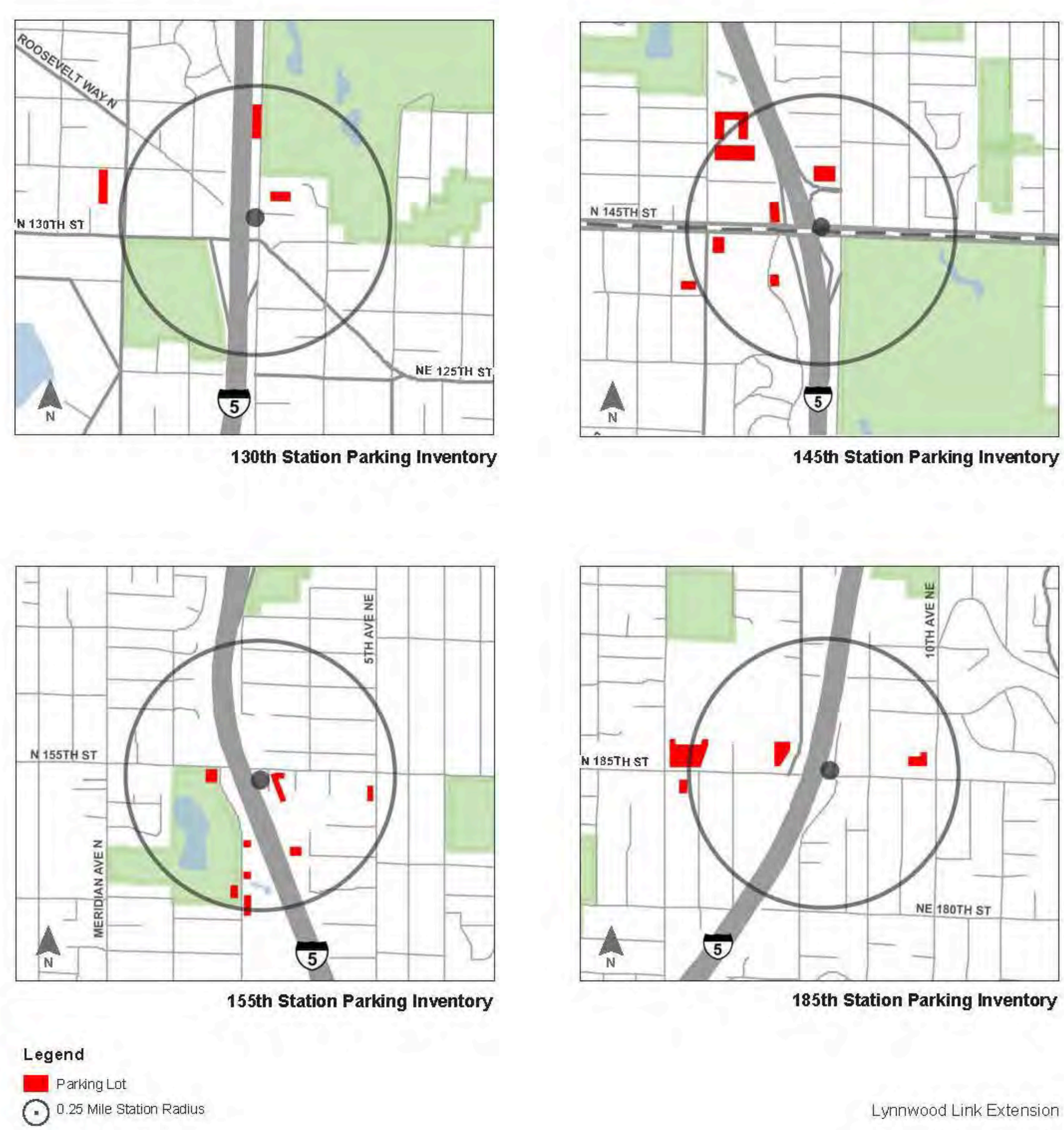


Figure 4-43 Area Inventoried for Parking in Segment A

Table 4-22. Parking Supply and Utilization for Segment A

Parking Type	Parking Supply			Midday Utilization	
	No Restrictions	Time-Restricted	Total	Parked Cars	Percent Utilization
On-Street[a]	130	0	130	12	9%
Off-Street[a]	19	0	19	12	63%

[a] Data were collected mid-week in May 2012. Utilization was counted between 9 am and 11 am and between 1 pm and 4 pm.

Within the survey area, on-street parking is available on a few streets that are within the proposed light rail alignment for a total of 130 spaces. The majority of the on-street parking spaces along the alignment are on 1st Avenue NE between NE 157th Street and 161st Street, and between NE 170th Street and NE 174th Street. As shown above in Table 4-22, the on-street parking utilization is 9 percent in this area based on field observations.

One off-street parking lot is available within the rail alignment and is located just north of NE 117th Street and east of I-5. This parking lot was 63 percent utilized.

NE 130th Street/I-5 Area

Table 4-23 summarizes the results of the parking survey within 0.25 mile of the proposed NE 130th Street Station. The parking survey area extends from approximately NE 125th Street to NE 135th Street and from 1st Avenue NE to 10th Avenue NE.

Table 4-23. Parking Supply and Utilization for NE 130th Street/I-5 Area

	Parking Supply			Midday Utilization	
Parking Type	No Restrictions	Time-Restricted	Total	Parked Cars	Percent Utilization
On-Street[a]	400	30	430	60	14%
Off-Street[a*]	290[b]	0	290	40[c]	14%

[a] Data were collected mid-week in May 2012. Utilization was counted between 9 am and 11 am and between 1 pm and 4 pm.
[b] Includes existing park-and-ride lot with 46 spaces.
[c] Park-and-ride utilization source: King County Metro Transit Park and Ride Utilization Report, Second Quarter 2012.

The study area is mostly residential with single-family homes. A large park, North Acres Park, is located to the southwest and Jackson Park Golf Course is located to the northeast.

The majority of the residential streets in this area has on-street parking, with a total of 400 unrestricted parking spaces. No parking is allowed on NE 130th Street, Roosevelt Way North, and portions of 5th Avenue NE. In addition, 5th Avenue NE and 127th Avenue NE have time-restricted parking. On 5th Avenue NE, approximately 5 spaces are allocated for buses only from 5 am to 9 am, and an additional 18 spaces are provided for 4-hour parking from 7 am to 6 pm. There are nine spaces on the north side of 127th Avenue NE with 4-hour parking from 7 am to 6 pm. As shown above in Table 4-23, the on-street parking utilization is 14 percent in this area based on field observations.

One off-street parking lot is within the study area. The South Jackson Park Park-and-Ride, located along 5th Avenue NE approximately 0.25 mile north of NE 130th Street, was 24 percent utilized.

NE 145th Street/I-5 Area

Table 4-24 summarizes the results of the parking survey within 0.25 mile of the NE 145th Street Station area. The parking survey area for the proposed NE 145th Street Station location extends from approximately NE 140th Street to NE 150th Street and from 1st Avenue NE to 10th Avenue NE.

Table 4-24. Parking Supply and Utilization for NE 145th Street/I-5 Area

	Parking Supply			Midday Utilization	
Parking Type	No Restrictions	Time-Restricted	Total	Parked Cars	Percent Utilization
On-Street[a]	450	0	450	120	27%
Off-Street[a]	350	0	350	250	71%

[a] Data were collected mid-week in May 2012. Utilization was counted between 9 am and 11 am and between 1 pm and 4 pm.

The study area to the north of NE 145th Street is mostly residential with single-family homes. The Lakeside School is located to the southwest and the Jackson Park Golf Course to the southeast.

The majority of the residential streets in this area has on-street parking, with a total of 450 unrestricted parking spaces. No parking is allowed on NE 145th Street, 1st Avenue NE, and portions of 5th Avenue NE. As shown in Table 4-24, the on-street parking utilization was 27 percent in this inventory area.

A few off-street parking lots are available, including lots for Lakeside School, which were 100 percent utilized. The North Jackson Park-and-Ride lot, located along 5th Avenue NE just north of NE 145th Street, was 94 percent utilized.

NE 155th Street/I-5 Area

Table 4-25 summarizes the results of the parking surveys within 0.25 mile of the proposed NE 155th Street Station. The survey area extends from NE 150th Street to NE 159th Street and from Meridian Avenue North to 5th Avenue NE.

Table 4-25. Parking Supply and Utilization for NE 155th Street/I-5 Area

Parking Type	Parking Supply: No Restrictions	Parking Supply: Time-Restricted	Parking Supply: Total	Midday Utilization: Parked Cars	Midday Utilization: Percent Utilization
On-Street[a]	580	0	580	100	17%
Off-Street[a]	200	0	200	50	25%

[a.] Data were collected mid-week in May 2012. Utilization was counted between 9 am and 11 am and between 1 pm and 4 pm.

The study area is mostly residential with single-family homes, including a large park in the southwest and a couple of businesses.

The majority of the residential streets in this area has on-street parking, with a total of 580 unrestricted parking spaces. No parking is allowed on NE 155th Street, 1st Avenue NE, and portions of 5th Avenue NE. As shown in Table 4-25, the on-street parking utilization was 17 percent.

A few off-street parking lots are available with approximately 200 spaces. The off-street parking lots were 25 percent utilized. There are no existing park-and-ride lots in this area.

NE 185th Street/I-5 Area

Table 4-26 summarizes the results of the parking surveys within 0.25 mile of the proposed NE 185th Street Station. The survey area for the NE 185th Street Station location extends from North 180th Street to North 190th Street and from 2nd Avenue NE to10th Avenue NE.

Table 4-26. Parking Supply and Utilization for NE 185th Street/I-5 Area

Parking Type	Parking Supply: No Restrictions	Parking Supply: Time-Restricted	Parking Supply: Total	Midday Utilization: Parked Cars	Midday Utilization: Percent Utilization
On-Street[a]	700	0	700	80	11%
Off-Street[a]	300	0	300	130	43%

[a] Data were collected mid-week in May 2012. Utilization was counted between 9 am and 11 am and between 1 pm and 4 pm.

The study area is mostly residential with single-family homes. The Shoreline Center is located in the northwest quadrant of the study area. The majority of the residential streets in this area has on-street parking, with a total of 700 unrestricted parking spaces. No parking is allowed on portions of NE 185th Street and portions of 5th Avenue NE. As shown in Table 4-26, the on-street parking utilization was 11 percent.

Off-street parking lots at the Shoreline Center were 58 percent utilized. Utilization of all off-street parking lots was 43 percent. There are no existing park-and-ride lots in this area.

4.7.2 Segment B: Shoreline to Mountlake Terrace

On-street or off-street parking is not available along the proposed light rail alignment between NE 185th Street and Mountlake Terrace beyond the station areas.

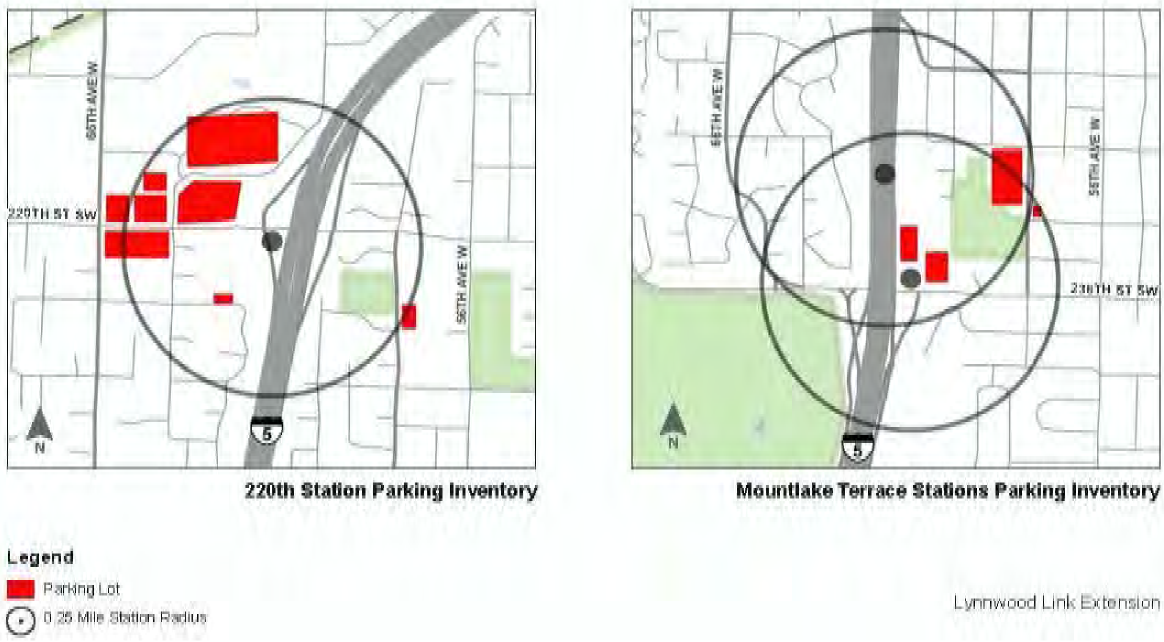


Figure 4-44 Area Inventoried for Segment B

Mountlake Terrace Transit Center Area

Tables 4-27 and 4-28 summarize the results of the parking surveys for the proposed Mountlake Terrace Transit Center Station and the Mountlake Terrace Freeway Station, respectively, within 0.25 mile of each proposed station location. The survey area for the Mountlake Terrace stations was from approximately 228th Street SW to 239th Street SW and from 66th Avenue West and 58th Avenue West. The survey area includes various uses: residential development, a golf course, the Mountlake Terrace Public Library, and the existing Mountlake Terrace Park-and-Ride.

Table 4-27. Parking Supply and Utilization for the Mountlake Terrace Transit Center Area

	Parking Supply			Midday Utilization	
Parking Type	No Restrictions	Time-Restricted	Total	Parked Cars	Percent Utilization
On-Street[a]	440	0	440	70	16%
Off-Street[a]	990[b]	0	990	870[c]	88%

[a] Data were collected mid-week in May 2012. Utilization was counted between 9 am and 11 am and between 1 pm and 4 pm.
[b] Includes existing park-and-ride with 878 spaces.
[c] Park-and-ride utilization source: Community Transit 2012 System Performance Report.

Table 4-28. Parking Supply and Utilization for the Mountlake Terrace Freeway Station Area

	Parking Supply			Midday Utilization	
	No Restrictions	Time-Restricted	Total	Parked Cars	Percent Utilization
On-Street[a]	640	0	640	50	8%
Off-Street[a]	990[b]	0	990	870[c]	88%

[a] Data were collected mid-week in May 2012. Utilization was counted between 9 am and 11 am and between 1 pm and 4 pm.
[b] Includes existing park-and-ride with 878 spaces.
[c] Park-and-ride utilization source: Community Transit 2012 System Performance Report..

On-street parking is available on the majority of the residential streets. No parking is allowed on 236th Street SW, and portions of 60th Avenue West and 64th Avenue West. As shown in Table 4-27, there were fewer on-street parking spaces within 0.25 mile of the Mountlake Terrace Transit Center and the utilization was higher at 16 percent. As shown in Table 4-28, the utilization of on-street parking within 0.25 mile of the Mountlake Terrace Freeway Station was 8 percent.

Off-street parking for the Mountlake Terrace Public Library was 49 percent utilized. The Mountlake Terrace Transit Center park-and-ride facility, which consists of 880 spaces in a garage and surface lot, was 93 percent utilized. The combined 990 parking spaces in the area were 88 percent utilized.

220th Street SW/I-5 Area

Table 4-29 summarizes the results of the parking survey within 0.25 mile of the proposed 220th Street SW Station area. The survey area for the 220th Street SW Station is approximately from 216th Street SW to 225th Place SW and from 66th Avenue West to 58th Avenue West.

Table 4-29. Parking Supply and Utilization for 220th Street SW/I-5 Area

Parking Type	Parking Supply			Midday Utilization	
	No Restrictions	Time-Restricted	Total	Parked Cars	Percent Utilization
On-Street[a]	610	0	610	70	11%
Off-Street[a]	1300	0	1300	680	52%

[a] Data were collected mid-week in May 2012. Utilization was counted between 9 am and 11 am and between 1 pm and 4 pm.

The survey area south of 220th Street SW is mostly single-family homes with a school to the west of I-5 and a shopping center to the east of 66th Avenue West. The area north of 200th Street SW is a mix of commercial and multifamily homes, including two large apartment complexes.

On-street parking is available on the majority of the residential streets. No parking is allowed on 220th Street SW. As shown in Table 4-29, the on-street parking utilization was 11 percent. The off-street parking lots were 52 percent utilized. There are no existing park-and-ride lots in this station area.

4.7.3 Segment C: Mountlake Terrace to Lynnwood

Table 4-30 summarizes the results of the parking survey within the Segment C light rail alignment, not including the station areas. The parking survey area for the light rail alignment in Segment C is from 236th Street SW to 196th Street SW along the west side of I-5 and until it reaches 52nd Avenue West, and then along the east side of 52nd Avenue West.

Figure 4-45 Areas Inventoried for Segment C

Table 4-30. Parking Supply and Utilization for Segment C

Parking Type	Parking Supply			Midday Utilization	
	No Restrictions	Time-Restricted	Total	Parked Cars	Percent Utilization
On-Street[a]	30	0	30	7	23%
Off-Street[a]	300	0	300	12	80%

[a] Data were collected mid-week in May 2012. Utilization was counted between 9 am and 11 am and between 1 pm and 4 pm.

On-street parking is available on 227th Street SW just west of I-5 and 204th Street SW east of Cedar Valley Road. The on-street parking utilization was 23 percent.

Two off-street parking lots are within the light rail alignment. One is north of 204th Street SW and east of 52nd Avenue West, and the other is north of 208th Street SW and east of 52nd Avenue West. These off-street parking lots were 80 percent utilized.

Lynnwood Transit Center Area

Table 4-31 summarizes the results of the parking survey within 0.25 mile of the proposed Lynnwood Park-and-Ride Station location.

Table 4-31. Parking Supply and Utilization for Lynnwood Park-and-Ride Station

	Parking Supply			Midday Utilization	
Parking Type	No Restrictions	Time-Restricted	Total	Parked Cars	Percent Utilization
On-Street[a]	0	0	0	0	Not applicable
Off-Street[a]	3,020[b]	0	3,020	2,050[c]	68%

[a] Data were collected mid-week in May 2012. Utilization was counted between 9 am and 11 am and between 1 pm and 4 pm.
[b] Includes existing park-and-ride with 1,370 spaces.
[c] Park-and-ride utilization source: Community Transit 2011 Annual Park and Ride License Plate Survey Strategic Planning report.

The survey area for the Lynnwood Park-and-Ride Station area extends from approximately the south side of I-5 to 200th Street SW and from 48th Avenue West to 44th Avenue West. The study area is a mix of uses: commercial, retail, multifamily homes, and the existing Lynnwood Park-and-Ride. There is no on-street parking in this area.

The Lynnwood Transit Center park-and-ride lot was 100 percent utilized. All of the off-street parking was 68 percent utilized.

Table 4-32 summarizes the results of the parking survey within 0.25 mile of the proposed Lynnwood Transit Center Station location.

Table 4-32. Parking Supply and Utilization for Lynnwood Transit Center Station

Parking Type	Parking Supply			Midday Utilization	
	No Restrictions	Time-Restricted	Total	Parked Cars	Percent Utilization
On-Street[a]	10	0	0	10	100%
Off-Street[a]	3,720[b]	0	3,720	2,410[c]	65%

[a] Data were collected in mid-week in May 2012. Utilization was counted between 9 am and 11 am and between 1 pm and 4 pm.
[b] Includes existing park-and-ride with 1,370 spaces.
[c] Park-and-ride utilization source: Community Transit 2011 Annual Park and Ride License Plate Survey Strategic Planning report.

The survey area for the proposed Lynnwood Transit Center Station extends from I-5 to 198th Street SW and from 50th Avenue West to 44th Avenue West. The study area is a mix of uses: commercial, retail, multifamily homes, and the existing Lynnwood Park-and-Ride lot.

On-street parking is only available on one block of 48th Avenue West, and all 10 parking spaces were utilized. The existing park-and-ride lot is 100 percent utilized. All of the off-street parking, including the park-and-ride, was 65 percent utilized during the survey.

Table 4-33 summarizes the results of the parking survey within 0.25 mile of the proposed 200th Street SW Station location.

Table 4-33. Parking Supply and Utilization for 200th Street SW Station

Parking Type	Parking Supply			Midday Utilization	
	No Restrictions	Time-Restricted	Total	Parked Cars	Percent Utilization
On-Street[a]	90	0	90	40	44%
Off-Street[a]	4,420[b]	0	4,420	2,510[c]	57%

[a] Data were collected mid-week in May 2012. Utilization was counted between 9 am and 11 am and between 1 pm and 4 pm.
[b] Includes existing park-and-ride with 1,370 spaces.
[c] Park-and-ride utilization source: Community Transit 2011 Annual Park and Ride License Plate Survey Strategic Planning report.

The survey area for the 200th Street SW Station is approximately from 204th Street SW to 196th Street SW and from 50th Avenue West to 44th Avenue West. The study area is a mix of uses: commercial, retail, multifamily homes, and the existing Lynnwood Park-and-Ride lot.

On-street parking is only available on one block of 48th Avenue West and one block on 50th Avenue West. The utilization was 44 percent.

The existing park-and-ride was 100 percent utilized. All of the off-street parking spaces were 57 percent utilized during the survey.

4.8 Safety

This section discusses current safety-related issues in the project corridor. Accident data for a 3-year period for the study intersections were collected from each jurisdiction and WSDOT for both highway facilities and city streets. Key observations and findings include the following:

- The City of Seattle identifies high accident locations (HALs) for future safety improvements at signalized intersections experiencing more than 10 collisions per year, and at unsignalized intersections with 5 collisions per year. For other jurisdictions, locations where the accident rate is at or exceeds 1.0 accident per million entering vehicles were identified.
- In Segment A, 11 HALs were identified near the I-5/NE 130th Street and I-5/NE 145th Street interchanges, at intersections along NE 145th Street, and at locations on Aurora Avenue North.
- In Segment B, three intersections located near the 220th Street SW Station vicinity currently meet HAL criteria.
- In Segment C, five intersections near the Lynnwood Transit Center currently meet HAL criteria.

4.8.1 I-5 Ramps and Ramp Terminals

Accident data were provided by WSDOT for I-5 ramps within the corridor study area.

Table 4-34 presents a summary of the accident data collected for the I-5 ramps extending from the Northgate interchange to the SR 524 interchange at 196th Street SW in Lynnwood. Table 4-34 identifies each study area segment and station areas.

Table 4-34. I-5 Ramp Accident Data

Jurisdiction/Intersection	ADT	2008–2011 Accident Average			Yearly Accident Average
		PDO	INJ	FAT	
Segment A					
Northgate - NB off-ramp to 1st Avenue NE at NE 107th Street	29,380	4.27	1.87	0	6.13
Northgate - ramp at reversible express lanes at NE 103rd Street	20,850	4.27	2.93	0	7.20
Northgate - NB on-ramp (from NE 107th Street and north of Northgate Way)	13,180	4.80	0.80	0	5.60
Northgate - SB collector-distributor off-ramp	6,320	5.60	2.40	0	8.00
Northgate - SB off-ramp to Northgate Way	8,180	5.07	3.73	0	8.80
Northgate - SB on-ramp	6,620	2.13	0.53	0	2.67
Northgate Way at SB off-ramp	-	3.73	3.20	0	6.93
Northgate Way at 1st Avenue NE	-	5.87	4.00	0	9.87
Northgate Way between ramps	-	3.20	1.87	0	5.07
Northgate - reversible lanes	16,940	11.73	5.60	0	17.33
Northgate - SB entrance to reversible express lanes	-	2.13	1.87	0	4.00
NE 130th Street- NB off-ramp to 5th Avenue NE	-	3.20	2.93	0	6.13
NE 130th Street - SB on-ramp at NE 130th Street	8,090	0.80	0.27	0	1.07
NE 130th Street between ramps	-	2.40	1.87	0	4.27
NE 130th - SB on-ramp from NE 130th Street	-	1.87	0.53	0	2.40
NE 145th Street - NB off-ramp to 5th Avenue NE	-	3.47	1.60	0	5.07
NE 145th Street - NB on-ramp from 5th Avenue NE, north of NE 145th Street	10,060	4.00	2.67	0	6.67
NE 145th Street - SB off-ramp to NE 145th Street	11,670	3.47	1.87	0	5.33
NE 145th Street - SB on-ramp from NE 145th Street	11,450	1.07	0.80	0	1.87
King County Metro Base - NB off-ramp	880	0.53	0.27	0	0.80
King County Metro Base - SB off-ramp	560	0.27	0.53	0	0.80
NE 175th Street - NB off-ramp	-	1.60	2.40	0	4.00
NE 175th Street - NB on-ramp	8,530	0.80	0.80	0	1.60
NE 175th Street at SB ramps	-	2.93	1.07	0	4.00
NE 175th Street at NB ramps	-	2.40	1.87	0	4.27
NE 175th Street - SB off-ramp	6,980	1.60	0.00	0	1.60
NE 175th Street - SB on-ramp	9,860	4.53	3.47	0	8.00

Table 4-34. I-5 Ramp Accident Data

Jurisdiction/Intersection	ADT	2008–2011 Accident Average PDO	INJ	FAT	Yearly Accident Average
Segment B					
SR 104 - NB collector-distributor SR 104 to 236th Street SW	5,430	6.93	3.73	0	10.67
SR 104 - SB off-ramp to SR 104	13,610	1.33	0.53	0	1.87
236th Street SW - NB off-ramp	4,890	0.80	0.00	0	0.80
236th Street SW - SB on-ramp	-	0.00	0.27	0	0.27
236th Street SW at SB ramp	-	0.53	0.00	0	0.53
Mountlake Terrace Freeway Station - NB off-ramp	-	0.80	0.00	0	0.80
Mountlake Terrace Freeway Station - NB on-ramp	-	2.13	0.00	0	2.13
220th Street SW - NB off-ramp	-	1.87	0.00	0	1.87
220th Street SW - NB on-ramp	-	2.93	2.13	0	5.07
220th Street SW at SB ramp	-	4.53	1.33	0	5.87
220th Street SW between ramps	-	0.53	0.00	0	0.53
220th Street SW at NB ramp	-	6.40	1.07	0	7.47
220th Street SW - SB off-ramp	10,800	5.33	2.13	0	7.47
220th Street SW - SB on- ramp	9,650	1.07	0.27	0	1.33
Segment C					
Lynnwood Transit Center Direct Access - Ramp	-	6.40	4.00	0	10.40
Lynnwood Transit Center Direct Access - SB off-ramp	1,170	0.27	0.27	0	0.53
Lynnwood Transit Center Direct Access - SB on-ramp	1,390	1.87	0.53	0	2.40
44th Avenue West - NB off-ramp	12,850	1.33	0.53	0	1.87
Poplar Way - NB off-ramp	7,660	1.07	1.33	0	2.40
Poplar Way - NB on-ramp	17,150	2.93	0.80	0	3.73
196th Street SW - SB on-ramp	9,310	12.00	5.60	0	17.60
196th Street SW - NB on-ramp	5,640	1.60	0.27	0	1.87

NB = northbound; SB = southbound; ADT = average daily traffic (entering only); FAT = fatality; INJ = injury; PDO = property damage only

4.8.2 Local Intersections

Accident rates were calculated for the study intersections as the number of accidents per million entering vehicles (acc/MEV). Tables 4-35 through 4-38 show the intersection locations for each station area under consideration, indicating intersection traffic volumes, accident averages, and accident rates for the intersections.

The City of Seattle uses a system in which an HAL is identified for future safety improvements. In evaluating the accident rates, a signalized intersection is considered an HAL with more than 10 collisions per year, on average, and an unsignalized intersection is considered an HAL with 5 collisions per year, on average.

Where the accident rate is at or exceeds 1.0 acc/MEV, the intersection is considered an HAL.

Segment A: Seattle to Shoreline

Accident data and rates for Seattle and Shoreline intersections are presented in Tables 4-35 and 4-36, respectively. Any intersections that are identified as HAL, either along the guideway or near the proposed light rail stations, are discussed below.

Table 4-35. Segment A, City of Seattle Intersection Accident Data

Jurisdiction/Intersection	ADT	2008–2011 Accident Average			Yearly Accident Average	Accident Rate (acc/MEV)
		PDO	INJ	FAT		
North Northgate Way at 1st Avenue NE	43,750	5.87	4.00	0	9.87	0.62
NE 103rd Street at 1st Avenue NE at I-5 express lanes on-ramp and off-ramp	20,850	4.27	2.93	0	7.20	0.95
North 117th Street at 1st Avenue NE	6,530	0.27	0.27	0	0.53	0.22
NE 125th Street at 15th Avenue NE	31,140	2.67	1.07	0	3.73	0.33
NE 127th Street at 8th Avenue NE/Roosevelt Way NE	15,650	0.53	0.27	0	0.80	0.14
Roosevelt Way NE at 10th Avenue NE	16,640	0.27	0.00	0	0.27	0.04
NE 125th Street at 5th Avenue NE	8,940	0.27	0.27	0	0.53	0.16
NE 127th Street at 5th Avenue NE	7,360	0.27	0.00	0	0.27	0.10
I-5 northbound off-ramp at 5th Avenue NE [a]	12,710	3.20	2.93	0	6.13	1.32
NE 130th Street at 5th Avenue NE/Roosevelt Way NE	26,110	0.27	0.00	0	0.27	0.03
NE 130th Street at I-5 southbound on-ramp [a]	20,610	0.80	0.27	0	1.07	0.14
NE 130th Street at 3rd Avenue NE	20,610	0.80	0.00	0	0.80	0.11
NE 130th Street at 1st Avenue NE	24,180	1.33	1.87	0	3.20	0.36
North 130th Street at Corliss Avenue North	15,910	0.00	0.27	0	0.27	0.05
North 130th Street at Meridian Avenue North	18,870	1.60	4.00	0	5.60	0.81
North 130th Street at Aurora Avenue North	41,980	8.53	5.07	0	13.60	0.89
North 145th Street at Aurora Avenue North	42,450	9.60	6.93	0	16.53	1.07
North 145th Street at Meridian Avenue North	23,580	6.13	5.87	0	12.00	1.39
North 145th Street at Corliss Avenue North	19,150	0.53	0.27	0	0.80	0.11
NE 145th Street at 1st Avenue NE	25,190	3.73	1.33	0	5.07	0.55
NE 145th Street at 3rd Avenue NE	22,430	1.33	0.00	0	1.33	0.16
NE 145th Street at 4th Avenue NE	22,520	0.00	0.27	0	0.27	0.03
NE 145th Street at I-5 southbound ramps	29,110	5.33	2.93	0	8.27	0.78
NE 145th Street at 5th Avenue NE	37,000	11.73	4.27	0	16.00	1.18
5th Avenue NE at I-5 northbound off-ramp [a]	13,740	3.47	1.60	0	5.07	1.01
5th Avenue NE at I-5 northbound transit-only off-ramp/Northbound on-ramp	13,310	4.00	2.67	0	6.67	1.37
5th Avenue NE at North Jackson Park-and-Ride driveway	7,160	0.53	0.00	0	0.53	0.20

Table 4-35. Segment A, City of Seattle Intersection Accident Data

Jurisdiction/Intersection	ADT	2008–2011 Accident Average			Yearly Accident Average	Accident Rate (acc/MEV)
		PDO	INJ	FAT		
NE 145th Street at 6th Avenue NE	24,080	0.27	0.27	0	0.53	0.06
NE 145th Street at 8th Avenue NE	24,570	1.60	0.53	0	2.13	0.24
NE 145th Street at 12th Avenue NE	23,880	0.80	1.07	0	1.87	0.21
NE 145th Street at 15th Avenue NE	36,450	5.87	5.60	0.27	12.00	0.90
NE 145th Street at Bothell Way NE	43,920	7.20	4.80	0	12.00	0.75

[a] Indicates same data for ramp intersection and local intersection.

acc/MEV = accidents per million entering vehicles; ADT = average daily traffic (entering only); FAT = fatality; INJ = injury; PDO = property damage only

Table 4-36. Segment A, City of Shoreline Intersection Accident Data

Jurisdiction/Intersection	ADT	2008–2011 Accident Average			Yearly Accident Average	Accident Rate (acc/MEV)
		PDO	INJ	FAT		
North 155th Street at Aurora Avenue North	36,310	8.00	5.33	0	13.33	1.01
North 155th Street at Ashworth Avenue North	12,210	0.00	0.80	0	0.80	0.18
North 155th Street at Meridian Avenue North	18,040	2.13	2.67	0	4.80	0.73
NE 155th Street at 1st Avenue NE	11,940	0.53	0.80	0	1.33	0.31
NE 155th Street at 3rd Avenue NE	10,370	0.53	0.53	0	1.07	0.28
NE 155th Street at 5th Avenue NE	14,930	1.60	0.27	0	1.87	0.34
NE 155th Street at 6th Avenue NE	8,490	0.27	0.27	0	0.53	0.17
NE 155th Street at 8th Avenue NE	9,460	0.27	0.00	0	0.27	0.08
NE 155th Street at 10th Avenue NE	8,640	0.00	0.27	0	0.27	0.08
NE 155th Street at 12th Avenue NE	8,000	0.27	0.27	0	0.53	0.18
NE 155th Street at 15th Avenue NE	19,740	1.33	1.07	0	2.40	0.33
NE 165th Street at 5th Avenue NE	7,640	0.80	0.27	0	1.07	0.38
NE 175th Street at 5th Avenue NE	17,970	2.40	2.13	0	4.53	0.69
NE 175th Street at I-5 northbound ramps [a]	25,600	2.40	1.87	0	4.27	0.46
NE 175th Street at I-5 southbound ramps [a]	26,340	2.93	1.07	0	4.00	0.42
North 175th Street at Meridian Avenue North	29,600	4.80	4.00	0	8.80	0.81
North 175th Street at Aurora Avenue North	31,720	8.53	3.47	0.27	12.27	1.06
NE 180th Street at 15th Avenue NE	17,370	1.07	0.00	0	1.07	0.17
NE 180th Street at 10th Avenue NE	5,960	0.80	0.27	0	1.07	0.49
NE 180th Street at 5th Avenue NE	4,090	0.80	0.53	0	1.33	0.89
N 180th Street at Meridian Avenue North	10,820	0.00	0.80	0	0.80	0.20
NE Perkins Way at 15th Avenue NE	13,990	1.33	1.07	0	2.40	0.47
North 185th Street at Aurora Avenue North	34,130	5.87	4.53	0	10.40	0.83
North 185th Street at Meridian Avenue North	20,370	2.67	1.07	0	3.73	0.50
North 185th Street at Corliss Avenue North	10,740	0.27	0.00	0	0.27	0.07

Table 4-36. Segment A, City of Shoreline Intersection Accident Data

Jurisdiction/Intersection	ADT	2008–2011 Accident Average			Yearly Accident Average	Accident Rate (acc/MEV)
		PDO	INJ	FAT		
NE 185th Street at 1st Avenue NE	22,310	1.07	0.27	0	1.33	0.16
NE 185th Street at 5th Avenue NE	10,820	1.60	1.07	0	2.67	0.68
NE 185th Street at 7th Avenue NE	11,540	0.27	0.00	0	0.27	0.06
NE 185th Street at 8th Avenue NE	8,350	0.27	0.53	0	0.80	0.26
NE 185th Street at 10th Avenue NE	8,660	0.53	0.00	0	0.53	0.17

[a] Indicates same data for ramp intersection and local intersection.

acc./MEV = accidents per million entering vehicles; ADT = average daily traffic (entering only); FAT = fatality; INJ = injury; PDO = property damage only

Northgate Station Area

All light rail alternatives will connect to the Northgate Station and elevated guideway, and extend north by crossing Northgate Way and following 1st Avenue NE to North 117th Street and to 5th Avenue NE at NE 125th Street. A summary of accident data for the Northgate study intersections is shown in Table 4-35.

Two pedestrian accidents and one bicycle accident occurred at Northgate Way and 1st Avenue NE.

NE 130th Street/I-5 Area

The City of Seattle identified two locations as HAL in the station study area:

- I-5 northbound off-ramp at 5th Avenue NE: 6.13 average accidents/year, 1.32 acc/MEV
- NE 130th Street at Aurora Avenue North: 13.6 average accidents/year, 0.89 acc/MEV

The reason why these intersections exhibit a higher accident rate was not evaluated, but the I-5 northbound off-ramp at 5th Avenue NE is a stop-controlled ramp where right-angle and rear-end collisions are prevalent. At North 130th Street and Aurora Avenue North, the dominant accident types are rear-end and right-angle accidents. Two pedestrian accidents occurred at North 130th Street and Aurora Avenue North. Bicycle accidents occurred at the I-5 northbound off-ramp to 5th Avenue North and at NE 130th Street and 1st Avenue NE.

NE 145th Street/I-5 Area

The NE 145th Street station lies just north of the Seattle – Shoreline boundary, and many of the study intersections lie along SR 523, also known as North/NE 145th Street. Accident data were collected from both cities and WSDOT.

The City of Seattle identified five signalized intersections as HALs within the study area for the NE 145th Street Station:

- North 145th Street at Aurora Avenue North: 16.53 average accidents/year, 1.07 acc/MEV
- North 145th Street at Meridian Avenue North: 12 average accidents/year, 1.39 acc/MEV
- NE 145th Street at 5th Avenue NE: 16 average accidents/year, 1.18 acc/MEV
- NE 145th Street at 15th Avenue NE: 12 average accidents/year, 0.90 acc/MEV
- NE 145th Street at Bothell Way NE: 12 average accidents/year, 0.75 acc/MEV

Two stop-controlled ramp intersections could also be considered HALs near the NE 145th Street Station:

- I-5 northbound off-ramp to 5th Avenue NE: 5.07 average accidents/year, 1.01 acc/MEV
- I-5 northbound transit off-ramp and general purpose on-ramp at 5th Avenue NE: 6.67 average accidents/year, 1.37 acc/MEV

The reason why these intersections exhibit a higher accident rate was not evaluated; accident experiences at each intersection are briefly summarized. The North 145th Street and Aurora Avenue North intersection experiences a high number of rear-end and right-angle accidents. The North 145th Street at Meridian Avenue North intersection experiences a high number of rear-end, left-turn, and right-angle accidents. The NE 145th Street at 5th Avenue NE intersection experiences a high number of rear-end, left-turn, right-angle, and sideswipe accidents. The NE 145th Street at 15th Avenue NE intersection experiences a high number of rear-end and right-angle accidents. The NE 145th Street at Bothell Way intersection experiences a high number of rear-end and right-angle accidents.

Pedestrian accidents occurred at North 145th Street and Aurora Avenue North (two), NE 145th Street at 15th Avenue NE (fatal), and NE 145th Street at Bothell Way (two). Bicycle accidents occurred at North 145th Street and Meridian Avenue North, NE 145th Street at 1st Avenue NE, and at the northbound off-ramp to 5th Avenue NE.

NE 155th Street/I-5 Area

One study intersection is considered an HAL:

- North 155th Street at Aurora Avenue North: 13.33 average accidents/year, 1.01 acc/MEV

The reason why these intersections exhibit a higher accident rate was not evaluated, but North 155th Street at Aurora Avenue North experiences a high number of rear-end and right-angle accidents.

Pedestrian accidents occurred at North 155th Street and Aurora Avenue North, North 155th Street and Meridian Avenue North (three), and NE 155th Street at 1st Avenue NE.

One bicycle accident occurred at North 155th Street and Aurora Avenue North.

NE 185th Street/I-5 Area

One intersection meets the HAL criteria:

- North 175th Street at Aurora Avenue North: 12.27 average accidents/year, 1.06 acc/MEV

The reason why these intersections exhibit a higher accident rate was not evaluated, but North 175th Street at Aurora Avenue North experiences high number of rear-end and sideswipe accidents and experienced a fatal accident during the analysis period.

Pedestrian accidents occurred at NE 175th Street and 5th Avenue NE and North 185th Street at Aurora Avenue North (two).

Bicycle accidents occurred at NE 175th Street at 5th Avenue NE, North 175th Street at Meridian Avenue North, and North 185th Street at Meridian Avenue North.

Segment B: Shoreline to Mountlake Terrace

Accident data and rates for Mountlake Terrace intersections are presented in Table 4-37. Any intersections that are identified as HAL, either along the light rail guideway or near the proposed light rail stations, are discussed below.

Mountlake Terrace Transit Center Area

In Mountlake Terrace near the Mountlake Terrace Transit Center, there are no HALs at any of the study intersections.

No pedestrian nor bicycle accidents occurred at study intersections.

Table 4-37. Segment B, City of Mountlake Terrace Intersection Accident Data

Jurisdiction/Intersection	ADT	2008–2011 Accident Average			Yearly Accident Average	Accident Rate (acc/MEV)
		PDO	INJ	FAT		
222nd Street SW at 64th Avenue West	2,490	5.60	0.00	0	5.60	6.16
220th Street SW at SR 99	47,570	19.20	9.33	0	28.53	1.64
220th Street SW at 70th Avenue West	21,770	2.67	1.60	0	4.27	0.54
220th Street SW at 66th Avenue West	32,660	8.80	3.47	0	12.27	1.03
220th Street SW at 64th Avenue West	32,650	4.00	2.13	0	6.13	0.51
220th Street SW at I-5 southbound ramps [a]	32,380	4.53	1.33	0	5.87	0.50
220th Street SW at I-5 northbound ramps [a]	26,620	6.40	1.07	0	7.47	0.77
220th Street SW at 58th Avenue West	12,160	2.93	0.53	0	3.47	0.78
220th Street SW at 56th Avenue West	13,120	3.20	1.07	0	4.27	0.89
220th Street SW at 55th Avenue West	8,870	0.27	0.00	0	0.27	0.08
220th Street SW at 54th Avenue West	8,960	0.27	0.53	0	0.80	0.24
220th Street SW at 52nd Avenue West	8,600	1.07	0.00	0	1.07	0.34
236th Street SW (Lakeview Drive) at I-5 southbound on-ramp [a]	10,560	0.53	0.00	0	0.53	0.14
236th Street SW at I-5 northbound off-ramp and Mountlake Terrace Park-and-Ride [a]	15,470	0.80	0.00	0	0.80	0.14
236th Street SW at 58th Avenue West	11,800	1.87	0.80	0	2.67	0.62
236th Street SW at 56th Avenue West	19,000	4.00	1.33	0	5.33	0.77

[a] Indicates same data for ramp intersection and local intersection.

acc/MEV = accidents per million entering vehicles; ADT = average daily traffic (entering only); FAT = fatality; INJ = injury; PDO = property damage only

220th Street SW/I-5 Area

Three study intersections meet HAL criteria near the proposed 220th Street SW Station location:

- 222nd Street West at 64th Avenue West: 5.6 average accidents/year, 6.16 acc/MEV
- 220th Street SW at SR 99: 28.53 average accidents/year, 1.64 acc/MEV
- 220th Street SW at 66th Avenue West: 12.27 average accidents/year, 1.03 acc/MEV

The reason why these intersections exhibit a higher accident rate was not evaluated, but 222nd Street SW at 64th Avenue West experienced high right-angle and rear-end accidents with low volumes through the intersection. 220th Street SW at SR 99 experienced a high number of rear-end, sideswipe, and right-angle accidents, and 220th Street SW at 66th Avenue West experienced a high number of rear-end and left-turn accidents.

Five pedestrian accidents occurred at 220th Street SW at SR 99.

Bicycle accidents occurred at 220th Street SW and 70th Avenue West and at 220th Street SW at 58th Avenue West.

Segment C: Mountlake Terrace to Lynnwood

Accident data and rates for Lynnwood intersections are presented in Table 4-38. Any intersections that are identified as HAL, either along the proposed light rail guideway or near the light rail stations, are discussed below.

Table 4-38. Segment C, City of Lynnwood Intersection Accident Data

Jurisdiction/Intersection	ADT	2008–2011 Accident Average			Yearly Accident Average	Accident Rate (acc/MEV)
		PDO	INJ	FAT		
200th Street SW at 50th Avenue West	17,830	1.60	1.87	0.27	3.73	0.57
200th Street SW at 48th Avenue West	19,360	6.13	2.13	0	8.27	1.17
200th Street SW at 46th Avenue West	18,790	5.33	1.33	0	6.67	0.97
204th Street SW at 52nd Avenue West	8,080	0.27	0.00	0	0.27	N/A
208th Street SW at 52nd Avenue West	10,500	1.33	1.07	0	2.40	0.63
212th Street SW at 52nd Avenue West	19,700	0.53	0.27	0	0.80	0.11
I-5 direct access at 46th Avenue West [a]	7,790	6.40	4.00	0	10.40	3.66
I-5 northbound off-ramp at 44th Avenue West [a]	29,170	1.33	0.53	0	1.87	0.18
Alderwood Mall Boulevard at 40th Avenue West	16,300	2.40	0.53	0	2.93	0.49
196th Street SW at 50th Avenue West	27,040	4.27	0.27	0	4.53	0.46
196th Street SW at 48th Avenue West	30,810	9.33	3.20	0	12.53	1.11
196th Street SW at 44th Avenue West	42,530	14.67	3.73	0	18.40	1.19
196th Street SW at 40th Avenue West	33,080	15.20	3.73	0	18.93	1.57
196th Street SW at 36th Avenue West	41,200	20.80	8.53	0	29.33	1.95
198th Street SW at 40th Avenue West	6,400	1.07	0.00	0	1.07	0.46

[a] Indicates same data for ramp intersection and local intersection.

acc/MEV = accidents per million entering vehicles; ADT = average daily traffic (entering only); FAT = fatality; INJ = injury; PDO = property damage only

Lynnwood Transit Center Area

Five study intersections meet HAL criteria near the Lynnwood Transit Center:

- 200th Street SW at 48th Avenue West: 8.27 average accidents/year, 1.17 acc/MEV
- I-5 direct access ramp to Lynnwood Transit Center : 10.4 average accidents/year, 3.66 acc/MEV
- 196th Street SW at 48th Avenue West: 12.53 average accidents/year, 1.11 acc/MEV

- 196th Street SW at 40th Avenue West: 18.4 average accidents/year, 1.57 acc/MEV
- 196th Street SW at 36th Avenue West: 28.33 average accidents/year, 1.95 acc/MEV

The reason why these intersections exhibit a higher accident rate was not evaluated, but 200th Street SW at 48th Avenue West experienced a high number of rear-end accidents with a modest amount of traffic through the intersection. The I-5 direct access ramp intersection experienced a high number of right-angle and rear-end accidents; 196th Street SW at 48th Avenue West experienced a high number of rear-end and left-turn accidents; 196th Street SW at 40th Avenue West experienced a high number of left-turn accidents; and 196th Street SW at 36th Avenue West experienced a high number of rear-end and sideswipe accidents.

Pedestrian accidents occurred at 196th Street SW at 48th Avenue West, 196th Street SW at 44th Avenue West (two), 196th Street SW at 40th Avenue West (two), and 196th Street SW at 36th Avenue West. A fatal accident occurred at the intersection of 200th Street SW at 50th Avenue W.

Bicycle accidents occurred at the I-5 direct access ramp intersection, 196th Street SW at 48th Avenue West, and 196th Street SW at 36th Avenue West.

5 LONG-TERM IMPACTS

Long-term impacts for the future forecast year of 2035 are discussed in this chapter for the light rail alternatives in comparison with the No Build Alternative. Improvements to the transportation system assumed to be in place under the No Build Alternative are listed in Appendix B, Future Transportation Improvement Assumptions for the No Build Alternative.

5.1 Regional Context and Travel Patterns

This chapter discusses travel in the region and in the project corridor for a future year (forecast year 2035) and how the project is expected to affect that travel. Key observations and findings related to these travel projections include the following:

- The selected light rail alternative would reduce overall regional VMT by more than 300,000 miles per day and approximately 30,000 daily hours of travel.
- Screenline traffic volumes and v/c ratios would generally be reduced with the light rail alternatives.
- PM peak period person trips through the corridor would increase from 136,000 to 138,000 with the light rail alternatives.

5.1.1 Travel Demand and Patterns

Miles Driven and Hours Spent in Travel

Table 5-1 shows the VMT and VHT for the Puget Sound region for the No Build Alternative and light rail alternative scenarios for forecast year 2035. By 2035, ridership on the light rail alternatives would help reduce automobile travel in the region by more than 300,000 miles per day, compared to the No Build Alternative, and about 30,000 fewer hours per day would be spent traveling by automobile. A significant portion of this reduction (more than 65 percent) is expected to occur within the project corridor as new riders shift from automobile to transit. The change in auto travel would be very similar between the light rail alternatives; differences between the build alternatives are too small to be accurately modeled. Differences in transit ridership between light rail alternatives are discussed in Section 5.2, Transit.

Table 5-1. Daily Vehicle Miles of Travel and Vehicle Hours of Travel for Forecast Year 2035

Alternative	VMT		VHT	
	4-County Region	Project Corridor	4-County Region	Project Corridor
No Build Alternative	98,870,000	19,870,000	3,080,000	700,000
Light Rail Alternatives	98,550,000 – 98,560,000	19,660,000	3,050,000	680,000

Vehicles Traveling through the Corridor

Tables 5-2 through 5-6 show AM peak hour, PM peak hour, daily traffic volumes, and peak hour v/c ratios at four selected screenline locations, respectively. The improved transit service provided by the light rail alternatives would attract more trips to transit, and hence slightly reduce vehicle volumes and congestion in the corridor. The v/c ratios indicate that southbound travel in the AM peak hour and northbound travel in the PM peak hour would be at capacity or over capacity in the corridor if the Lynnwood Link Extension was built or not, although these ratios would be slightly reduced with the light rail alternatives. This reflects, in part, the additional HOV lane capacity made available for other vehicles with the truncation of bus routes that currently operate in the I-5 HOV lanes.

Table 5-2. AM Peak Hour Screenline Vehicle Volumes for Forecast Year 2035

	No Build Alternative		Light Rail Alternatives	
Screenline Location	**Northbound**	**Southbound**	**Northbound**	**Southbound**
1: North of Northgate Way NE	8,700	19,400	8,200	18,800
2: South of North 205th Street	7,100	15,000	6,700	14,600
3: South of 196th Street SW	5,800	11,800	5,700	11,500
	Westbound	**Eastbound**	**Westbound**	**Eastbound**
4: NE 145th Street	1,200	400	1,200	400

Table 5-3. AM Peak Hour Volume-to-Capacity Ratios for Forecast Year 2035

	No Build Alternative		Light Rail Alternatives	
Screenline Location	**Northbound**	**Southbound**	**Northbound**	**Southbound**
1: North of Northgate Way NE	0.46	1.04	0.44	1.00
2: South of North 205th Street	0.42	1.00	0.40	0.97
3: South of 196th Street SW	0.49	1.01	0.48	0.99
	Westbound	**Eastbound**	**Westbound**	**Eastbound**
4: NE 145th Street	0.72	0.27	0.75	0.26

Table 5-4. PM Peak Hour Screenline Vehicle Volumes for Forecast Year 2035

	No Build Alternative		Light Rail Alternatives	
Screenline Location	**Northbound**	**Southbound**	**Northbound**	**Southbound**
1: North of Northgate Way NE	20,900	13,200	20,000	12,800
2: South of North 205th Street	16,500	10,900	15,800	10,500
3: South of 196th Street SW	12,600	8,500	12,400	8,300
	Westbound	**Eastbound**	**Westbound**	**Eastbound**
4: NE 145th Street	900	1,000	900	1,000

Table 5-5. PM Peak Hour Volume-to-Capacity Ratios for Forecast Year 2035

	No Build Alternative		Light Rail Alternatives	
Screenline Location	**Northbound**	**Southbound**	**Northbound**	**Southbound**
1: North of Northgate Way NE	1.12	0.71	1.07	0.69
2: South of North 205th Street	0.97	0.72	0.93	0.71
3: South of 196th Street SW	1.07	0.72	1.05	0.71
	Westbound	**Eastbound**	**Westbound**	**Eastbound**
4: NE 145th Street	0.57	0.59	0.57	0.60

Table 5-6. Daily Screenline Vehicle Volumes for Forecast Year 2035

	No Build Alternative		Light Rail Alternatives	
Screenline Location	**Northbound**	**Southbound**	**Northbound**	**Southbound**
1: North of Northgate Way NE	213,300	216,100	207,700	211,000
2: South of North 205th Street	171,100	173,400	166,700	169,400
3: South of 196th Street SW	134,700	135,900	132,900	133,900
	Westbound	**Eastbound**	**Westbound**	**Eastbound**
4: NE 145th Street	15,700	12,300	15,900	12,500

People Traveling through the Corridor

Table 5-7 shows person throughput in the corridor at two screenline locations during the PM peak period for the No Build Alternative and light rail alternatives for forecast year 2035. The person throughput includes trips on I-5, SR 99, and other north-south arterials, as well as transit trips on those facilities. Compared with the No Build Alternative, the light rail alternatives would result in more people moving through the corridor (person throughput) during the peak periods, as measured by screenlines across the corridor. The evening peak (northbound) direction would have the largest increase in total trips by all modes. The total person throughput in both directions would increase by approximately 1.5 percent north of Northgate

Way and by 5 percent south of North 205th Street. On I-5 only, up to a 10 percent increase in person throughput is expected with the light rail alternatives.

Table 5-7. Northbound Person Throughput—Forecast Year 2035 PM Peak Period

Screenline Location	Alternative	Northbound	Southbound	Total
North of Northgate Way NE	No Build	87,000	49,000	136,000
	Light Rail Alternatives	89,000	49,000	138,000
South of North 205th Street	No Build	67,000	39,000	106,000
	Light Rail Alternatives	70,000	41,000	111,000

Sources: Sound Transit Ridership Model and PSRC Regional Model: WSDOT Project Version (2012)

5.2 Transit

This section discusses future transit service, operations, and expected ridership in the project corridor, and the project's potential effects on these elements. Key observations and findings include the following:

- By 2035, between 60,000 and 70,000 daily riders would use the proposed light rail extension, and overall transit usage from Snohomish County to King County would increase by as much as 55 percent under the light rail alternatives. Up to 23,000 new daily transit riders would use the regional system (bus and rail) as a result of the project.
- Transit travel times to and from all regional destinations would be shorter with the light rail alternatives, with AM peak trips to Northgate and downtown Seattle 10 to 17 minutes faster than with the No Build Alternative.
- Transit passenger LOS between the project area and other regional destinations, including service frequency, hours of service, passenger load, and reliability, would improve significantly with the light rail alternatives.
- I-5 bus routes would be restructured to remove duplication of service with light rail, and local transit service could be restructured to reduce duplication and to provide improved or new connections to light rail under the light rail alternatives.

5.2.1 Regional Transit

The ridership forecast shows that by 2035, under current assumptions, all Community Transit bus service to Seattle would be truncated; between 60,000 and 70,000 riders would use the Lynnwood Link Extension each day, and up to 23,000 new daily transit riders throughout the region would result from the extension. Transit use from Snohomish County to King County would increase by as much as

55 percent. There would be direct light rail service from Lynnwood to Northgate, the University District, Capitol Hill, downtown Seattle, south of downtown Seattle, the Rainier Valley, and Sea-Tac Airport. Light rail connections would be provided to Bellevue, Bel-Red, and Overlake. In addition, light rail in the I-5 corridor would substantially improve transit service reliability. The reliability would improve to LOS A with light rail, compared to LOS C or worse with the No Build Alternative. The frequency of transit throughout the day would also improve because light rail would operate with midday headways of 5 to 10 minutes, compared to midday headways of 15 minutes on the most frequent bus routes. Light rail would also be available for more hours of the day and additional destinations, such as Shoreline and Mountlake Terrace Transit Center.

Transit Facility and Service Characteristics

With the light rail alternatives, a number of transit facility improvements would be implemented, including new light rail stations and new or expanded park-and-ride and bus layover facilities at some of the stations. Proposed park-and-ride facilities are discussed in Sections 5.4.1 (Traffic Volume Forecasts) and 5.7 (Parking). Other bus facility improvements are identified the *Definition of Alternatives Technical Memorandum* (Sound Transit 2012).

Regional bus service could be restructured to reduce duplication with light rail and to provide improved or new connections to the Lynnwood Link Extension. King County Metro, Community Transit, and Sound Transit Express have identified potential conceptual plans for bus services to be integrated with the future Link light rail routes and stations. This information included scenarios for low and high service levels, covering a range of potential future revenue scenarios. Table 5-8 lists the assumed level of feeder bus service serving the proposed light rail stations. The low revenue scenarios were assumed for the ridership forecasting effort, while the higher revenue scenarios were used to size the bus facilities at each station. However, actual changes to regional and local bus routes will require a public comment process and council or board approval to implement changes. This section describes some conceptual options for modifying regional bus operations. Additional information on the conceptual bus options is provided in the *Definition of Alternatives Technical Memorandum* (Sound Transit 2012) and the *Ridership Forecasting Technical Report* (Sound Transit 2012).

Ridership

Table 5-9 shows daily ridership on buses (for the 2011 base year and No Build Alternative for 2035) and on light rail (for five representative light rail scenarios in 2035) in the project corridor. The number of light rail project riders in any of the representative light rail scenarios would be more than double the bus riders in the No Build Alternative. Among the light rail scenarios, project riders would range from 60,000 to 70,000 daily riders. The total daily systemwide boardings for the No Build and light rail alternatives are also provided in Table 5-9. This number is calculated differently than the project rider, and includes all bus and rail transit boardings in the system.

Table 5-8. Assumed Feeder Bus Service to Light Rail Stations

Station (Number of Feeder Routes)	Peak Headway (Minutes)		Mid-day Headway (Minutes)	
	Low Revenue Scenario	High Revenue Scenario	Low Revenue Scenario	High Revenue Scenario
130th Street (1 route)	15	15	15	15
145th Street (3 routes)	15	15	20	15
	15	15	20	15
	15	15	20	15
155th Street (2 routes)	15	15	15	15
	15	15	20	15
185th Street (5 routes, including CT *Swift*)	15	15	20	15
	15	15	20	15
	15	15	30	15
	15	15	20	15
	10	10	10	10
Mountlake Terrace (5 routes)	30	15	60	30
	30	30	-	-
	20	15	20	20
	20	15	20	20
	-	15	-	20
220th Street (2 routes)	30	15	60	30
	20	15	20	20
Lynnwood Transit Center (15 routes)	20	15	20	20
	30	20	60	30
	-	30	-	30
	30	20	30	30
	20	15	20	20
	30	30	60	60
	10	7.5	-	-
	30	30	-	-
	30	30	-	-
	15	10	-	-
	30	30	-	-
	30	30	-	-
	7.5	7.5	15	15
	10	10	30	30
	20	20	30	30

Table 5-9. Daily Ridership for Forecast Year 2035

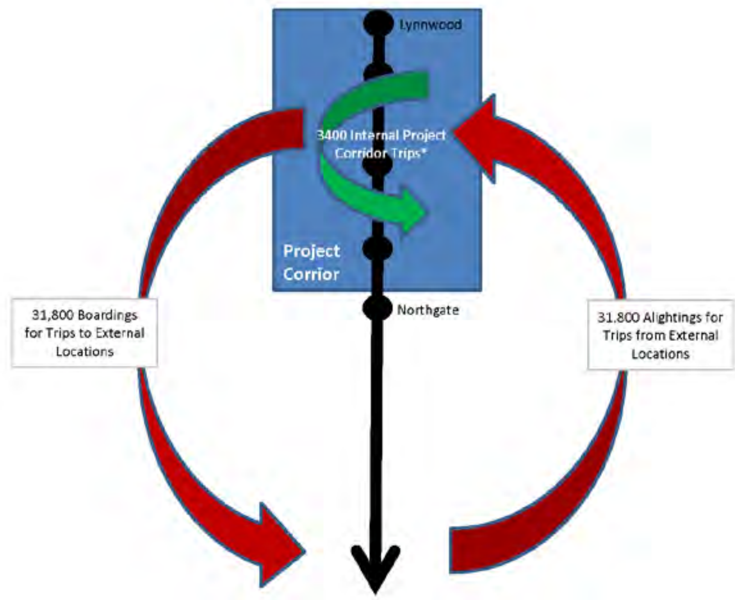
	Bus Riders		Light Rail Project Riders				
	Base Year (2011)	No Build Alternative	Light Rail Alternatives				
Number of Stations			4	5	5	5	6
Station Locations			North 145th Street North 185th Street Mountlake Terrace Transit Center Lynnwood Transit Center	North 130th Street North 155th Street North 185th Street Mountlake Terrace Freeway Lynnwood Transit Center	North 130th Street North 145th Street North 185th Street Mountlake Terrace Transit Center Lynnwood Transit Center	North 145th Street North 185th Street Mountlake Terrace Transit Center 220th Street SW Lynnwood Transit Center	North 130th Street North 155th Street North 185th Street Mountlake Terrace Transit Center 220th Street SW Lynnwood Transit Center
Segments			A1+B1+ C1/C2/C3	A5+B4+ C1/C2/C3	A10+B1+ C1/C2/C3	A1+B2A+ C1/C2/C3	A5+B2A+ C1/C2/C3
Total Corridor Project Riders[a]: North of Northgate	19,400	32,000 34,000	60,000-67,000	62,000-69,000	63,000-70,000	61,000 - 67,000	62,000-70,000
Total Systemwide Daily Boardings	533,000	879,000	912,000	909,000	910,000	910,000	909,000

Source: Sound Transit Ridership Forecasting Model

[a]Note: The FTA defines project riders as the number of trips on any portion of the project within a given weekday; range represents assumptions on future population and employment forecasts for station areas.

Average weekday boardings by station under different alternative station combinations for 2035 are shown in Figures 5-1 through Figure 5-4. Figure 5-1 provides a schematic summary of station-level boardings for all possible station combinations. In this figure, the convergence of the arrows between NE 185th Street and Mountlake Terrace indicates that any of the station combinations between Northgate and NE 185th Street could be combined with any of the combinations between Mountlake Terrace and Lynnwood. The ridership for the Lynnwood Transit Center station would vary depending on the combination of stations to the south. For example, as shown in the far left scenario in the figure, with a station at the Mountlake Terrace Transit Center, and no station at 220th Street SW or NE 130th Street, there would be 20,000 daily boardings at Lynnwood Transit Center station. However, the addition of a station at NE 130th Street to this scenario would reduce ridership at Lynnwood Transit Center station to 19,800 boardings. The number of boardings shown in Figure 5-1 is not directly comparable to the project riders shown in Table 5-9 because these numbers are calculated differently. The number of project riders is calculated as the number of inbound boardings and outbound alightings that occur within the project corridor (north of Northgate). In cases where a rider boards and alights within the project corridor, only one of these is counted in the project rider calculation. In contrast, the station boardings shown in Figure 5-1 include only boardings. To generate a number that is roughly comparable to the project riders shown in the Table 5-9, one would need to double the numbers shown in Figure 5-1. However, this would be slightly higher than the number of project riders because it would reflect all boardings and alightings for those trips that occur at stations completely within the project corridor. Figures 5-2 through 5-4 show boardings for combinations of stations. These figures identify where boardings are gained and lost, depending on how ridership is attracted to a combination of stations. Some key trade-offs include the following:

Example calculation of project riders for a four station alignment (145th Street, 185th Street, Mountlake Terrace Transit Center, Lynnwood Transit Center)



Total Daily Project Boardings = Boardings for Internal to External Trips (31,800) + Boardings for Internal to Internal Trips (3,400) = 35,200

Total Daily Project Corridor Riders = Boardings for Internal to External Trips (31,800) + Alightings for External to Internal Trips (31,800) + Boardings/Alightings for Internal to Internal Trips** (3,400) = 67,000

Total Daily Project Boardings and Alightings = Daily Project Boardings (35,200) * 2 = 70,400

or

Total Daily Project Boardings and Alightings = Daily Project Riders (67,000) + Daily Alightings for Internal to Internal Trips (3,400) = 70,400

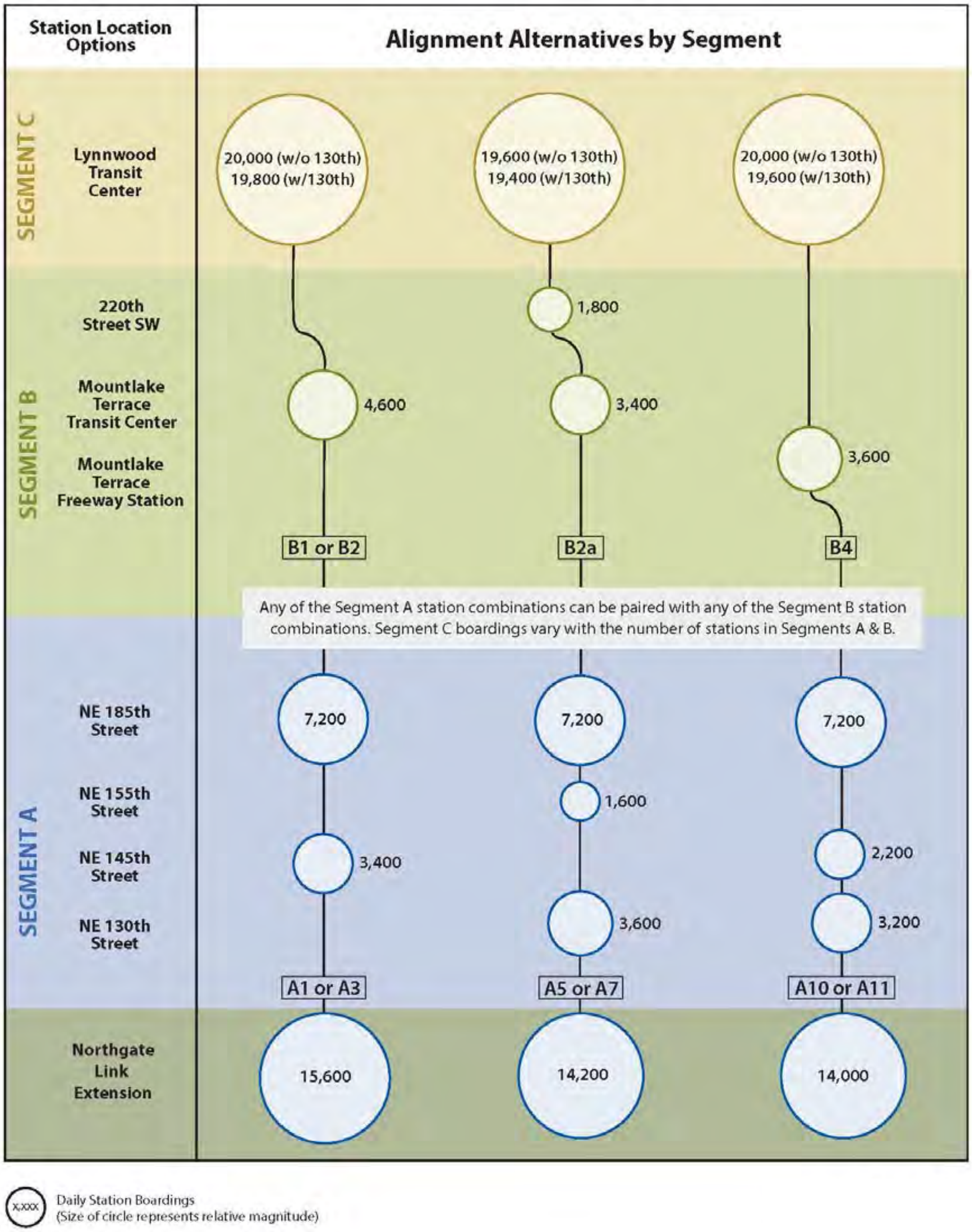
**Each internal project corridor trip has one boarding and one alighting within the corridor.*

***There are 3,400 internal project corridor trips which produce 3,400 internal boardings and 3,400 internal alightings.*

- Adding the 220th Street SW Station to the project route would reduce daily boardings at the Lynnwood Transit Center Station by 400, while adding the NE 130th Street Station would reduce boardings there by 200. The reason for this loss is that adding the stations would increase travel time for the light rail trip, which would be less attractive for riders to and from Lynnwood. In addition, approximately 200 of the forecasted boardings at 220th Street SW would shift from Lynnwood.

- Adding a station at 220th Street SW would increase net corridor ridership by 200 daily boardings because it would provide access to another market. Some Lynnwood and Mountlake Terrace station boardings would move to the 220th Street SW Station.
- Moving the Mountlake Terrace station from the transit center into the freeway median would reduce daily boardings by 1,000 at the station and for the corridor because it would add substantial walk time for riders using the Mountlake Terrace station.
- Adding a third Segment A station would result in a net increase of 400 daily boardings in the segment because it would provide more access points to the transit market. Some Northgate Station boardings would move to stations farther north in the segment.
- For the alternatives with three stations in Segment A, moving the station from NE 145th Street to NE 155th Street would reduce daily boardings by 200 for the segment but would increase the Northgate Station boardings by 200.

The difference in boardings between alternatives is influenced by a combination of factors, including the density of population and employment near stations, the amount of parking available at stations, connecting local bus service at stations, and distance between stations. Figures 5-5 through 5-11 show the 15-minute walkshed for each of the potential station locations, while Table 5-10 shows the forecasted population and employment in 2030 that is contained within those walksheds.



Note: Any of the Segment A station combinations shown can be combined with any of the Segment B station cor
Segment C boardings vary depending on the number of stations added in Segments A and B.

Figure 5-1. 2035 Average Weekday Station Boardings—Summary

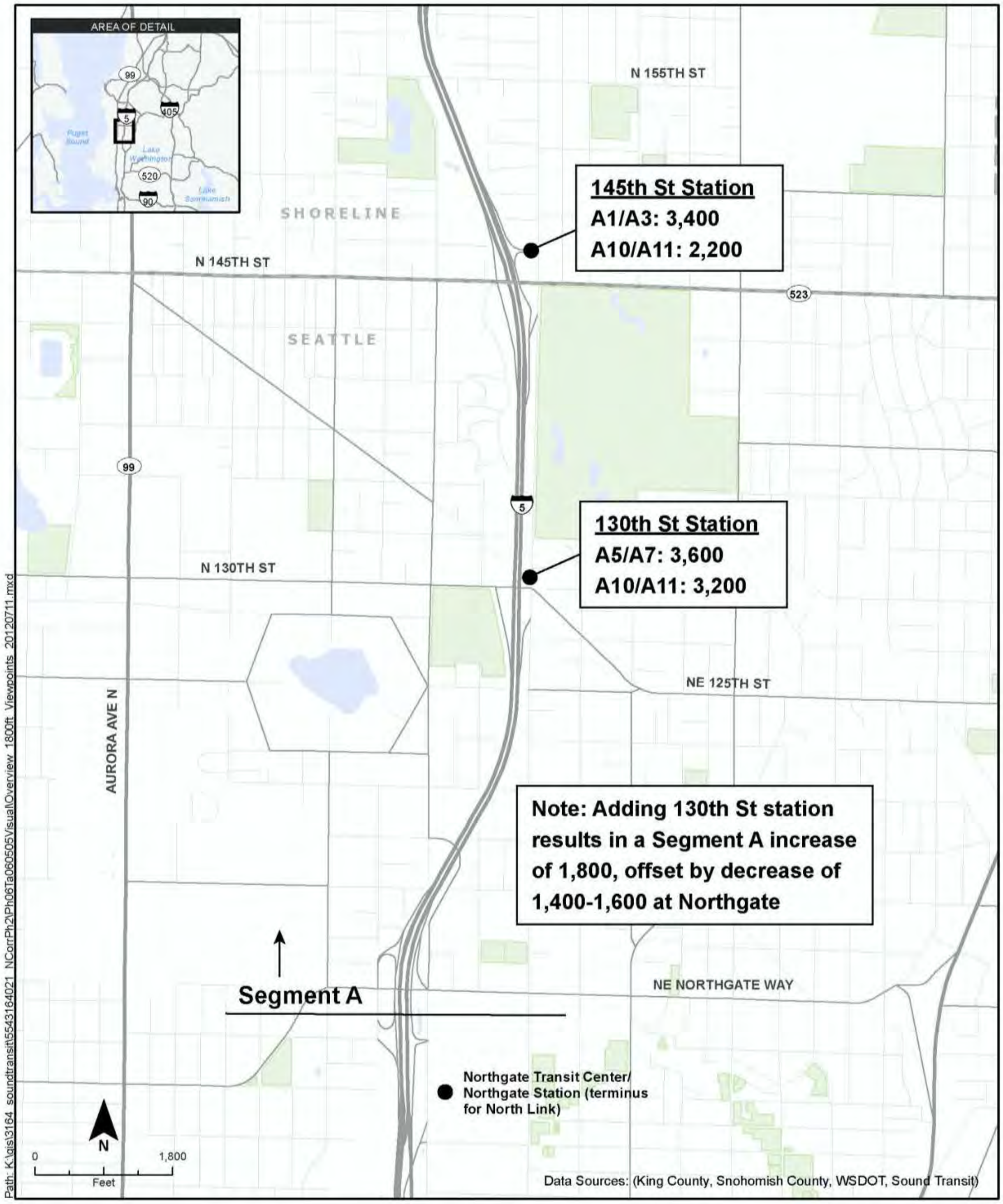


Figure 5-2. 2035 Average Weekday Station Boardings—Northgate to NE 145th Street

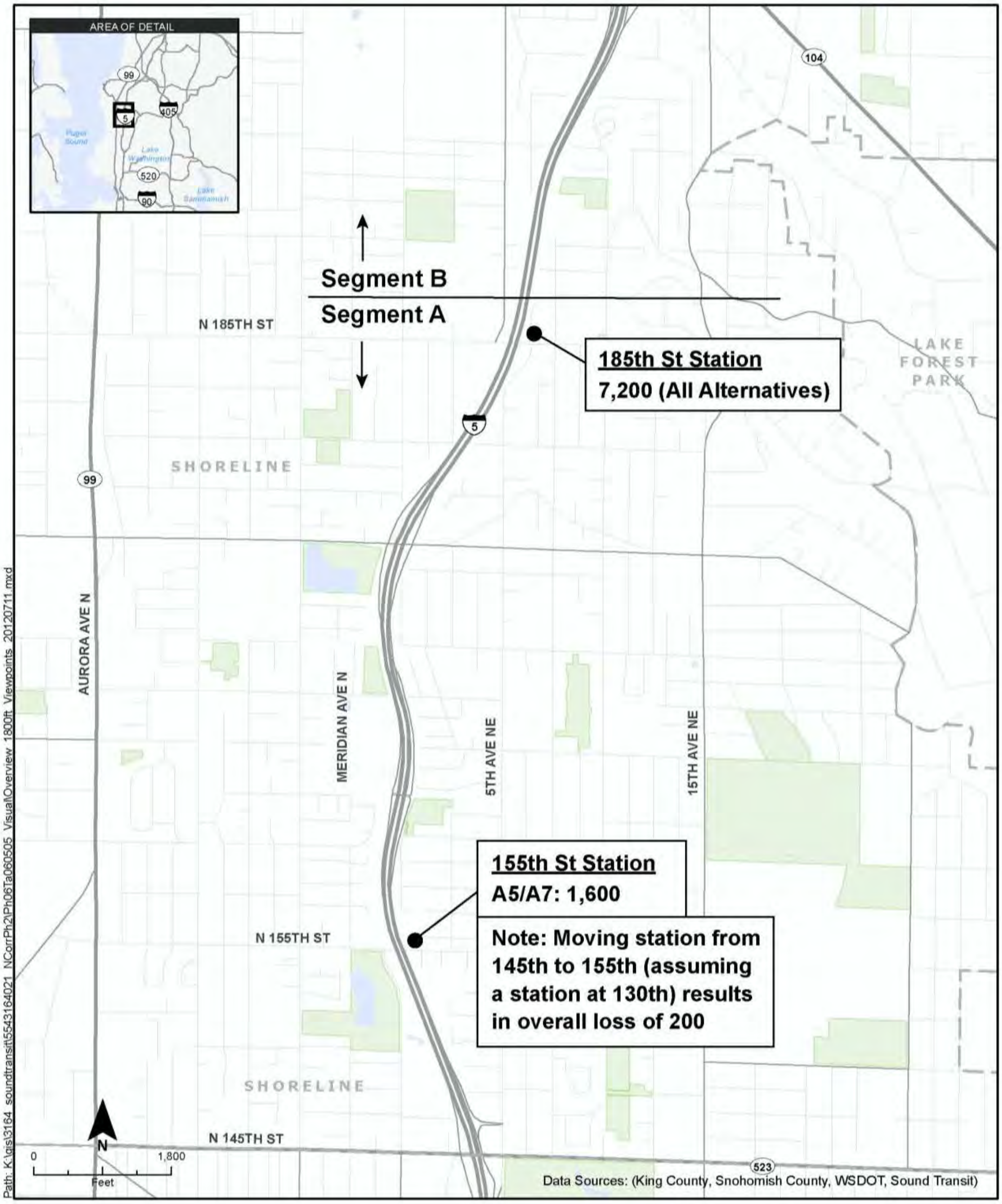


Figure 5-3. 2035 Average Weekday Boardings—NE 155th Street to NE 185th Street

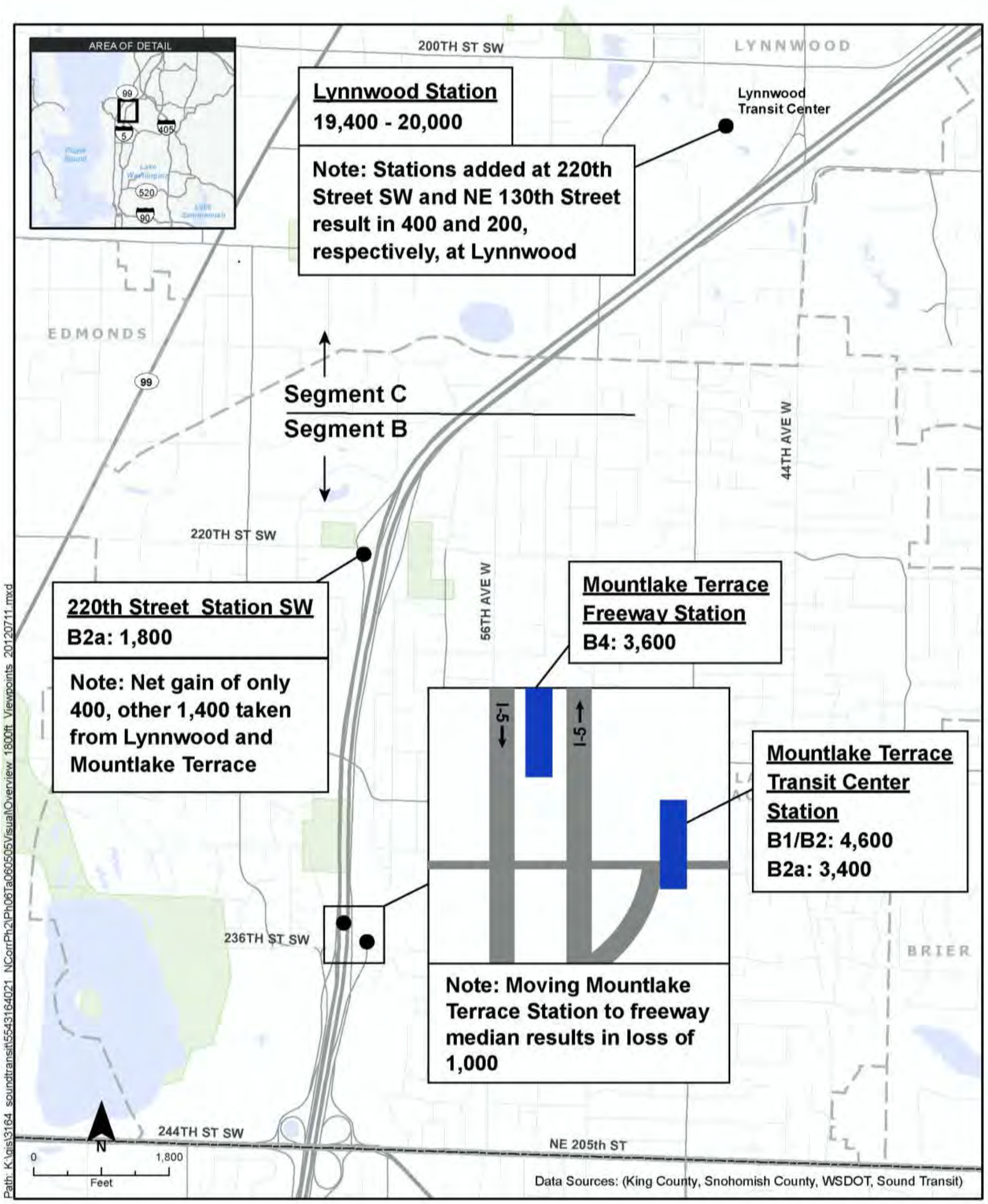


Figure 5-4. 2035 Average Weekday Station Boardings—Mountlake Terrace to Lynnwood

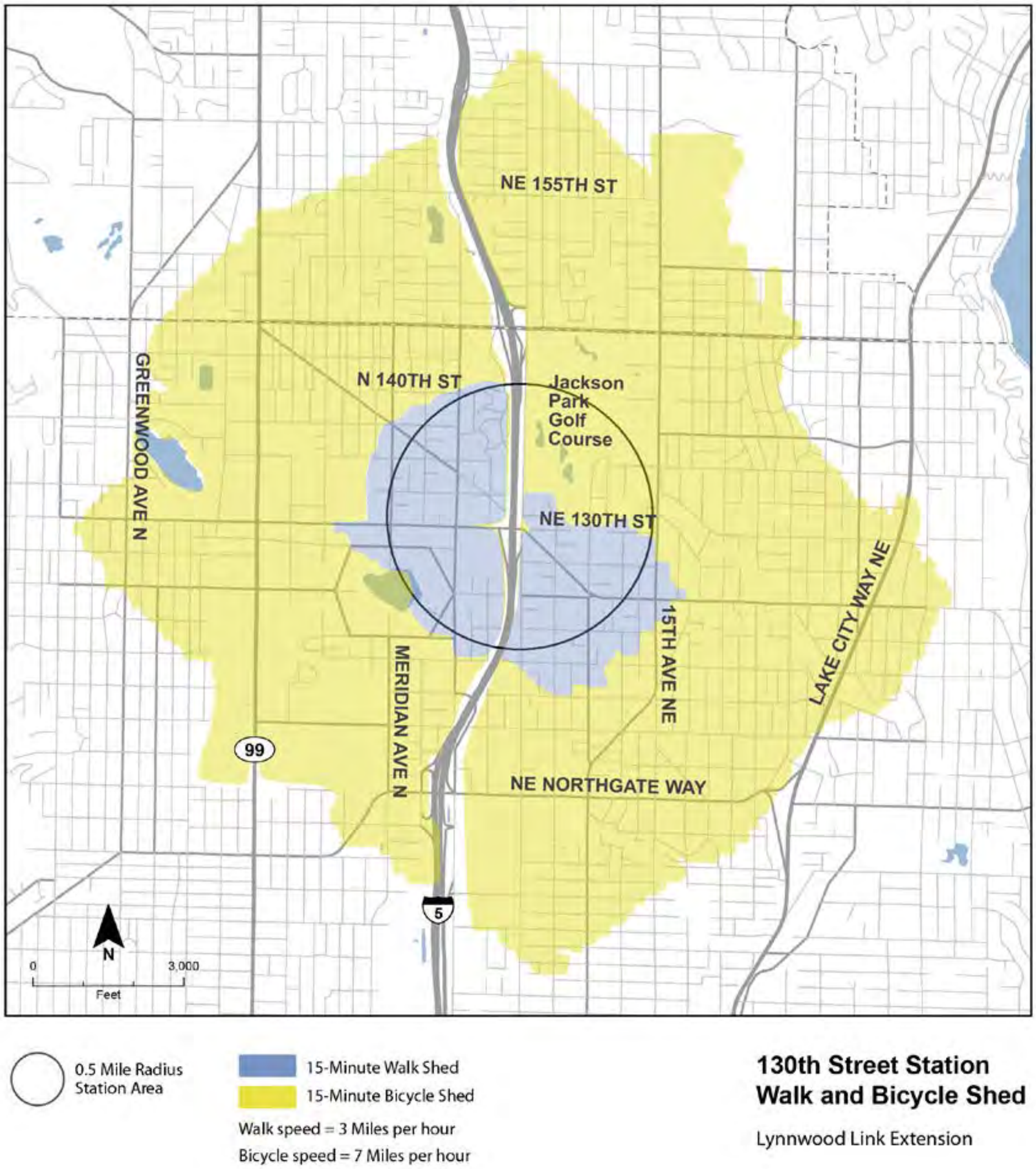


Figure 5-5. 15-minute Walk- and Bicycle-shed—NE 130th Street Station

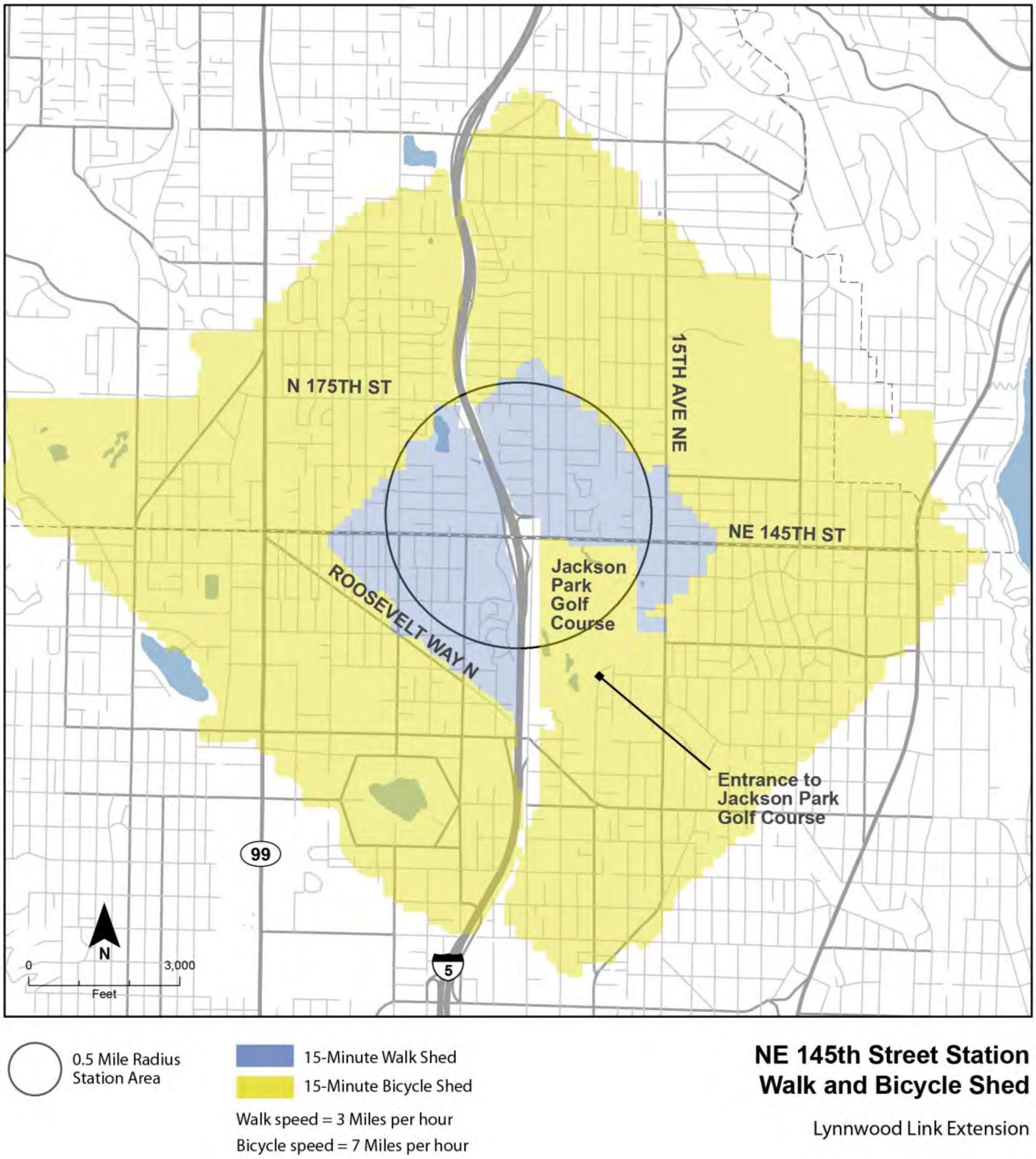


Figure 5-6. 15-minute Walk- and Bicycle-shed—NE 145th Street Station

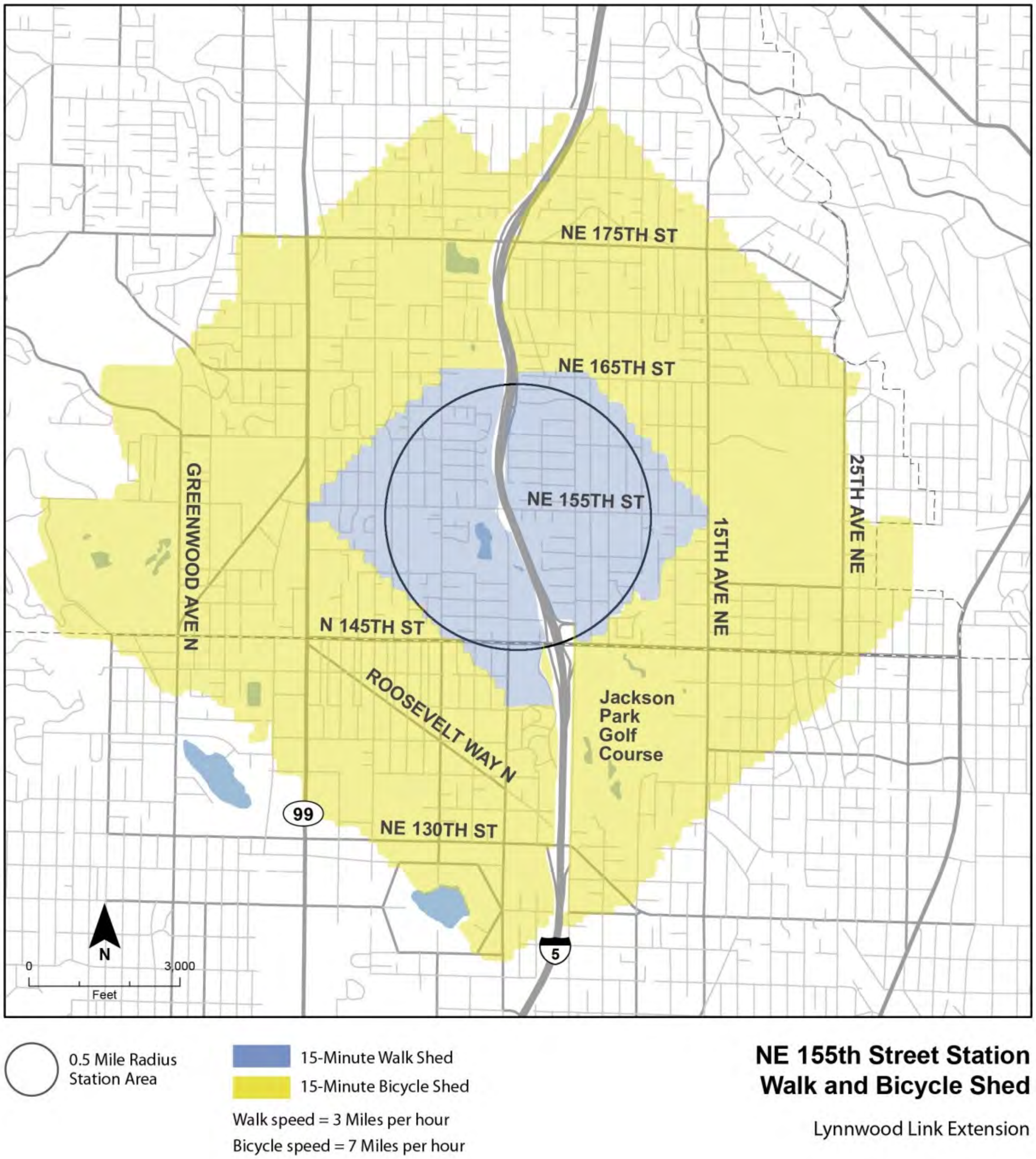


Figure 5-7. 15-minute Walk- and Bicycle-shed— NE 155th Street Station

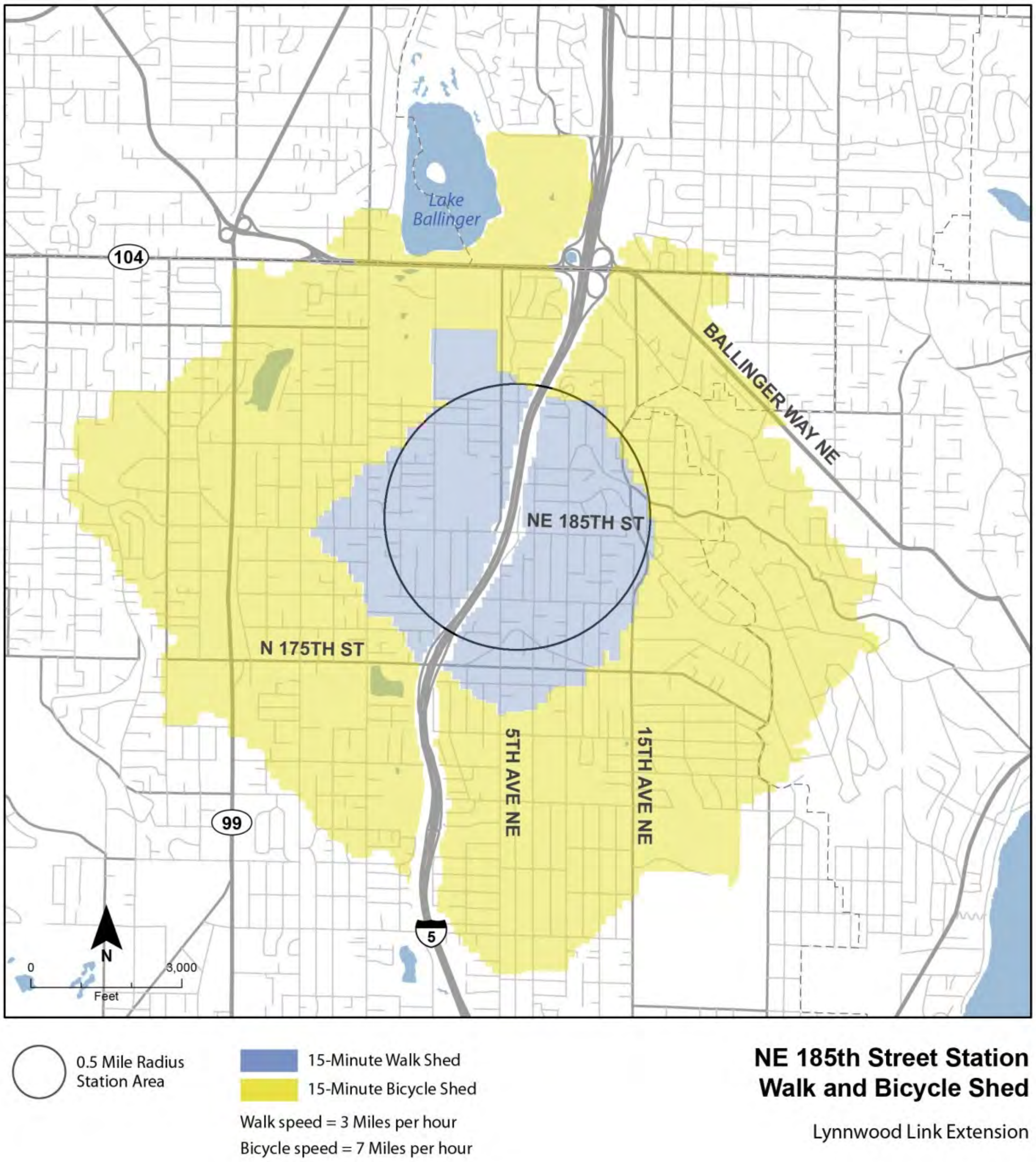
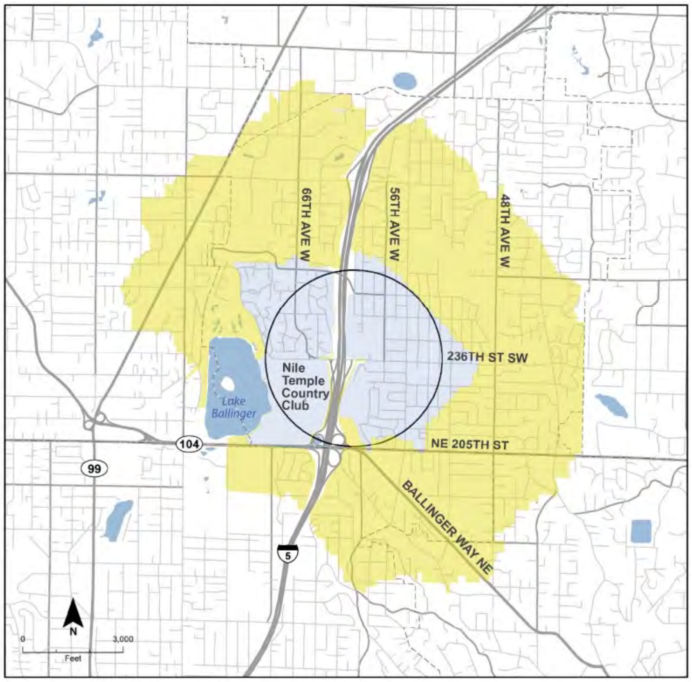
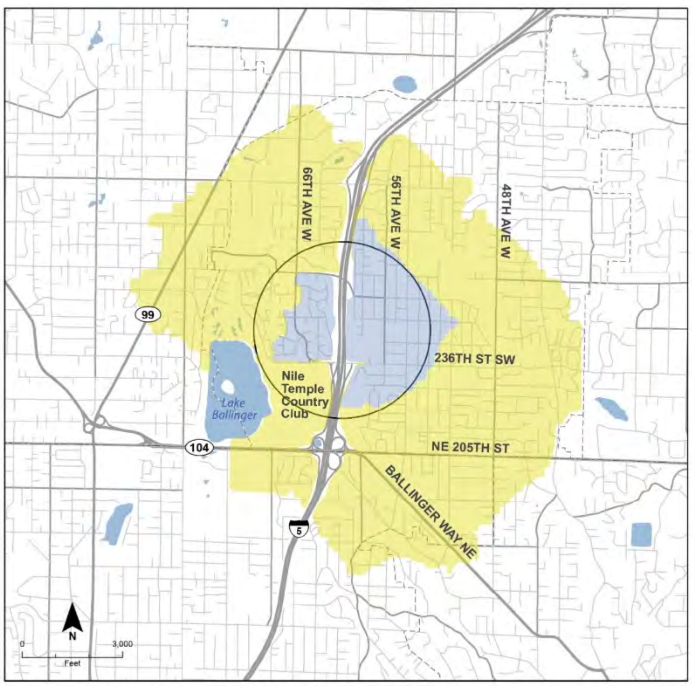


Figure 5-8. 15-minute Walk- and Bicycle-shed—NE 185th Street Station



Mountlake Terrace Transit Center Station



Mountlake Terrace Freeway Station

Figure 5-9. 15-minute Walk- and Bicycle-shed—Mountlake Terrace Transit Center and Mountlake Terrace Freeway Station

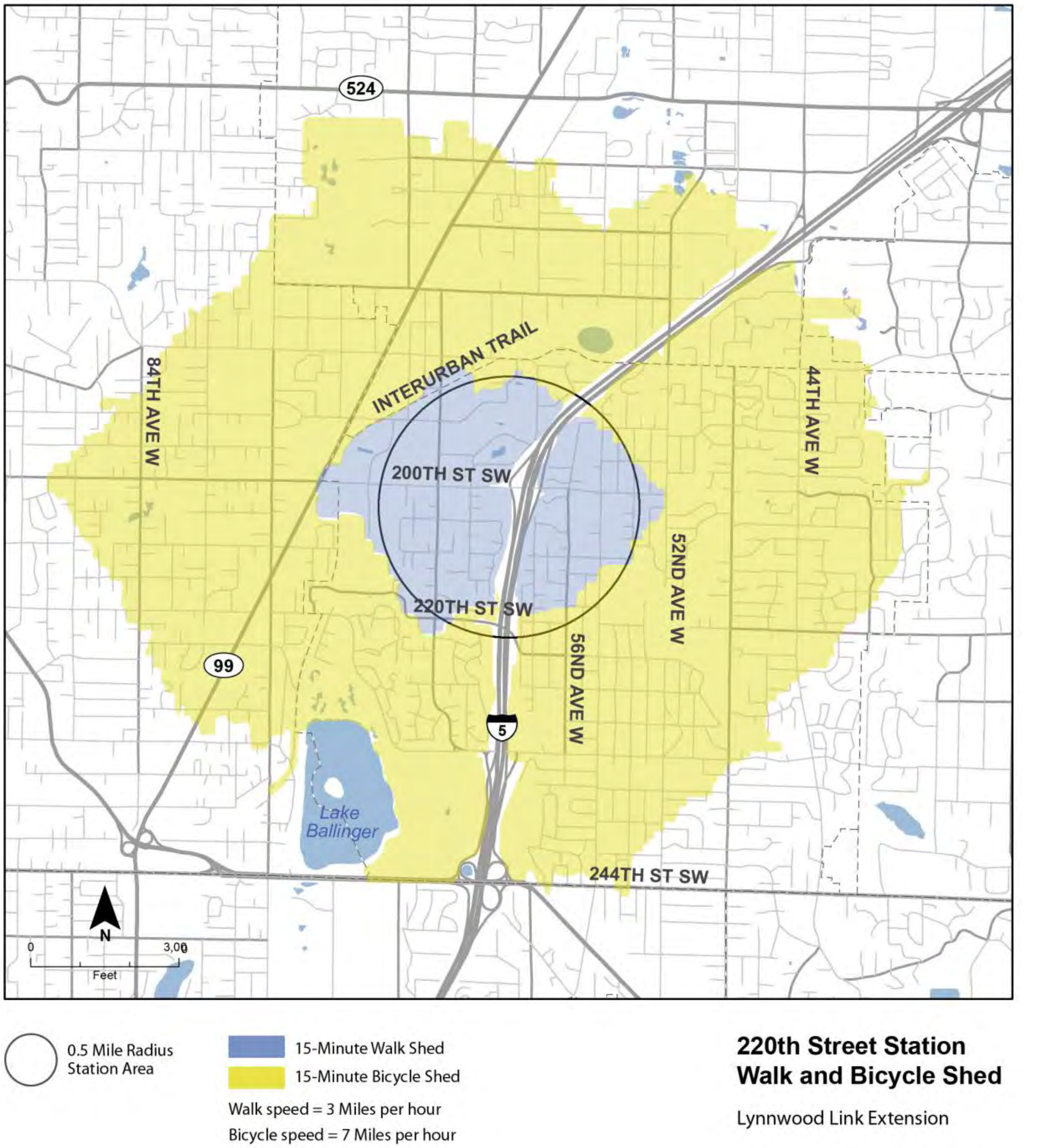


Figure 5-10. 15-minute Walk- and Bicycle-shed—220th Street SW- Station

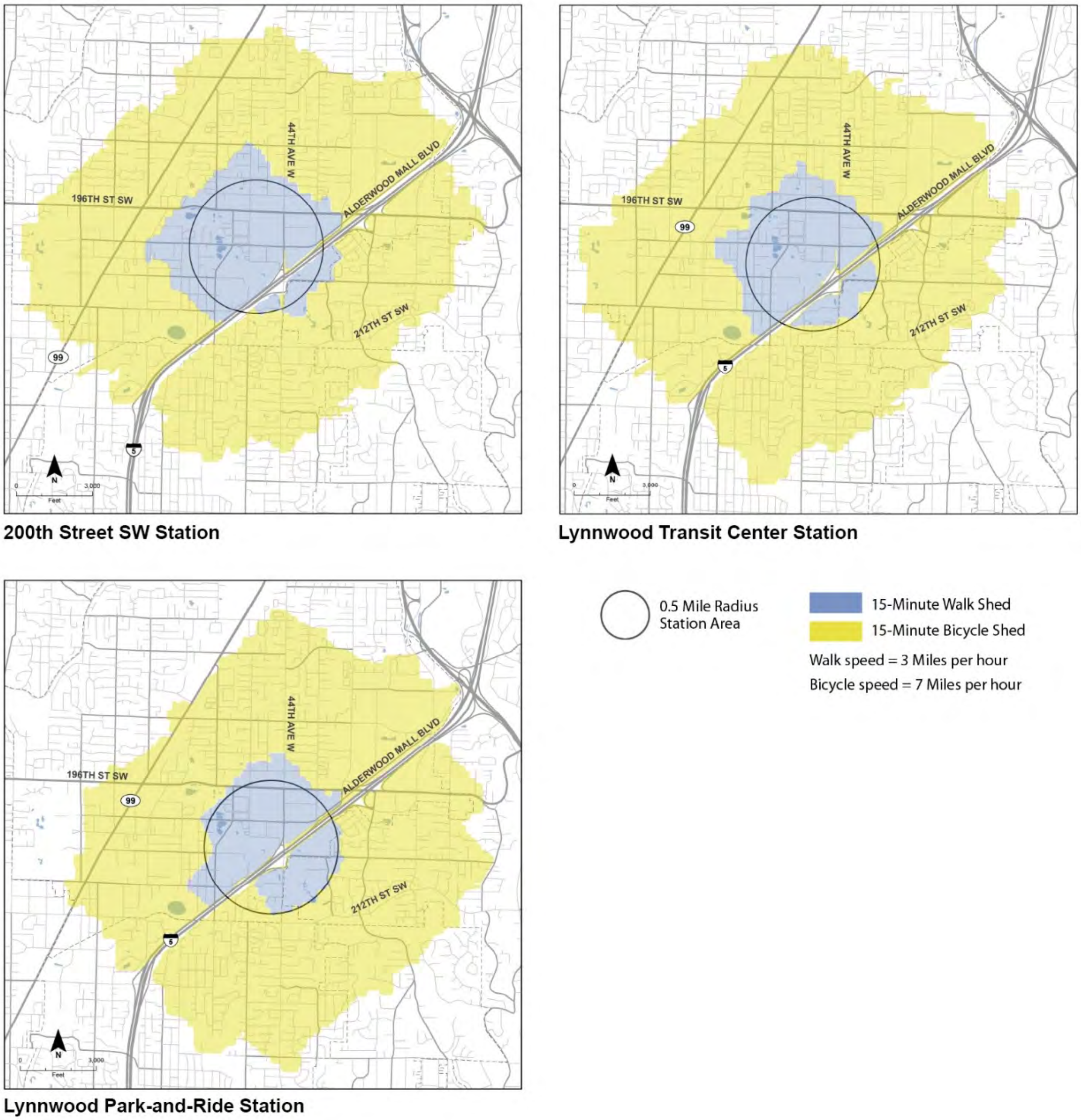


Figure 5-11. 15-minute Walk- and Bicycle-shed—Lynnwood Transit Center Station Alternatives

Table 5-10. Walkshed and Bicycleshed Population and Employment for Forecast Year 2030

Station	Walkshed		Bicycleshed	
	2030 Population	2030 Employment	2030 Population	2030 Employment
NE 130th Street Station	5,700	700	55,400	35,200
NE 145th Street Station	6,400	1,300	43,500	14,300
NE 155th Street Station	6,300	500	32,700	12,300
NE 185th Street Station	5,500	1,300	30,900	8,900
Mountlake Terrace Transit Center Station	4,900	1,200	27,800	11,600
Mountlake Terrace Freeway Station	5,000	1,000	23,600	9,800
220th Street SW Station	4,700	6,000	37,600	20,500
Lynnwoood Park-and-Ride Station	4,300	6,600	44,900	39,500
Lynnwood Transit Center Station	4,600	6,400	40,800	37,200
200th Street SW Station	5,900	7,400	43,300	43,300

Source: PSRC Land Use Forecast, 2006

Transit Travel Times

Tables 5-11 and 5-12 show estimated AM peak-period transit travel times from Shoreline and Lynnwood, respectively, to regional destinations for the No Build Alternative and light rail alternatives in forecast year 2035. Travel times are shown for light rail scenarios with four, five, and six stations, respectively. Bus travel times are based on existing scheduled travel times, adjusted to reflect estimated future roadway congestion, while light rail travel times are based on estimated future actual travel times. Travel times under the No Build Alternative are expected to increase compared with existing conditions because bus speeds in general purpose and HOV freeway lanes would degrade with increasing traffic congestion. Travel times to all regional destinations would be shorter with the light rail alternatives, with trips to Northgate from Lynnwood up to 12 minutes faster and trips to downtown Seattle from Lynnwood up to 16 minutes faster than the No Build Alternative, which relies on bus travel in congested mixed traffic for portions of its route.

Table 5-11. 2035 Transit Travel Times (minutes) from Shoreline for AM Peak Period Southbound

Destination	No Build Alternative	Light Rail Alternatives	
		4 Stations	5/6 Stations
Northgate	10	3	4
University of Washington	22	11	12
Capitol Hill	26	14	15
Downtown Seattle	22	16	17
Sea-Tac Airport	63	51	52
Downtown Bellevue	53	41	42
Overlake	63	51	52

Sources: No Build Alternatives: King County Metro Trip Planner, http://metro.kingcounty.gov/, representative trip selected and adjusted for future estimated roadway congestion. Light rail alternatives: Sound Transit light rail travel time estimates

Table 5-12. 2035 Transit Travel Times (minutes) from Lynnwood for AM Peak Period Southbound

Destination	No Build Alternative	Light Rail Alternatives		
		4 Stations	5 Stations	6 Stations
Northgate	26	14	15	16
University of Washington	38	22	23	24
Capitol Hill	42	25	26	27
Downtown Seattle	43	27	28	29
Sea-Tac Airport	79	62	63	64
Downtown Bellevue	55	52	53	54
Overlake	79	62	63	64

Sources: No Build Alternatives: King County Metro Trip Planner, http://metro.kingcounty.gov/, representative trip selected and adjusted for future estimated roadway congestion. Light rail alternatives: Sound Transit light rail travel time estimates

Transit travel times during the PM peak period from regional destinations to Shoreline and Lynnwood, respectively, are presented in Tables 5-13 and 5-14. Similar to AM peak southbound trips, travel times from all regional destinations would be shorter with the light rail alternatives, with trips from Northgate to Lynnwood up to 10 minutes faster and trips from downtown Seattle to Lynnwood up to 15 minutes faster than the No Build Alternative.

Table 5-13. 2035 Transit Travel Times (minutes) to Shoreline for PM Peak Period Northbound

Origin	No Build Alternative	Light Rail Alternatives	
		4 Stations	5/6 Stations
Northgate	10	3	4
University of Washington	22	11	12
Capitol Hill	26	14	15
Downtown Seattle	26	16	17
Sea-Tac Airport	63	51	52
Downtown Bellevue	53	41	42
Overlake	63	51	52

Sources: No Build Alternatives: King County Metro Trip Planner, http://metro.kingcounty.gov/, representative trip selected and adjusted for future estimated roadway congestion. Light rail alternatives: Sound Transit light rail travel time estimates

Table 5-14. 2035 Transit Travel Times (minutes) to Lynnwood for PM Peak Period Northbound

Origin	No Build Alternative	Light Rail Alternatives		
		4 Stations	5 Stations	6 Stations
Northgate	24	14	15	16
University of Washington	36	22	23	24
Capitol Hill	40	25	26	27
Downtown Seattle	42	27	28	29
Sea-Tac Airport	77	62	63	64
Downtown Bellevue	64	52	53	54
Overlake	77	62	63	64

Sources: No Build Alternatives: King County Metro Trip Planner, http://metro.kingcounty.gov/, representative trip selected and adjusted for future estimated roadway congestion. Light rail alternatives: Sound Transit light rail travel time estimates

The southbound bus travel times during the PM peak period to regional destinations from Shoreline and Lynnwood, respectively, are presented in Tables 5-15 and 5-16. Similar to AM peak southbound trips and PM peak northbound trips, travel times to all regional destinations would be shorter with the light rail alternatives, with trips to Northgate from Lynnwood up to 6 minutes faster and trips to downtown Seattle from Lynnwood up to 11 minutes faster than the No Build Alternative.

Table 5-15. 2035 Transit Travel Times (minutes) from Shoreline for PM Peak Period Southbound

Destination	No Build Alternative	Light Rail Alternatives	
		4 Stations	5/6 Stations
Northgate	14	3	4
University of Washington	26	11	12
Capitol Hill	30	14	15
Downtown Seattle	28	16	17
Sea-Tac Airport	67	51	52
Downtown Bellevue	57	41	42
Overlake	67	51	52

Sources: No Build Alternatives: King County Metro Trip Planner, http://metro.kingcounty.gov/, representative trip selected and adjusted for future estimated roadway congestion. Light rail alternatives: Sound Transit light rail travel time estimates

Table 5-16. 2035 Transit Travel Times (minutes) from Lynnwood for PM Peak Period Southbound

Destination	No Build Alternative	Light Rail Alternatives		
		4 Stations	5 Stations	6 Stations
Northgate	20	14	15	16
University of Washington	32	22	23	24
Capitol Hill	36	25	26	27
Downtown Seattle	38	27	28	29
Sea-Tac Airport	73	62	63	64
Downtown Bellevue	55	52	53	54
Overlake	73	62	63	64

Sources: No Build Alternatives: King County Metro Trip Planner, http://metro.kingcounty.gov/, representative trip selected and adjusted for future estimated roadway congestion. Light rail alternatives: Sound Transit light rail travel time estimates

The No Build Alternative transit travel times (forecast year 2035) shown above reflect the planned light rail network extending to Northgate to the north and Overlake to the east. For many of the trips depicted above, passengers would use bus service to travel between Lynnwood/Shoreline and Northgate, and light rail between Northgate and other regional destinations. These bus routes would travel in mixed traffic under varying degrees of congestion, hence adding delays to the trip. These times also incorporate transfer times between bus routes if more than one route is needed to complete the trip, as well as between bus and rail.

In addition to these travel times, as listed in Tables 5-11 through 5-16, the total transit travel time would also include the time to access the bus as a pedestrian, bicyclist, passenger, or driver. The wait time for a bus would be dependent on the service reliability (adherence to schedule). If the scheduled bus arrival time is unreliable, then the riders must arrive prior to the scheduled time and wait until the bus arrives either on time or late, adding to the total travel time. Bus reliability is an

LOS factor discussed in a subsequent section. An analysis of transfer requirements for transit users is discussed below.

Transfers

When transit riders need to transfer to make a trip, they may see the transit system as being too complex and their travel times can feel longer or more unpredictable. As a result, they may choose not to use transit for the trip. However, the quality of transfers, whether between buses or between bus and rail, has a dramatic impact on the overall perception of transfers. Factors determining the quality of transfers include proximity of transfer location, wait time, waiting area conditions, service reliability, safety and security, and availability of real-time arrival information.

Wait time is a function of the service frequency on the route to which a transit user is transferring and/or the ability to provide reliable “timed transfer” connections. There is evidence that quality transfers are acceptable and can be only a minor impediment. For example, King County Metro, which historically has been one of the strongest advocates of the “one-seat ride,” has been implementing a new “multi-centered” route structure focused on a series of transit “hubs” where convenient transfers can be made to multiple destinations. The key to the acceptance and success of these systems is safe, appealing, and protected transfer facilities together with more frequent service and/or timed transfers, thereby resulting in negligible impacts on ridership.

Transfers can be measured by a systemwide transfer rate, which is the average number of transit boardings per transit trip. Table 5-17 provides the transfer rate for the existing base year (2011) as well as the projected transfer rate for the forecast year (2035) under the No Build Alternative and for the light rail alternatives. Overall, the transfer rate is estimated to increase from the base year (1.39) to the No Build Alternative (1.51). This can be attributed to an increase in riders transferring from local bus service to the planned light rail extensions to Northgate and Overlake. The transfer rates are expected to stay relatively similar for the No Build Alternative and the light rail alternatives. A slight reduction in transfer rate is predicted with the light rail alternatives because riders using the Lynnwood Link Extension would have a no-transfer, one-seat ride to regional destinations accessible via the light rail network. Transfers may be required to travel to destinations to the east, including downtown Bellevue and Overlake. Also, transfers in some parts of the regional system could increase as more riders use light rail for a part of their trip because it could reduce their overall travel times.

Table 5-17. Transit Transfer Rates for the Base Year (2011) and Forecast Year (2035)

	Base Year	No Build Alternative	Light Rail Alternatives
Transfer Rate	1.39	1.51	1.50
Total Daily (24 hours) Transit Trips	384,000	583,000	605,000 – 606,000
Total Daily Transit Boardings	533,000	878,000	908,000 – 912,000

Source: Sound Transit Ridership Forecasting Model

Level of Service for Service Frequency

Figures 5-12 and 5-13 show the LOS for service frequency for the No Build Alternative and light rail alternatives in forecast year 2035, respectively. As shown in Figure 5-12, the light rail connections created by implementing the Northgate Link Extension and East Link projects for travel connecting downtown Seattle, Capitol Hill, the University District, Northgate, downtown Bellevue, and Sea-Tac Airport were not evaluated. For the majority of those origin-destination pairs with no-transfer, one seat service under the No Build Alternative, the LOS for service frequency is expected to be LOS C.

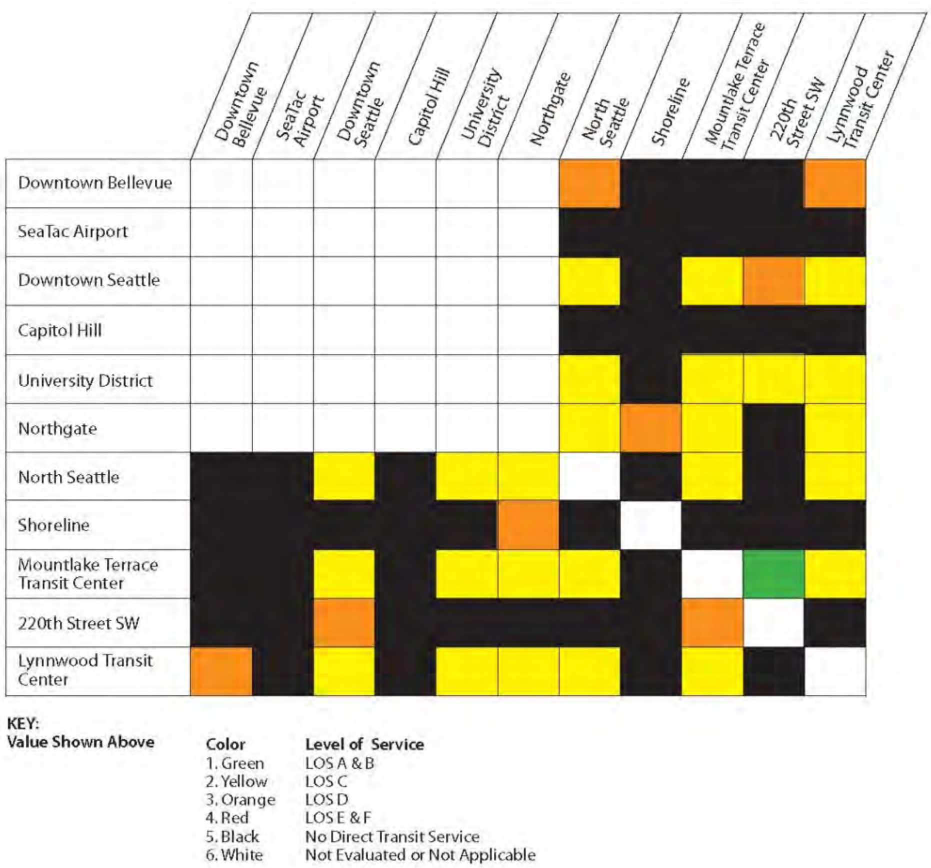


Figure 5-12. No Build Alternative LOS for Service Frequency in Forecast Year 2035

As shown in Figure 5-13, the implementation of the Lynnwood Link Extension (forecast year 2035) improves the quality of service to LOS A for connections between north Seattle, Shoreline, Mountlake Terrace Transit Center, 220th Avenue SW, Lynnwood Transit Center, and the rest of the Link light rail system.

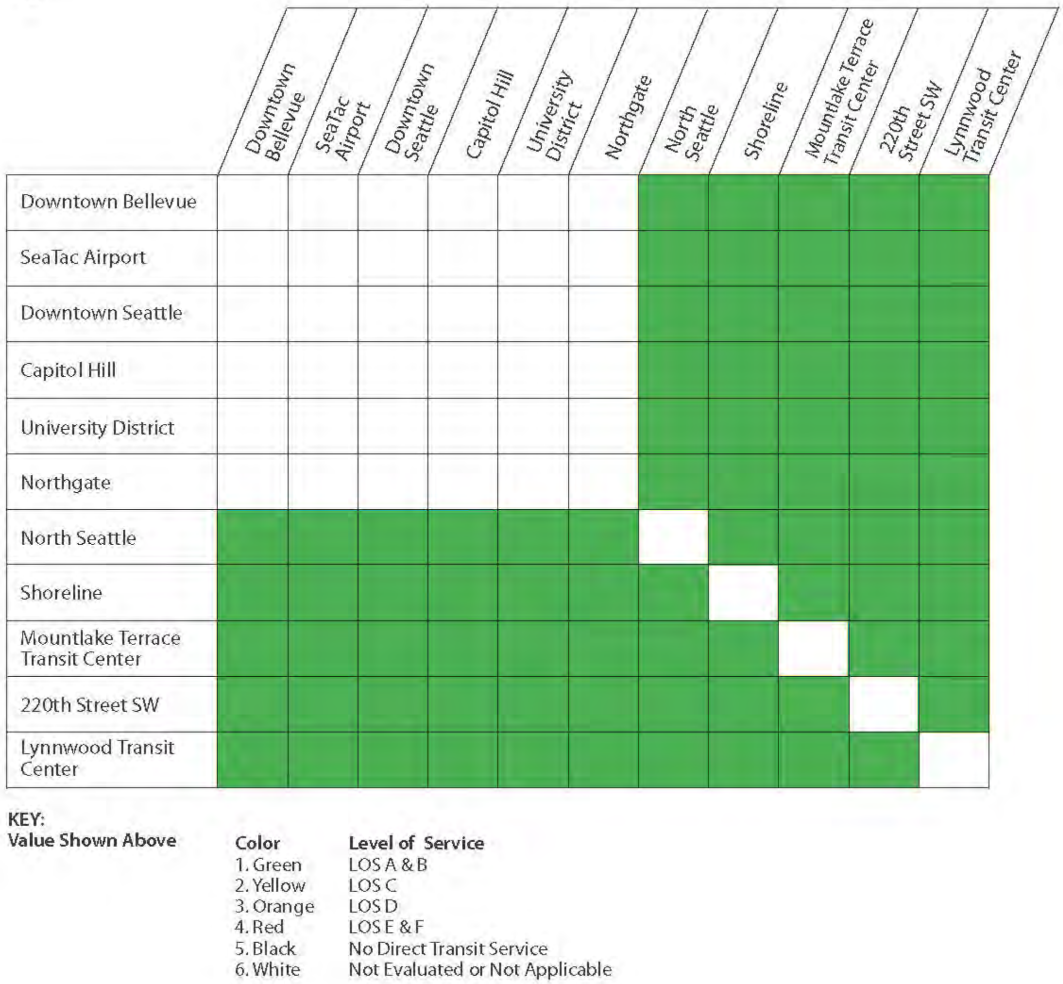


Figure 5-13. Light Rail Alternatives LOS for Service Frequency in Forecast Year 2035

Level of Service for Hours of Service

Figures 5-14 and 5-15 show the LOS for hours of service for the No Build Alternative and light rail alternatives in forecast year 2035, respectively. As shown in Figure 5-14, the light rail connections created by implementing the Northgate Link Extension and East Link projects for travel connecting downtown Seattle, Capitol Hill, the University District, Northgate, downtown Bellevue, and Sea-Tac Airport were not evaluated.

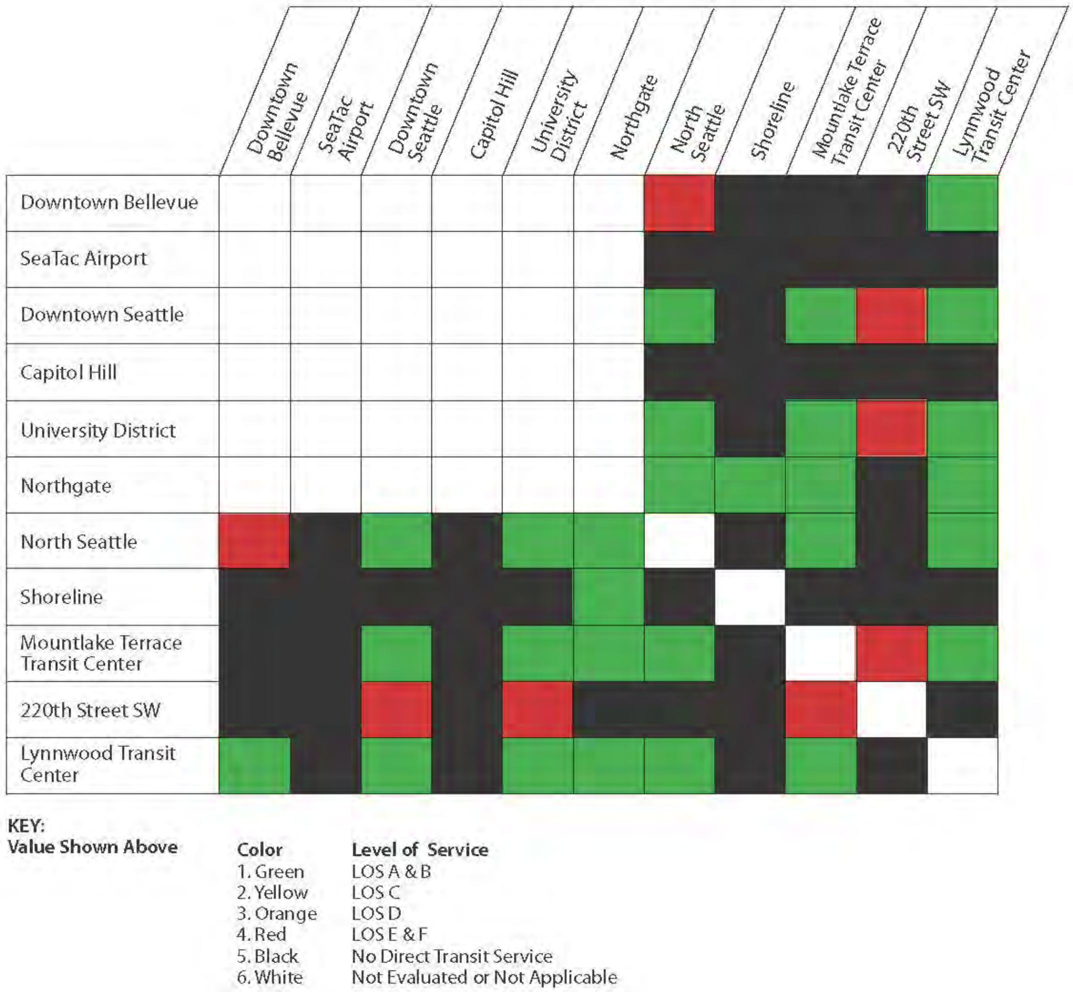


Figure 5-14. No Build Alternative LOS for Hours of Service in Forecast Year 2035

As shown in Figure 5-15, implementing the Lynnwood Link Extension improves the hours of service to LOS A for no-transfer, one-seat service between, in particular, Shoreline, 220th Street SW, and the rest of the Link light rail system.

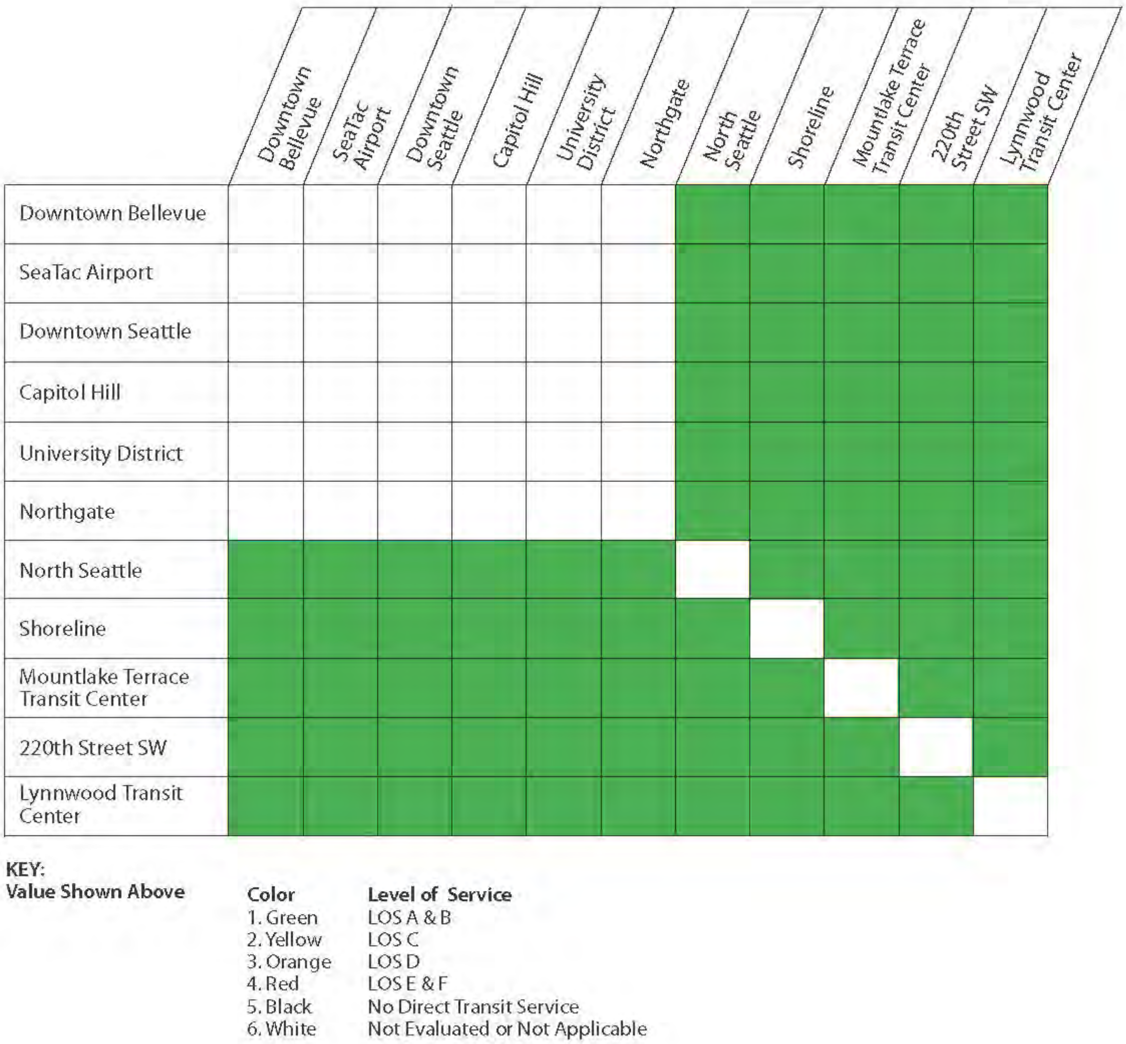


Figure 5-15. Light Rail Alternatives LOS for Hours of Service in Forecast Year 2035

Level of Service for Passenger Load

Passenger load LOS for the No Build Alternative and the light rail alternatives (forecast year 2035) were estimated using passenger volume forecasts from the Sound Transit Ridership Model, and calculated in accordance with the TCQSM guidelines. Table 5-18 shows the PM peak-hour passenger load LOS on bus routes and light rail on I-5, SR 99, and other north-south facilities at three screenline locations for the No Build Alternative and light rail alternatives (forecast year 2035). With the No Build Alternative, the passenger load LOS for bus service is expected to be LOS E or F. For the light rail alternatives, bus service on parallel north-south facilities would be LOS A or B, while light rail LOS would be LOS A for all screenlines and directions, except for the northbound direction north of Northgate, where passenger loads would reach LOS C.

Table 5-18. PM Peak Hour Passenger Load Factors in Forecast Year 2035

		No Build Alternative	Light Rail Alternatives	
Screenline Location	**Direction**	**Bus LOS**	**Bus LOS**	**Light Rail LOS**
Screenline 1: North of NE Northgate Way	Northbound	E	A	C
	Southbound	F	A	A
Screenline 2: South of 205th Street	Northbound	E	A	A
	Southbound	F	A	A
Screenline 3: North of 112th Street SW	Northbound	E	A	A
	Southbound	E	B	A

Source: Sound Transit Ridership Model, 2011

Level of Service for Reliability and On-time Performance

Reliability of bus service in forecast year 2035 for the No Build Alternative is expected to degrade in comparison with existing conditions as traffic congestion on freeways and arterials in the project corridor continues to worsen. Forecasts show future speeds will decrease along I-5 as congestion increases. Poor bus reliability could result in buses arriving close together (bunched) rather than at scheduled intervals, as well as buses being unable to meet scheduled arrival times. Light rail operating within the corridor would be more reliable because it would operate in an exclusive right-of-way for the entire length of the corridor. However, light rail reliability in the corridor could be subject to delays experienced elsewhere in the system where the light rail segment is operating at-grade.

5.2.2 Local and Sub-Regional Bus Transit

As discussed in Section 5.4.2, congested traffic operations with the No Build and light rail alternatives could affect the reliability of local bus service near stations. Near the NE 145th Street Station, the impact of additional traffic associated with that station would contribute to already congested conditions (LOS E–F), which could impair the ability of local bus service to provide reliable access to the station. Near the Lynnwood station options, congested traffic operations in the No Build condition along 196th Street would similarly affect local bus service and the access provided to the station.

Bus routes on I-5 would be restructured to remove duplication of service with light rail. Local transit service could be restructured to reduce duplication and to provide improved or new connections to the Lynnwood Link Extension. Additional routes would achieve desirable goals for frequency and coverage by establishing local service to the light rail stations but would require additional resources. Local route changes will require a public comment process and council or board approval to implement the changes. The following sections describe some conceptual options for modification of local bus operations. Additional information on the conceptual bus options is provided in Section 5.2.1.

Segment A: Seattle to Shoreline

Alternative A1: At-grade/Elevated with NE 145th and NE 185th Street Stations

NE 145th Street Station

Local routes stopping at the North Jackson Park-and-Ride lot could be combined with local service parallel to the light rail corridor to provide a more frequent service to the NE 145th Street Station. Local bus riders taking a short trip who are currently on routes parallel to the proposed light rail alignment could experience reduced frequency of service if new routes are not added. Riders who are on local bus routes and taking a longer trip could benefit by frequent service and a transfer to light rail. Routes selected for rerouting to the light rail stations could be those that currently carry more long-distance riders.

NE 185th Street Station

The combined bus routes developed to provide more frequent service to the NE 145th Street Station could be rerouted to provide frequent service to the NE 185th Street Station. An existing route on NE 185th Street that terminates at the Aurora Village Transit Center could be terminated at the NE 185th Street Station. Local transit service on NE 175th Street could be shifted to NE 185th Street. Bus rerouting to NE 175th Street and 5th Avenue NE could necessitate improvements to the tight turning radius around the northeast corner. This turn is currently problematic for buses.

Community Transit's SR 99 *Swift* bus rapid transit service, which currently terminates at the Aurora Village Transit Center, could be extended to the south and east to terminate at the NE 185th Street Station, providing high frequency connections to light rail. Potential transit priority treatments along NE 185th Street could be considered in the Final EIS.

Alternative A3: Mostly Elevated with NE 145th and NE 185th Street Stations

NE 145th Street Station

Alternative A3 local transit impacts could be the same as with Alternative A1.

NE 185th Street Station

Alternative A3 local transit impacts could be the same as with Alternative A1.

Alternative A5: At-grade/Elevated with NE 130th, NE 155th, and NE 185th Street Stations

NE 130th Street Station

Under Alternative A5, the transit route restructuring for the NE 130th Street Station could be very similar to the restructuring for the NE 145th Street Station.

NE 155th Street Station

The frequency of the existing route on NE 155th Street, from Lake City to Shoreline Community College, with Alternative A5 could be enhanced with an increase in service frequency.

NE 185th Street Station

Alternative A5 local transit impacts could be the same as with Alternative A1.

Alternative A7: Mostly Elevated with NE 130th, NE 155th, and NE 185th Street Stations

NE 130th Street Station

Alternative A7 local transit impacts could be the same as with Alternative A5.

NE 155th Street Station

Alternative A7 local transit impacts could be the same as with Alternative A5.

NE 185th Street Station

Alternative A7 local transit impacts could be the same as with Alternatives A1 and A5.

Alternative A10: At-grade/Elevated with NE 130th, NE 145th, and NE 185th Street Stations

NE 130th Street Station

Alternative A10 local transit impacts could be similar to Alternative A1, with local service connections to the light rail stations shared between the NE 130th Street Station and NE 145th Street Station.

NE 145th Street Station

Alternative A10 local transit impacts would be similar to Alternative A1, with local service connections to the light rail stations shared between the NE 130th Street Station and NE 145th Street Station.

NE 185th Street Station

Alternative A10 local transit impacts could be the same as Alternative A1.

Alternative A11: Mostly Elevated with NE 130th, NE 145th, and NE 185th Street Stations

NE 130th Street Station

Local transit impacts with Alternative A11 could be the same as with Alternative A10.

NE 145th Street Station

Local transit impacts with Alternative A11 could be the same as with Alternative A10.

NE 185th Street Station

Local transit impacts with Alternative A11 could be the same as with -Alternative A10.

Segment B: Shoreline to Mountlake Terrace

Alternative B1: East Side to Mountlake Terrace Transit Center to Median

Mountlake Terrace Transit Center Station

The existing local service is focused on the Mountlake Terrace Transit Center due to its size and connections to existing regional transit service. Therefore, the frequency of local service could be increased as funding allows in order to feed the higher frequency and higher capacity of light rail service with Alternative B1. Buses using the Mountlake Terrace Freeway flyer stop could be truncated by dropping off passengers to connect to light rail and the turnaround at the SR 104 interchange. Some buses could continue as regional bus service to destinations farther south, depending on the origin and destination of the riders.

Alternative B2: East Side to Mountlake Terrace Transit Center to West Side

Mountlake Terrace Transit Center Station

The frequency of local service could be increased as funding allows in order to feed the higher frequency and capacity of light rail service. The effects on buses at the Mountlake Terrace Freeway Station with Alternative B2 would be the same as with Alternative B1.

Alternative B2A: Optional 220th Street SW Station (elevated)

220th Street SW Station

The frequency of local service could be increased as funding allows in order to feed the higher frequency and capacity of light rail service under Alternative B2A.

Alternative B4: East Side to Mountlake Terrace Freeway Station to Median

Mountlake Terrace Freeway Station

Bus routes currently serving the Mountlake Terrace Freeway Station would be eliminated to reduce duplication with light rail service with Alternative B4 or rerouted to access the Mountlake Terrace Transit Center on arterial streets. The frequency of local service could be increased as funding allows in order to feed the higher frequency and capacity of light rail service.

Segment C: Mountlake Terrace to Lynnwood

Alternative C1: 52nd Avenue West to 200th Street SW

200th Street SW Station

The existing local service is focused on the Lynnwood Transit Center due to its size and connections to existing regional transit service. Therefore, the frequency of local service could be increased as funding allows in order to feed the higher frequency and capacity of light rail service with Alternative C1.

Alternative C2: 52nd Avenue West to Lynnwood Transit Center

Lynnwood Transit Center Station

The frequency of local service could be increased as funding allows in order to feed the higher frequency and capacity of light rail service with Alternative C2.

Alternative C3: Along I-5 to Lynnwood Park-and-Ride

Lynnwood Park-and-Ride Station

The frequency of local service could be increased as funding allows in order to feed the higher frequency and capacity of light rail service with Alternative C3.

5.3 Freeway Operations

This section discusses future freeway operations within the project corridor and the potential effects that the project would have on operations. Key observations and findings include the following:

- Freeway operations were analyzed in detail for the segment of I-5 that includes the NE 130th Street and NE 145th Street interchanges because these are the only two interchanges that may potentially be physically modified with any of the light rail alternatives.

- In the No Build Alternative (forecast year 2035), freeway mainline traffic during peak periods in the peak direction of travel is expected to operate at congested conditions, with AM southbound speeds at approximately 25 mph or slower and PM northbound speeds ranging from 15 mph south of the NE 130th Street off-ramp to 50 mph north of the off-ramp. Although not analyzed specifically, HOV lane performance is also forecasted to degrade, particularly in the peak direction, affecting reliability and travel times for bus transit.

- For the light rail alternatives (forecast year 2035), during the AM peak hour, freeway speeds and operations are not expected to be substantially affected by the additional traffic generated by the park-and-ride lots. However, freeway operations could be affected in some measure by potential minor slowdowns along southbound I-5 approaching the NE 145th Street off-ramp for alternatives that include a station at NE 145th Street. The minor slowdowns on southbound I-5 are likely a result of the operations along NE 145th Street causing increased congestion on the southbound off-ramp, not a result of the conditions along I-5.

- During the PM peak hour, the three at-grade alternatives (Alternatives A1, A5, and A10) would provide improved freeway operations along northbound I-5 due to the reconfiguration of the northbound NE 130th Street off-ramp and the resulting removal of the off-ramp stop control at the intersection with 5th Avenue NE. In the southbound direction, speeds on I-5 could decrease with alternatives that include a NE 145th Street Station due to congestion on the southbound off-ramp caused by increased congestion along NE 145th Street. In addition, the project would likely reduce the number of buses in the I-5 HOV lanes, which would create additional HOV capacity and improve HOV operations and speeds compared with the No Build Alternative.

5.3.1 Freeway Volumes

For the No Build Alternative (forecast year 2035), freeway volumes were estimated using growth rates derived from the PSRC Regional Model: WSDOT Project Version. The growth rates were applied to existing traffic volumes and modeled in VISSIM traffic operations software. The VISSIM model was prepared and calibrated for existing conditions for Segment A with a focus on the NE 130th Street and NE 145th Street I-5 interchanges. Estimated 2035 freeway volumes are shown in Figures 5-16 and 5-17 for the AM and PM peak hours, respectively.

The I-5 mainline volumes between the NE 130th Street interchange and the NE 145th Street interchange are expected to increase by approximately 4 percent over existing conditions, except for the off-peak, northbound direction in the AM peak hour, which would increase by approximately 12 percent over existing conditions. These forecasts reflect higher growth in the northbound direction during the AM peak hour since it is currently not operating at full capacity and has more room for growth.

Traffic volumes with each light rail alternative are generated by the station area activity and include traffic to and from the park-and-ride and passenger pick-up and drop-off area. This station area traffic is assumed to arrive at the station using local streets. Changes in freeway operations with the light rail alternatives would result from reconstruction and geometric changes at the interchanges that would affect the freeway traffic flow and, in some cases, congestion on the local streets could affect I-5 off-ramps and subsequently the I-5 mainline. NE 130th Street and NE 145th Street are the two interchanges with proposed modifications to the interchange and/or ramp terminal intersections; therefore, these are analyzed in more detail using the VISSIM microsimulation software.

Freeway Speeds and Level of Service

By 2035, freeway operations near the NE 130th Street and NE 145th Street interchanges would worsen over today's already congested conditions for the No Build Alternative. Freeway speeds and densities are an output of the VISSIM model and are a direct reflection of congestion. The LOS is calculated from the densities based on the Highway Capacity Manual methodology. Tables 5-19 and 5-20 show the AM peak hour freeway speeds and LOS for the No Build Alternative and light rail alternatives in forecast year 2035, respectively; Tables 5-21 and 5-22 show the PM peak hour speeds and LOS; and Figure 5-18 indicates the freeway segment locations. The results are discussed below.

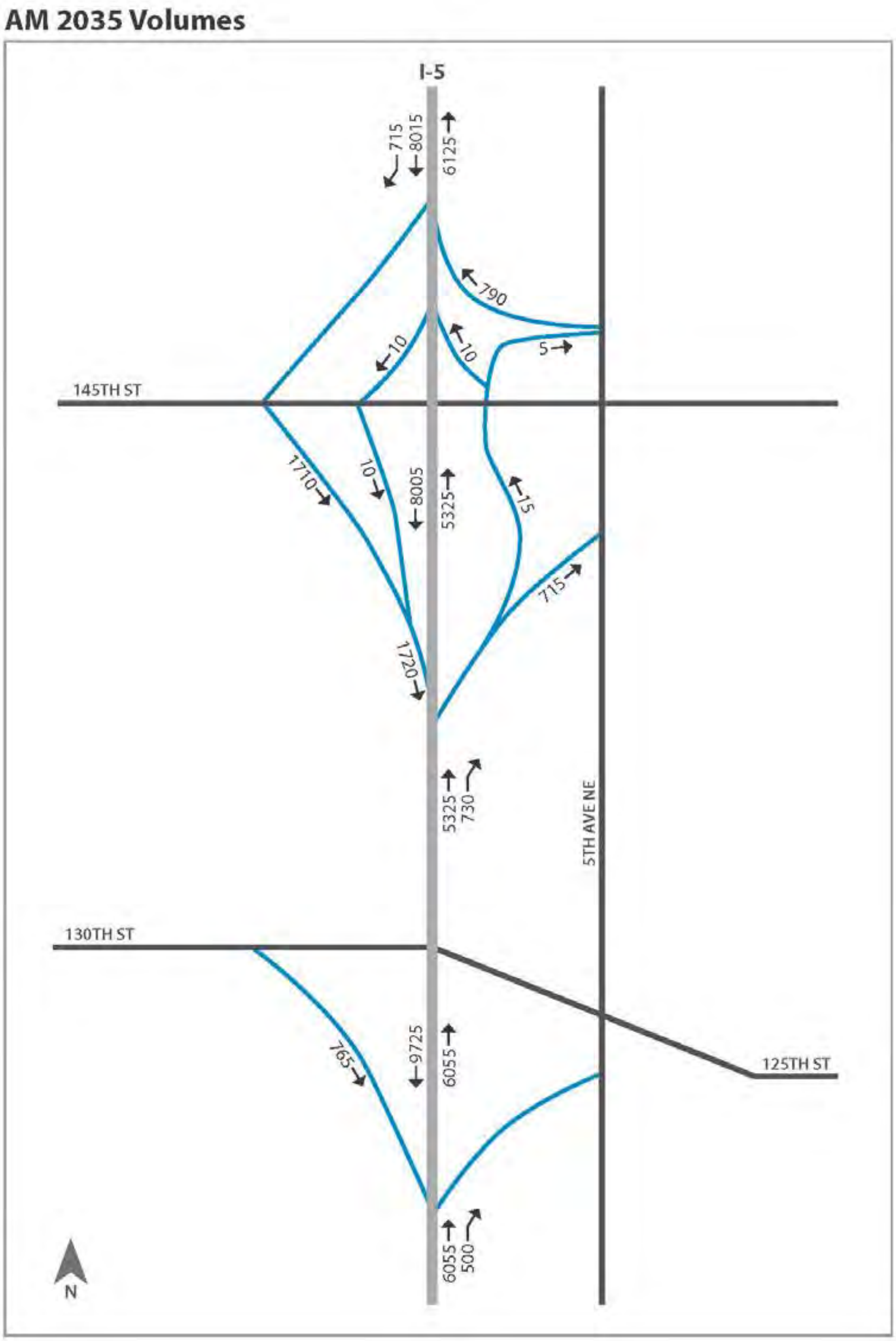


Figure 5-16. 2035 AM Peak Hour Freeway Volumes

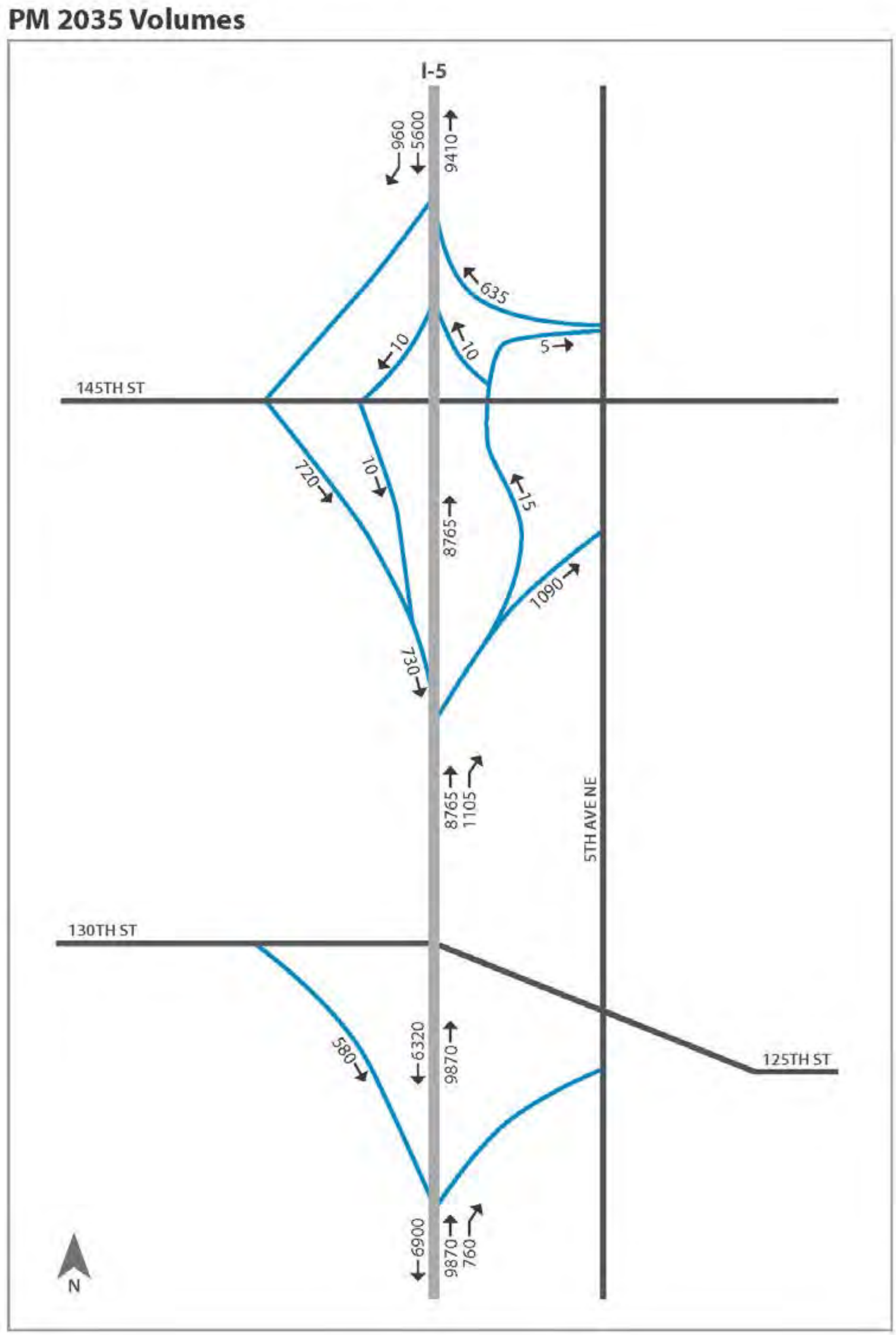


Figure 5-17. 2035 PM Peak Hour Freeway Volumes

Table 5-19. Forecast Year 2035 AM Peak Hour Freeway Speeds

ID	I-5 Segment	Segment Type	No Build Alternative	Alternative A1	Alternative A3	Alternative A5	Alternative A7	Alternative A10	Alternative A11
N1	Northbound, Northgate on-ramp to NE 130th Street off-ramp	Weave	52	52	52	52	52	52	52
N2	Northbound, north of NE 130th Street off-ramp	Segment	52	52	52	52	52	52	52
N3	Northbound, NE 145th Street off-ramp	Diverge	51	50	51	51	51	51	51
N4	Northbound, NE 145th Street off-ramp to NE 145th Street on-ramp	Segment	56	56	56	56	56	56	56
N5	Northbound, north of NE 145th Street transit on-ramp	Merge	55	55	55	55	55	55	55
N6	Northbound, north of NE 145th Street on-ramp	Merge	53	53	53	53	53	53	53
S1	Southbound, north of NE 145th Street off-ramp	Diverge	26	24	26	30	28	23	30
S2	Southbound, north of NE 145th Street transit off-ramp	Diverge	26	29	22	28	27	43	26
S3	Southbound, NE 145th Street off-ramp to NE 145th Street on-ramp	Segment	20	22	19	23	23	43	22
S4	Southbound, south of NE 145th Street on-ramp	Merge	16	17	16	17	18	37	18
S5	Southbound, north of NE 130th Street on-ramp	Segment	16	17	16	16	17	30	17

Table 5-19. Forecast Year 2035 AM Peak Hour Freeway Speeds

ID	I-5 Segment	Segment Type	No Build Alternative	Alternative A1	Alternative A3	Alternative A5	Alternative A7	Alternative A10	Alternative A11
S6	Southbound, south of NE 130th Street on-ramp	Merge	22	22	21	22	22	29	22

Table 5-20. Forecast Year 2035 AM Peak Hour Freeway LOS

ID	I-5 Segment	Segment Type	No Build Alternative	Alternative A1	Alternative A3	Alternative A5	Alternative A7	Alternative A10	Alternative A11
N1	Northbound, Northgate on-ramp to NE 130th Street off-ramp	Weave	C	C	C	C	C	C	C
N2	Northbound, north of NE 130th Street off-ramp	Segment	C	C	C	C	C	C	C
N3	Northbound, NE 145th Street off-ramp	Diverge	C	C	C	C	C	C	C
N4	Northbound, NE 145th Street off-ramp to NE 145th Street on-ramp	Segment	C	C	C	C	C	C	C
N5	Northbound, north of NE 145th Street transit on-ramp	Merge	B	B	B	B	B	B	B
N6	Northbound, north of NE 145th Street on-ramp	Merge	C	C	C	C	C	C	C

Table 5-20. Forecast Year 2035 AM Peak Hour Freeway LOS

ID	I-5 Segment	Segment Type	No Build Alternative	Alternative A1	Alternative A3	Alternative A5	Alternative A7	Alternative A10	Alternative A11
S1	Southbound, north of NE 145th Street off-ramp	Diverge	F	F	F	F	F	F	F
S2	Southbound, north of NE 145th Street transit off-ramp	Diverge	F	F	F	F	F	E	F
S3	Southbound, NE 145th Street off-ramp to NE 145th Street on-ramp	Segment	F	F	F	F	F	F	F
S4	Southbound, south of NE 145th Street on-ramp	Merge	F	F	F	F	F	F	F
S5	Southbound, north of NE 130th Street on-ramp	Segment	F	F	F	F	F	F	F
S6	Southbound, south of NE 130th Street on-ramp	Merge	F	F	F	F	F	F	F

Table 5-21. Forecast Year 2035 PM Peak Hour Freeway Speeds

ID	I-5 Segment	Segment Type	No Build Alternative	Alternative A1	Alternative A3	Alternative A5	Alternative A7	Alternative A10	Alternative A11
N1	Northbound, Northgate on-ramp to NE 130th Street off-ramp	Weave	16	23	15	21	14	19	14
N2	Northbound, north of NE 130th Street off-ramp	Segment	48	42	45	44	49	43	48

Table 5-21. Forecast Year 2035 PM Peak Hour Freeway Speeds

ID	I-5 Segment	Segment Type	No Build Alternative	Alternative A1	Alternative A3	Alternative A5	Alternative A7	Alternative A10	Alternative A11
N3	Northbound, NE 145th Street off-ramp	Diverge	42	36	41	38	44	36	43
N4	Northbound, NE 145th Street off-ramp to NE 145th Street on-ramp	Segment	48	46	47	49	53	43	52
N5	Northbound, north of NE 145th Street transit on-ramp	Merge	46	45	46	46	50	41	49
N6	Northbound, north of NE 145th Street on-ramp	Merge	42	38	40	40	46	35	45
S1	Southbound, north of NE 145th Street off-ramp	Diverge	30	17	16	29	26	16	15
S2	Southbound, north of NE 145th Street transit off-ramp	Diverge	53	51	52	52	52	50	51
S3	Southbound, NE 145th Street off-ramp to NE 145th Street on-ramp	Segment	58	58	58	58	58	58	58
S4	Southbound, south of NE 145th Street on-ramp	Merge	58	58	58	58	58	58	58
S5	Southbound, north of NE 130th Street on-ramp	Segment	58	58	58	58	58	58	58
S6	Southbound, south of NE 130th Street on-ramp	Merge	52	53	53	53	52	53	53

Table 5-22. Forecast Year 2035 PM Peak Hour Freeway LOS

ID	I-5 Segment	Segment Type	No Build Alternative	Alternative A1	Alternative A3	Alternative A5	Alternative A7	Alternative A10	Alternative A11
N1	Northbound, Northgate on-ramp to NE 130th Street off-ramp	Weave	F	F	F	F	F	F	F
N2	Northbound, north of NE 130th Street off-ramp	Segment	E	F	E	E	E	E	E
N3	Northbound, NE 145th Street off-ramp	Diverge	E	F	F	F	E	F	E
N4	Northbound, NE 145th Street off-ramp to NE 145th Street on-ramp	Segment	E	E	E	D	D	E	D
N5	Northbound, north of NE 145th Street transit on-ramp	Merge	D	D	D	D	C	E	D
N6	Northbound, north of NE 145th Street on-ramp	Merge	E	E	E	E	D	F	E
S1	Southbound, north of NE 145th Street off-ramp	Diverge	F	F	F	F	F	F	F
S2	Southbound, north of NE 145th Street transit off-ramp	Diverge	C	C	C	C	C	C	C
S3	Southbound, NE 145th off-ramp to NE 145th Street on-ramp	Segment	C	C	C	C	C	C	C
S4	Southbound, south of NE 145th Street on-ramp	Merge	C	C	B	C	C	C	B

Table 5-22. Forecast Year 2035 PM Peak Hour Freeway LOS

ID	I-5 Segment	Segment Type	No Build Alternative	Alternative A1	Alternative A3	Alternative A5	Alternative A7	Alternative A10	Alternative A11
S5	Southbound, north of NE 130th Street on-ramp	Segment	C	C	C	C	C	C	C
S6	Southbound, south of NE 130th Street on-ramp	Merge	C	C	C	C	C	C	C

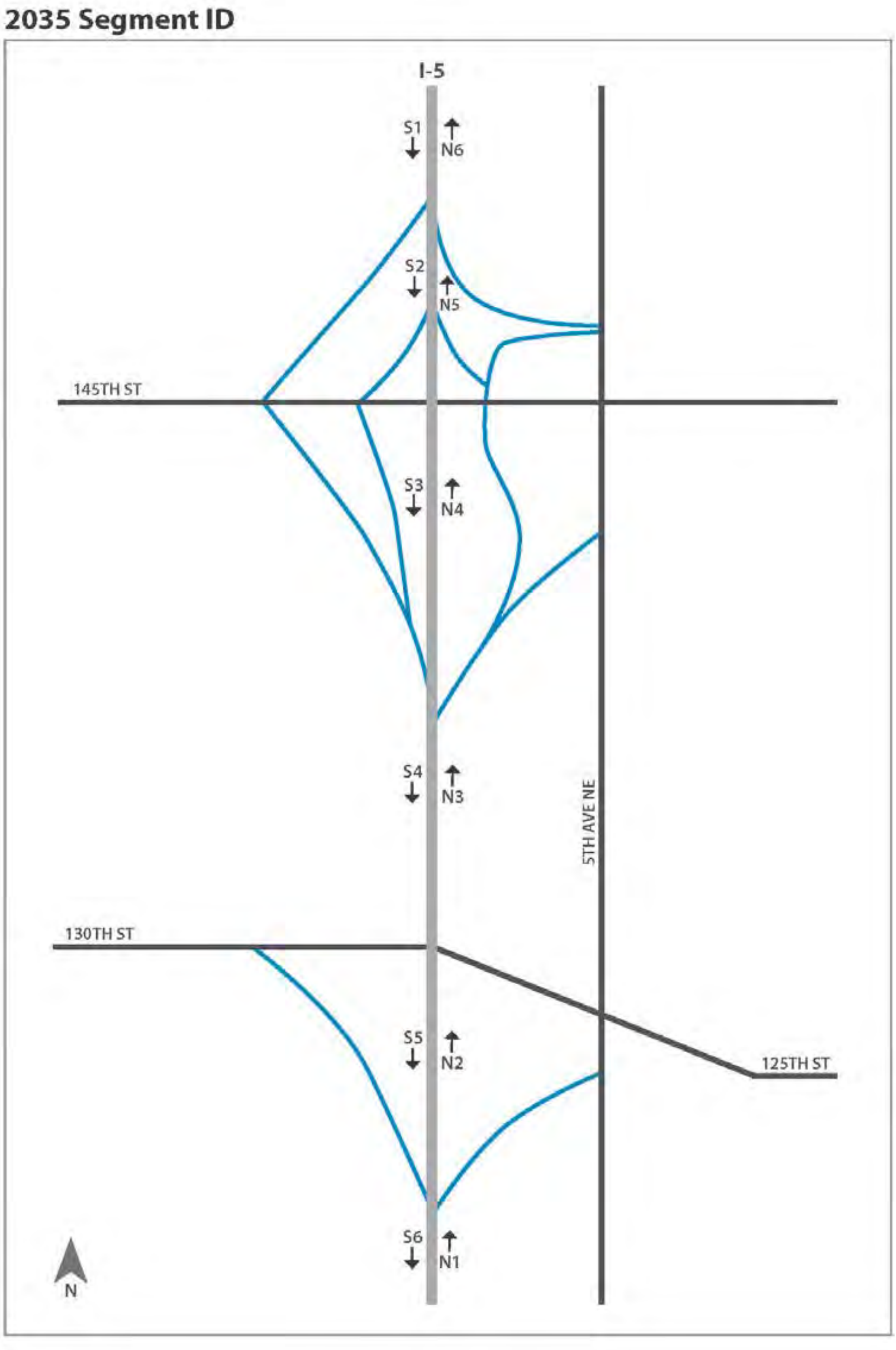


Figure 5-18. I-5 Freeway Segments for Freeway Operations Analysis

Freeway Operations for the No Build Alternative

During the AM peak hour, average speeds along southbound I-5 would be approximately 25 mph or slower with the No Build Alternative (forecast year 2035). These very congested conditions would continue to be caused by high demand or entering and exiting traffic. In the northbound (off-peak) direction, I-5 would operate with average speeds ranging from 51 mph to 56 mph. The congested conditions southbound are also reflected in the LOS, resulting in LOS F operations, while the northbound direction would generally operate at LOS C, indicating free-flow conditions.

During the PM peak hour, average northbound travel speeds would range from approximately 15 mph south of the NE 130th Street off-ramp to approximately 50 mph north of this interchange. I-5 would continue to operate under very congested conditions (LOS E and F), with high volumes of diverging traffic at both NE 130th Street and NE 145th Street causing delay and spill-back onto the I-5 mainline. Some of the northbound speeds would increase from existing operations in certain sections due to bottlenecks along I-5, which effectively meter traffic that can pass through so that when through the bottleneck, traffic speeds up. This would likely occur in the northbound direction due to the bottleneck caused by the northbound NE 130th Street off-ramp.

Southbound (off-peak) speeds on I-5 would range from approximately 30 mph to 60 mph within the area analyzed. On the freeway mainline segment approaching NE 145th Street, southbound off-ramp volumes cause delays and queues that extend onto the freeway mainline. Similar to existing conditions, I-5 traffic south of the NE 130th Street interchange, beginning near the Northgate interchange, would slow down in the PM peak hour. This would be due to congestion caused by the HOV lane merging into the general purpose lanes (due to the express lanes operating northbound during this time period), traffic from the Northgate interchange merging in, a lane drop to NE 85th/80th Streets, and congestion emanating from as far south as downtown Seattle and beyond. This level of congestion is expected to become worse in the future and would result in very unreliable travel time and speed.

Freeway Operations for the Light Rail Alternatives

During the AM peak hour, freeway speeds and operations are not expected to be substantially affected by the additional traffic generated by the park-and-ride lots because few trips to and from the light rail stations are expected to use I-5 to access the park-and-rides. Some minor slowdowns could be expected along southbound I-5 approaching the NE 145th Street off-ramp because increased local street traffic along NE 145th Street would cause additional delays for vehicles using the southbound off-ramp and on-ramp at this location. Delays would be higher for alternatives that include a NE 145th Street Station (Alternatives A1, A3, A10, and

A11). This is particularly true for Alternative A10, which would maintain the current northbound NE 145th Street on-ramp configuration and add a proposed park-and-ride facility with 650 spaces. The NE 145th Street Station Option 2 that moves the northbound I-5 on-ramp north of the park-and-ride facility provides more storage for the northbound left-turns. These effects are only on the ramps and do not affect the I-5 mainline. Speeds and LOS on I-5 in the northbound direction would remain similar with or without the proposed light rail alternatives.

During the PM peak hour, the three at-grade alternatives (Alternatives A1, A5, and A10) would provide improved freeway operations along northbound I-5 due to the reconfiguration of the northbound NE 130th Street off-ramp and the resulting removal of the off-ramp stop control at the intersection with 5th Avenue NE. Northbound travel speeds approaching NE 130th Street could improve by approximately 5 mph. However, speeds north of this off-ramp could decrease as increased traffic throughput is facilitated due to the removal of the bottleneck at the off-ramp, not due to increased congestion at the NE 145th Street interchange. The travel times along I-5 from south of the NE 130th Street interchange to north of the NE 145th Street interchange are not anticipated to change as a result of the light rail alternatives. Under Alternative A10, the merge operations of the northbound on-ramp from NE 145th Street is expected to degrade to LOS F due to the increased traffic flow from removing the bottleneck at the NE 130th Street off-ramp and slightly increased on-ramp volumes due to the 650 stall park-and-ride lot. Note that this condition drops back down to LOS E with mitigation which is discussed in Secton 9.3. Alternatives A7 and A11, with an elevated guideway and a station at NE 130th Street, do not include the 130th Street off-ramp reconstruction and would potentially result in degraded I-5 operations as the existing ramp terminus configuration could be affected by local street congestion.

During the PM peak period in the southbound direction, speeds on I-5 could decrease with Alternatives A1, A3, A10, and A11 that include a NE 145th Street Station. The increased local street traffic associated with the park-and-ride facility would cause increased intersection delay that could worsen the congestion on the southbound NE 145th Street off-ramp and on I-5 near the ramp diverge. The increase in travel times for southbound through trips between NE 155th Street and Northgate is estimated at less than a minute. This slight increase in delay is eliminated with mitigation. Potential measures for mitigating these impacts focus on improving local street intersection operations and are described in Section 9.3, Freeway, in Chapter 9, Potential Mitigation Measures. Detailed intersection results from the VISSIM analysis for intersections within the NE 130th Street and NE 145th Street interchange areas are provided in Appendix C.

In addition, the project would be likely to reduce the number of buses in the I-5 HOV lanes, which would create additional HOV capacity and improve HOV operations and speeds compared with the No Build Alternative. The benefits to the HOV lane would likely be similar across all light rail alternatives.

5.4 Arterials and Local Streets

This section describes the impacts of the No Build Alternative and light rail alternatives on arterials and local streets. The evaluation included development of forecast year 2035 traffic volumes, LOS analysis, and identification of changes to access and circulation that would result from the project alternatives. The focus of the analysis in this section is on areas around each proposed station and along the alternative routes. Key observations and findings related to this section include the following:

- Traffic volumes through the project corridor are expected to increase by approximately 0.6 to 1.3 percent per year between 2012 and 2035, with the highest growth anticipated in Segment C.
- The amount of traffic generated is expected to be the highest at stations providing the greatest number of new park-and-ride spaces. These include the NE 145th Street, NE 155th Street, NE 185th Street, and Lynnwood Transit Center Stations. Overall trip generation is expected to be the highest at the Lynnwood Transit Center Station because this station would serve as the northern terminus of the Lynnwood Link Extension, it would provide the highest overall number of park-and-ride spaces, and is expected to generate the highest station ridership.
- In 2035, intersections near the proposed light rail stations are expected to operate at LOS similar to the No Build Alternative. Exceptions exist primarily near the Segment A stations, with a few isolated locations in Segment C.
- In Segment A, Alternatives A5 and A10, which have three stations, would result in the highest number of intersections degrading below acceptable LOS standards; most of the intersection improvements would be required near the NE 145th Street, NE 155th Street, and NE 185th Street Stations to address this condition. Alternatives A7 and A11 would also have three stations each and result in a slightly lower number of intersections degrading below acceptable LOS standards. Alternatives A1 and A3 would result in the lowest number of intersections degrading below LOS standards.
- The Segment B alternatives would not degrade intersection operations. In Segment C, only one intersection would degrade below acceptable LOS standards with all of the light rail alternatives.

5.4.1 Traffic Volume Forecasts

No Build Alternative

Travel demand forecasts for 2035 were developed for the Lynnwood Link Extension based on PSRC's current population and land use forecasts. The methodology used in developing these forecasts is described in detail in the *Transit Ridership Forecasting Interim Technical Report* (Sound Transit 2012). In addition to these forecasts, the following information from the Cities of Shoreline and Lynnwood was used to augment 2035 AM and PM peak hour traffic volume forecasts:

- City of Shoreline – Year 2010 and 2030 PM peak hour Synchro files and AM and PM peak hour EMME/2 model data
- City of Lynnwood – Year 2015 and 2040 AM and PM peak hour Synchro files for the Poplar Way Extension Project Traffic Analysis

Existing turning-movement count information and annual compounded growth rates developed from the Lynnwood Link Extension travel demand model were used to develop 2035 AM and PM peak hour turning movements for locations in Seattle and Mountlake Terrace. For locations in Shoreline, the City's 2030 PM peak hour turning-movement volumes were adjusted to the year 2035 by applying straight-line growth rates developed from the City's EMME/2 travel demand model. 2035 AM peak hour turning-movement volumes were estimated by applying straight-line growth rates from the City's travel demand model to existing turning-movement count volumes. For Lynnwood, year 2040 AM and PM peak hour volumes provided by the City were adjusted downward based on growth rates between the year 2015 and year 2040 Synchro models.

Overall, by 2035, traffic volumes in Segment A for the No Build Alternative are predicted to increase by an average annual growth rate of approximately 0.6 percent and 0.7 percent in the AM and PM peak hours, respectively. Traffic volumes in Segment B are projected to increase by approximately 0.8 percent and 0.6 percent per year in the AM and PM peak hours, respectively. In Segment C, traffic volumes are expected to increase by approximately 1.3 percent and 1 percent in the AM and PM peak hours, respectively.

Light Rail Alternatives

For the light rail alternatives, trips generated by light rail station usage were calculated for each station and added to the No Build Alternative's estimated volumes for 2035. Trip generation for each station comprises automobile trips to and from park-and-ride lots, passenger drop-off/pick-up trips, and new bus trips.

For the light rail alternatives, additional traffic would be generated by new or modified park-and-ride facilities. Table 5-23 shows existing and proposed park-and-ride capacities associated with each station. As shown in Table 5-23, park-and-ride spaces would be provided at all stations, except at the NE 130th Street Station with Alternative A10. For stations with park-and-ride lots, the number of park-and-ride spaces provided is expected to increase over existing capacities at all stations except for the Mountlake Terrace Freeway Station.

For all proposed park-and-ride stations, it was assumed that the number of new park-and-ride vehicle trips generated during a 3-hour peak period would be equal to the net increase in park-and-ride stalls provided at each station. If the park-and-ride facility is an existing lot, the total number of new park-and-ride trips is the difference between the total number of proposed stalls and the total number of existing stalls. This assumption was applied to all park-and-ride lots in the study area and provides a conservatively high assessment of traffic impacts near the stations because all available parking stalls are assumed to be fully utilized. For the traffic analysis, it was assumed that 0.50 trips per occupied space would be generated during the AM peak hour and 0.45 trips per occupied space would be generated during the PM peak hour. These rates are consistent with survey data from Sound Transit's commuter rail stations, Central Link light rail park-and-ride, and trip generation from light rail transit park-and-ride lots in other rail systems in the United States.

Vehicle trips generated by passenger drop-off/pick-up activity are not constrained by the number of parking spaces at the park-and-ride lots and instead are more directly related to station ridership and mode of access. The Sound Transit Ridership Model was used to assign ridership to various modes of travel based on data from the 2008 BART Station Profile Study and recent data collected from the Tukwila park-and-ride station. Using this method, 16 percent of the total PM peak period ridership at each proposed station was used to calculate the estimated passenger drop-off/pick-up volumes.

Bus route trips were estimated from King County Metro's and Community Transit's conceptual 2025 transit integration plans to support planning for the Lynnwood Link Extension.

Table 5-24 shows AM and PM peak hour vehicle trips for forecast year 2035 for each proposed station. In general, the highest trip-generating stations are those providing the highest number of new park-and-ride spaces. These include the NE 145th Street, NE 155th Street, NE 185th Street, and Lynnwood Transit Center stations. Overall, trip generation is expected to be the highest at the Lynnwood Transit Center Station because this station would serve as the northern terminus of the Lynnwood Link Extension, it would provide the highest overall number of park-and-ride spaces, and is expected to generate the highest station ridership.

Table 5-23. Existing and Proposed Park-and-Ride Capacity

Segment/Station	Station Option	Alternative	Number of Park-and-Ride Spaces: Existing	Proposed	Net Change
Segment A					
NE 130th Street Station	Option 1—At-grade, with park-and-ride	A5	46	100[a]	+54
	Option 1—At-grade, no park-and-ride	A10	46	0	-46
	Option 2—Elevated	A7, A11	46	142	+96
NE 145th Street Station	Option 1—Elevated, 500 park-and-ride spaces	A1	68	500	+432
	Option 1—Elevated, 650 park-and-ride spaces	A10	68	650	+582
	Option 2—Elevated	A3, A11	68	500	+432
NE 155th Street Station	Elevated	A5, A7	0	500	+500
NE 185th Street Station	Option 1—At-grade	A1	0	500	+500
	Option 2—Elevated	A3, A7, A11	0	500	+500
	Option 3—At-Grade	A5, A10	0	350	+350
Segment B					
Mountlake Terrace Station	Transit Center Station—Elevated	B1, B2, B2A	880	880	0
	Freeway Station—At-Grade	B4	880	880	0
220th Street Station—Optional	Elevated	B2A	0	200	+200
Segment C					
Lynnwood Transit Center Station	200th Street SW—Elevated	C1	1,370	1,900	+530
	Transit Center—Elevated	C2	1,370	1,900	+530
	Park-and-Ride Option 1—Elevated	C3 (Option 1)	1,370	1,900	+530
	Park-and-Ride Option 2—Elevated	C3 (Option 2)	1,370	1,900	+530

[a] Possible surface parking lot available for lease located adjacent to the station

Table 5-24. Peak Hour Vehicle Trip Generation Summary by Station

Segment/Station	Alternative	Trip Type	AM Peak Hour In	AM Peak Hour Out	AM Peak Hour Total	PM Peak Hour In	PM Peak Hour Out	PM Peak Hour Total
Segment A								
NE 130th Street Station	A5 (Option 1—at-grade, with park-and-ride) A7, A11 (Option 2—Elevated)	Park-and-ride	24 (40)	6 (10)	30 (50)	5 (9)	22 (36)	27 (45)
		Drop-off/ pick-up	13	13	26	13	13	26
		Buses	8	8	16	8	8	16
		Total	45 (61)	27 (31)	72 (92)	26 (30)	43 (57)	69 (87)
	A10 (Option 1—at-grade, no park-and-ride)	Park-and-ride	-16 (0)	-4 (0)	-20 (0)	-4 (0)	-14 (0)	-18 (0)
		Drop-off/ pick-up	6	6	12	6	6	12
		Buses	0	0	0	0	0	0
		Total	-10 (6)	2 (6)	-8 (12)	2 (6)	-8 (6)	-6 (12)
NE 145th Street Station	A1 (Option 1—Elevated, 500 park-and-ride spaces) A3, A11 (Option 2—Elevated)	Park-and-ride	173 (200)	43 (50)	216 (250)	39 (45)	155 (180)	194 (225)
		Drop-off/ pick-up	26	26	52	26	26	52
		Buses	24	24	48	24	24	48
		Total	223 (250)	93 (100)	316 (350)	89 (95)	205 (230)	294 (325)
	A10 (Option 1—Elevated, 650 park-and-ride spaces)	Park-and-ride	233 (260)	58 (65)	291 (325)	53 (59)	209 (234)	262 (293)
		Drop-off/ pick-up	26	26	52	26	26	52
		Buses	24	24	48	24	24	48
		Total	283 (310)	108 (115)	391 (425)	103 (109)	259 (284)	362 (393)
NE 155th Street Station	A5, A7 (Elevated)	Park-and-ride	200	50	250	45	180	225
		Drop-off/ pick-up	13	13	26	13	13	26
		Buses	24	24	48	24	24	48
		Total	237	87	324	82	217	299
NE 185th Street Station	A1 (Option 1—At-Grade) A3, A7, A11 (Option 2—Elevated)	Park-and-ride	200	50	250	45	180	225
		Drop-off/ pick-up	38	38	76	38	38	76
		Buses	22	22	44	22	22	44
		Total	260	110	370	105	240	345
	A5, A10 (Option 3—At-Grade)	Park-and-ride	140	35	175	32	126	158
		Drop-off/ pick-up	38	38	76	38	38	76
		Buses	22	22	44	22	22	44
		Total	200	95	295	92	186	278

Table 5-24. Peak Hour Vehicle Trip Generation Summary by Station

Segment/Station	Alternative	Trip Type	AM Peak Hour In	AM Peak Hour Out	AM Peak Hour Total	PM Peak Hour In	PM Peak Hour Out	PM Peak Hour Total
Segment B								
Mountlake Terrace Station	B1, B2, B2A (Transit Center Station—Elevated)	Park-and-ride	0 (352)	0 (88)	0 (440)	0 (79)	0 (317)	0 (396)
		Drop-off/ pick-up	64	64	128	64	64	128
		Buses	3	14	17	14	3	17
		Total	67 (419)	78 (166)	145 (585)	78 (157)	67 (384)	145 (541)
	B4 (Freeway Station—At-Grade)	Park-and-ride	0 (352)	0 (88)	0 (440)	0 (79)	0 (317)	0 (396)
		Drop-off/ pick-up	58	58	116	58	58	116
		Buses	3	14	17	14	3	17
		Total	61 (413)	72 (160)	133 (573)	72 (151)	61 (378)	133 (529)
220th Street SW Station—Optional	B2A (Elevated)	Park-and-ride	80	20	100	18	72	90
		Drop-off/ pick-up	13	13	26	13	13	26
		Buses	20	20	40	20	20	40
		Total	113	53	166	51	105	156
Segment C								
Lynnwood Transit Center Station	C1 (SW 200th Street—Elevated) C2 (Transit Center—Elevated) C3a (Park-and-Ride Option 1—Elevated) and C3b (Park-and-Ride Option 2—Elevated)	Park-and-ride	200 (760)	50 (190)	250 (950)	45 (171)	180 (684)	225 (855)
		Drop-off/ pick-up	122	122	244	122	122	244
		Buses	26	26	54	26	26	54
		Total	248 (1008)	198 (388)	548 (1498)	193 (364)	328 (1012)	523 (1378)

Note: Park-and-ride and bus volumes noted in parentheses represent total volumes. The numbers shown outside the parentheses represent the net changes to the park-and-ride volumes between the No Build Alternative and the light rail alternatives.

The peak-hour vehicle trips generated at each proposed station area, as shown in Table 5-24, were assigned to study area roadways and intersections based on existing travel patterns, station access, and bus route assumptions provided by King County and/or Community Transit for each station.

5.4.2 Traffic Operations

The traffic operations analysis compares the No Build Alternative and light rail alternatives in forecast year 2035 in the study area. Sound Transit selected the locations evaluated with input from affected jurisdictions. These locations include intersections in areas that would be most directly affected— such as by a change in channelization or signal control—as well as those indirectly affected by a change in traffic volume caused by trips accessing the light rail system. The latter includes intersections surrounding transit stations with proposed increases in park-and-ride lot capacity and passenger pick-up and drop-off activity. In total, more than 108 intersections were analyzed for the three segments. Synchro version 7.0 model was used to determine LOS at signalized and unsignalized intersections. The LOS at signalized intersections is defined in terms of average delay per vehicle, based on the definitions described in the 2000 *Highway Capacity Manual*. These definitions are shown in Table 4-17 in Section 4.4, Arterials and Local Streets, of Chapter 4, Affected Environment. Detailed LOS analysis reports for each intersection are provided in Appendix D.

In most cases, the signal timing plans provided by the Cities of Seattle, Shoreline, Mountlake Terrace, and Lynnwood were used to analyze the No Build Alternative and the light rail alternatives for forecast year 2035. Where appropriate, minor changes were made to the existing signal timing and phasing plans to model the future conditions. Figures 5-19 through 5-22 summarize the PM and AM peak hour intersection LOS analysis results for the No Build Alternative (in forecast year 2035), and indicate where the light rail alternatives would cause LOS to degrade below standards if not effectively mitigated. Several intersections analyzed within the Shoreline city limits are not subject to the City's LOS standard. In these cases, LOS D was still used as a threshold for identifying potential congestion issues.

In most locations, intersections near proposed stations are expected to operate at an LOS similar to the No Build Alternative. Exceptions primarily exist near the Segment A stations, with a few isolated locations in Segments B and C. For the NE 130th and NE 145th Street areas, Synchro analysis results were supplemented by results from the VISSIM model that was used to assess freeway and interchange area operations for these two locations. Impacts specific to each segment and alternative are described in the following subsections. Potential measures for mitigating these impacts are described in Section 9.4, Arterials and Local Streets, in Chapter 9, Potential Mitigation Measures.

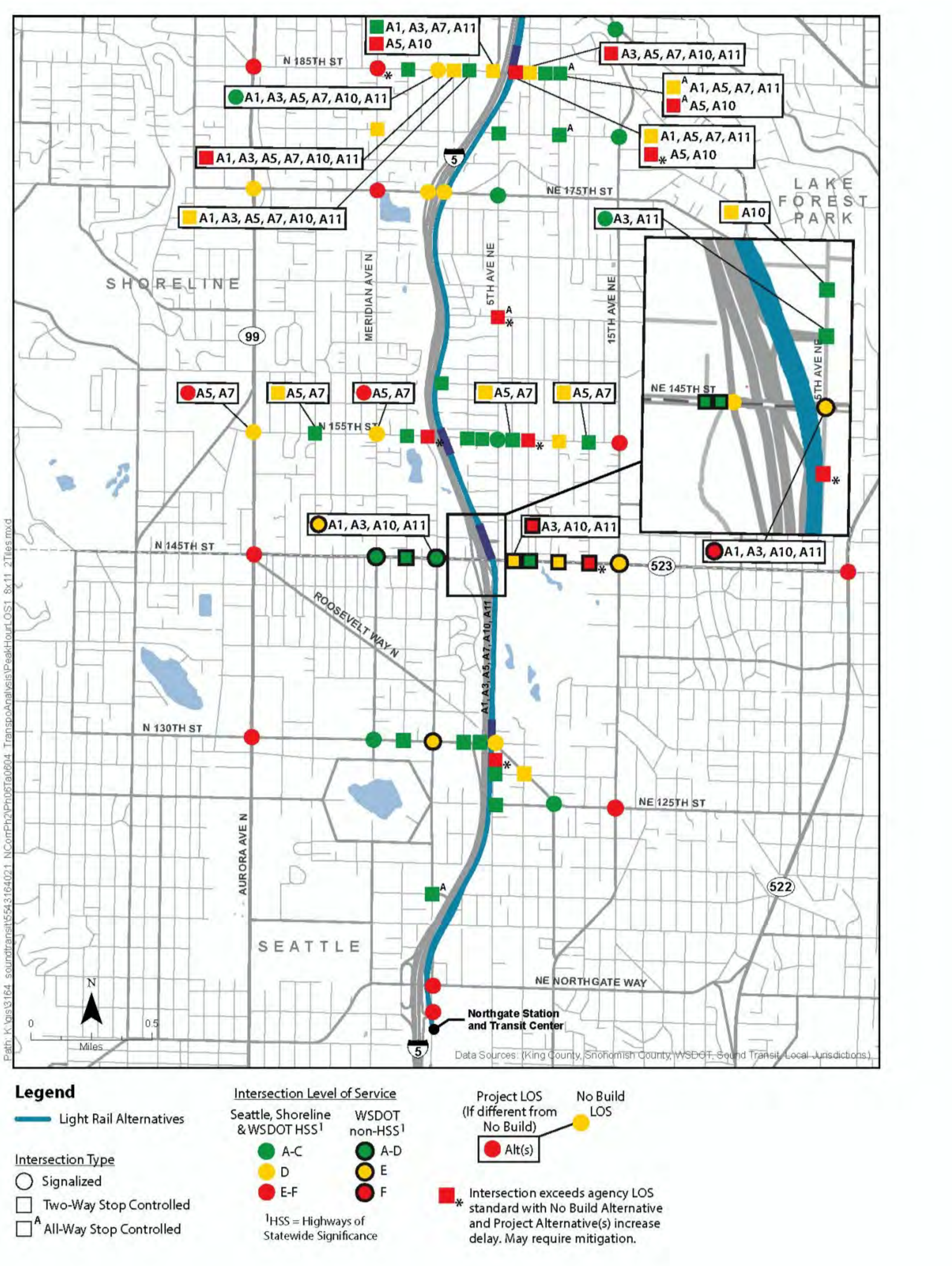


Figure 5-19. Segment A Seattle to Shoreline 2035 PM Peak Hour Intersection LOS

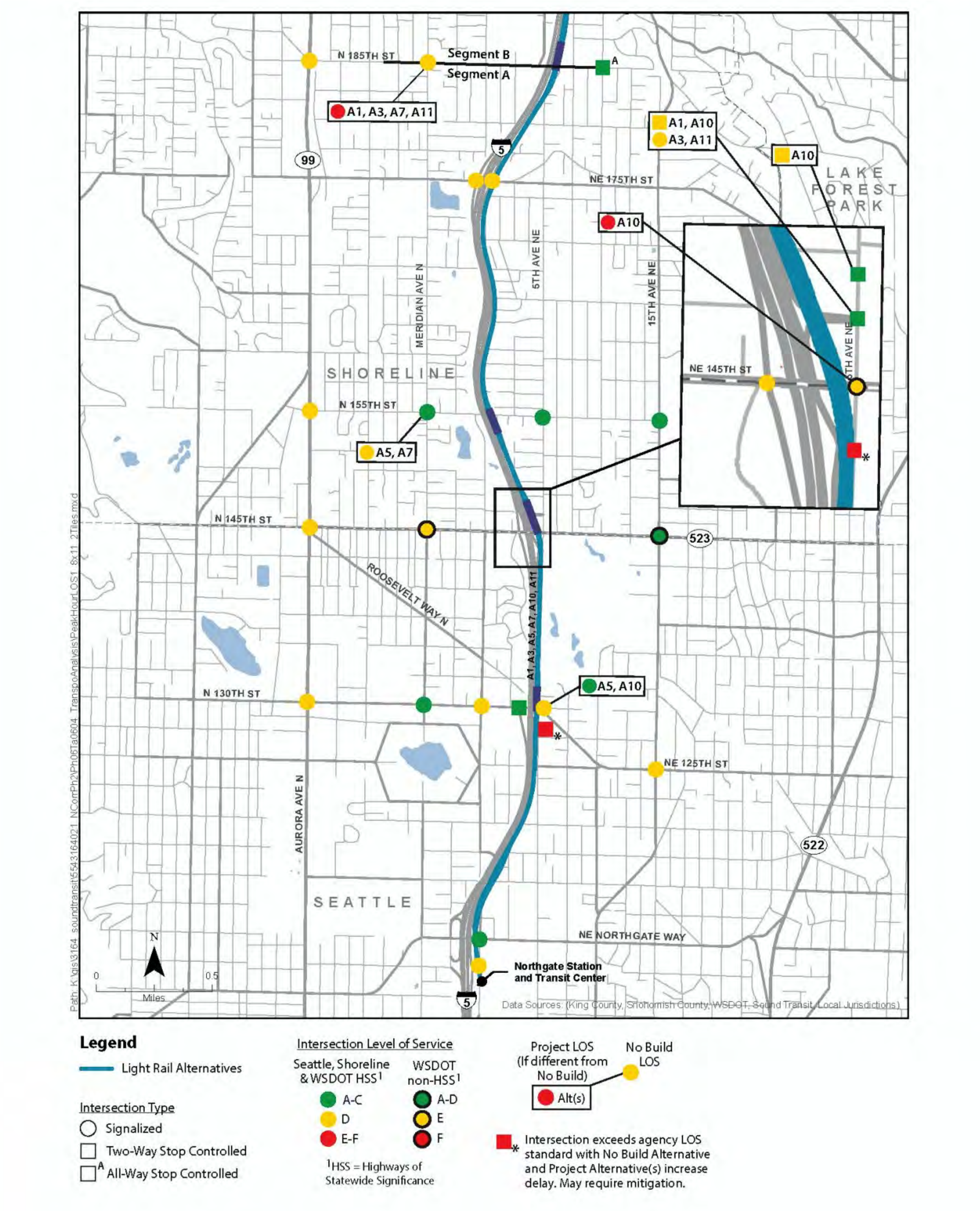


Figure 5-20. Segment A Seattle to Shoreline 2035 AM Peak Hour Intersection LOS

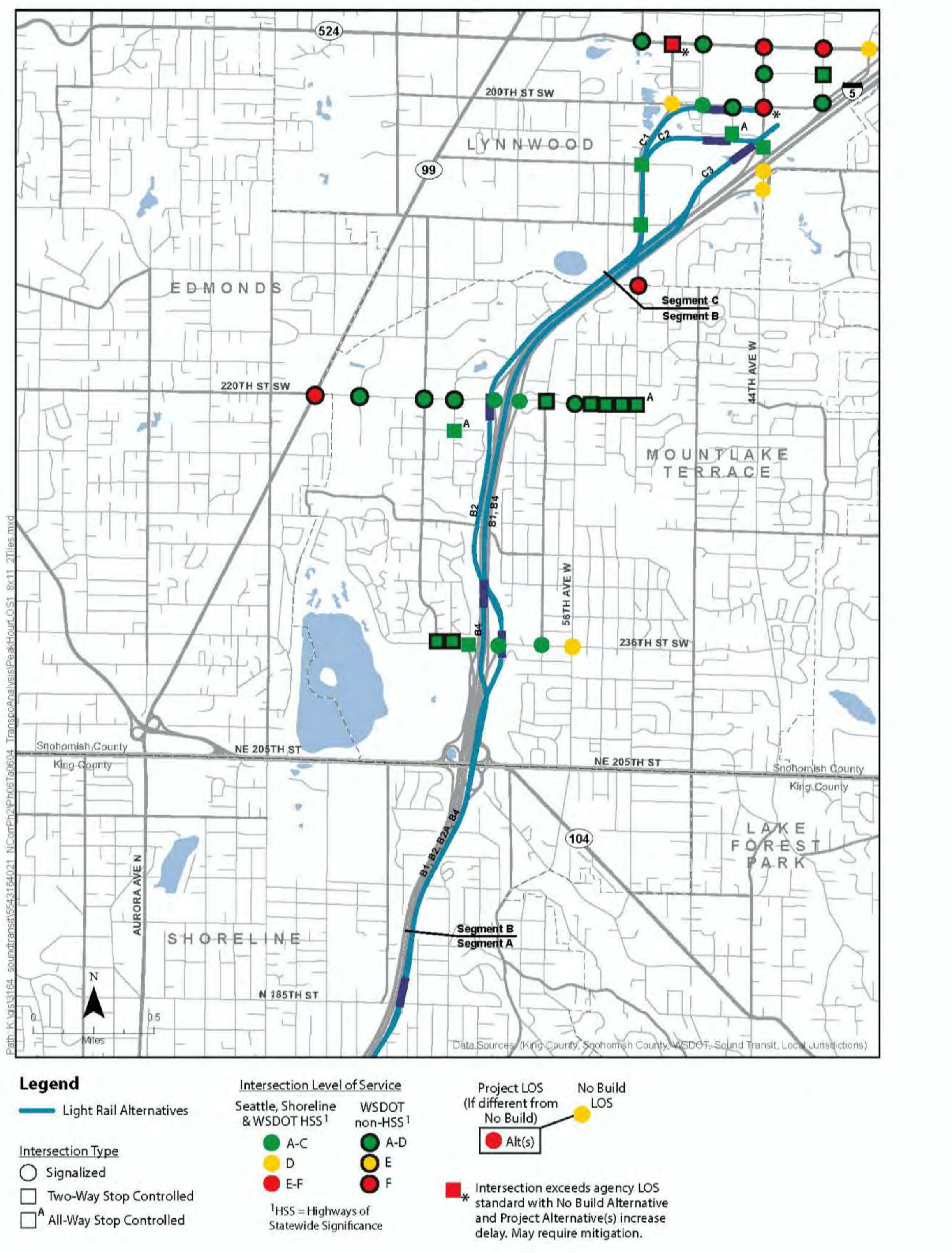


Figure 5-21. Segments B and C Shoreline to Lynnwood 2035 PM Peak Hour Intersection LOS

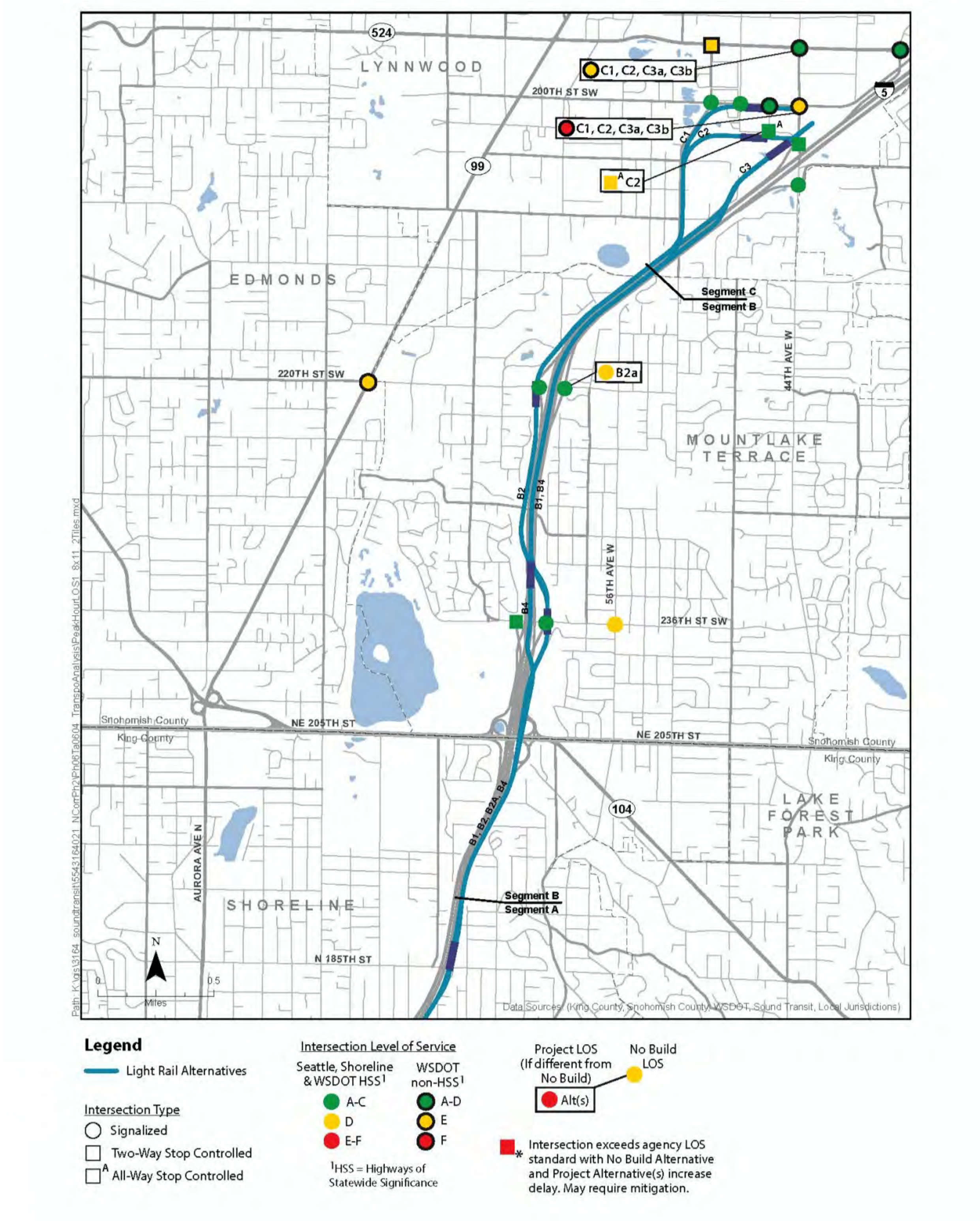


Figure 5-22. Segments B and C Shoreline to Lynnwood 2035 AM Peak Hour Intersection LOS

Segment A: Seattle to Shoreline

Tables 5-25 and 5-26 show the PM and AM peak hour LOS results for the Segment A No Build Alternative and the light rail alternatives in forecast year 2035. As shown in Table 5-25, 15 of the 31 intersections evaluated in Segment A would operate below LOS standards with the No Build Alternative during the PM peak hour. An additional eight intersections would degrade below LOS standards during the PM peak hour with at least one of the light rail alternatives. For the AM peak hour (Table 5-26), two of the intersections analyzed would operate below LOS standards with the No Build Alternative. Two additional intersections would degrade below LOS standards during the AM peak hour with at least one of the light rail alternatives.

Table 5-25. Forecast Year 2035 PM Peak Hour Intersection LOS—Segment A

Nearest Station/ Intersection	LOS Standard	Alternative: No Build	A1	A3	A5	A7	A10	A11	Assumed Project Improvements[a]
NE 130th Street Station					**Opt.1**	**Opt.2**	**Opt.1 (No park-and-ride)**	**Opt.2**	
North 130th Street and Aurora Avenue North	D	E			E	E	E	E	
North 130th Street and Meridian Avenue North	D	B			B	B	B	B	
North 130th Street and Corliss Avenue North	D	B			B	B	B	B	
North 130th Street and 1st Avenue North	D	D			D	D	D	D	
NE 130th Street and 3rd Avenue NE	D	B			C	C	C	C	
NE 130th Street and I-5 southbound on-ramp	D	A			A	A	A	A	
5th Avenue NE and park-and-ride driveway (north)	D					B		B	
5th Avenue NE and park-and-ride driveway (south)	D				C	B	B	B	
NE 130th Street and 5th Avenue NE	D	D			D	D	D	D	(PM) Opt. 1 – change signal control from fixed time to actuated operation

Table 5-25. Forecast Year 2035 PM Peak Hour Intersection LOS—Segment A

Nearest Station/ Intersection	LOS Standard	Alternative							Assumed Project Improvements[a]
		No Build	A1	A3	A5	A7	A10	A11	
									(PM) Opt. 1 (no park-and-ride) – change signal control from fixed time to actuated operation
5th Avenue NE and I-5 northbound off-ramp	D	F				F		F	
5th Avenue NE and NE 127th Street	D	B			B	B	B	B	
5th Avenue NE and NE 125th Street	D	C			C	C	C	C	
Roosevelt Way NE and 8th Avenue NE	D	D			D	D	D	D	
8th Avenue NE and NE 127th Street	D	A			A	A	A	A	
Roosevelt Way NE and 10th Avenue NE	D	B			B	B	B	B	
NE 125th Street and 15th Avenue NE	D	E			E	E	E	E	
NE 145th/NE 155th Street Station			**Opt.1**	**Opt.2**	**155th**	**155th**	**Opt.1 (650-space park-and-ride)**	**Opt.2**	
North 145th Street and Aurora Avenue North	D	E	E	E			E	E	
North 145th Street and Meridian Avenue North	E	B	B	B			C	B	
North 145th Street and Corliss Avenue North	E	D	D	D			D	D	
North 145th Street and 1st Avenue NE	E	D	E	E			E	E	
NE 145th Street and 3rd Avenue NE	E	B	B	B			B	B	
NE 145th Street and 4th Avenue NE	E	B	B	B			B	B	
NE 145th Street and I-5 southbound ramps	D	D	D	D			D	D	

Table 5-25. Forecast Year 2035 PM Peak Hour Intersection LOS—Segment A

Nearest Station/ Intersection	LOS Standard	Alternative							Assumed Project Improvements[a]
		No Build	A1	A3	A5	A7	A10	A11	
5th Avenue NE and park-and-ride driveway	D	B	C	C			D	C	Opt. 1 – includes two-way left turn lane on 5th Avenue NE Opt. 1 (650-space park-and-ride) – includes two-way left-turn lane on 5th Avenue NE
5th Avenue NE and I-5 northbound on-ramp	D	B	A	B			B	B	
NE 145th Street and 5th Avenue NE	E	E	F	F			F	F	
5th Avenue NE and I-5 northbound off-ramp	D	F	F	F			F	F	
NE 145th Street and 6th Avenue NE	E	E	E	F			F	F	
NE 145th Street and 8th Avenue NE	E	D	D	D			D	D	
NE 145th Street and 10th Avenue NE	E	E	E	E			E	E	
NE 145th Street and 12th Avenue NE	E	F	F	F			F	F	
NE 145th Street and 15th Avenue NE	E	E	E	E			E	E	
NE 145th Street and Lake City Way NE	D	F	F	F			F	F	
North 155th Street and Aurora Avenue North	D	D			E	E			
North 155th Street and Ashworth Avenue North	D	C			D	D			
North 155th Street and Meridian Avenue North	D	D			E	E			
North 155th Street and Corliss Avenue North	D	C			C	C			
North 155th Street and 1st Avenue NE	D	E			F	F			

Table 5-25. Forecast Year 2035 PM Peak Hour Intersection LOS—Segment A

Nearest Station/ Intersection	LOS Standard	Alternative							Assumed Project Improvements[a]
		No Build	A1	A3	A5	A7	A10	A11	
NE 155th Street and park-and-ride driveway	D				C	C			
NE 155th Street and 3rd Avenue NE	D	B			B	B			
NE 155th Street and 4th Avenue NE	D	B			C	C			
NE 155th Street and 5th Avenue NE	D	B			B	B			
NE 155th Street and 6th Avenue NE	D	C			D	D			
NE 155th Street and 8th Avenue NE	D	F			F	F			
NE 155th Street and 10th Avenue NE	D	D			D	D			
NE 155th Street and 12th Avenue NE	D	C			D	D			
NE 155th Street and 15th Avenue NE	D	E			E	E			
NE 159th Street and 1st Avenue NE	D	A			A	A			
NE 161st Street and 1st Avenue NE	D	A			A	A			
NE 165th Street and 5th Avenue NE	D	E			F	F			
NE 185th Street Station			**Opt.1**	**Opt.2**	**Opt.3**	**Opt.2**	**Opt. 3**	**Opt.2**	
North 185th Street and SR 99	D	E	E	E	E	E	E	E	
North 185th Street and Meridian Avenue North	D	F	F	F	F	F	F	F	
North 185th Street and Corliss Avenue North	D	B	C	C	C	C	C	C	
North 185th Street and 1st Avenue NE	D	D	B	B	B	B	B	B	
NE 185th Street and 2nd Avenue NE	D	D	F	F	F	F	F	F	
NE 185th Street and 3rd Avenue NE	D	C	D	D	D	D	D	D	
5th Avenue NE and park-and-ride driveway	D		B						

Table 5-25. Forecast Year 2035 PM Peak Hour Intersection LOS—Segment A

Nearest Station/ Intersection	LOS Standard	Alternative							Assumed Project Improvements[a]
		No Build	A1	A3	A5	A7	A10	A11	
NE 185th Street and 5th Avenue NE	D	D	C	C	E	C	E	C	Opt. 1 – includes two-way left-turn lane or median refuge area on NE 185th Street and southbound right-turn pocket Opt. 2 – includes two-way left-turn lane or median refuge area on NE 185th Street
NE 185th Street and 7th Avenue NE	D	F	D	D	F	D	F	D	Opt. 1 – includes two-way left-turn lane or median refuge area on NE 185th Street Opt. 2 – includes two-way left-turn lane or median refuge area on NE 185th Street
8th Avenue NE and transit center driveway (in)	D			A	A	A	A	A	
8th Avenue NE and park-and-ride driveway (north)	D			A	A	A	A	A	
8th Avenue NE and park-and-ride driveway (south) / transit center driveway (out)	D		A	A	B	A	B	A	
NE 185th Street and 8th Avenue NE	D	D	D	F	E	F	E	F	
NE 185th Street and east park-and-ride driveway (south)	D				B		B		
NE 185th Street and 9th Avenue NE	D	C	C	C	C	C	C	C	
10th Avenue NE and east park-and-ride driveway (north)	D				B		B		
NE 185th Street and 10th Avenue NE	D	C	D	D	E	D	E	D	

Table 5-25. Forecast Year 2035 PM Peak Hour Intersection LOS—Segment A

Nearest Station/ Intersection	LOS Standard	Alternative							Assumed Project Improvements[a]
		No Build	A1	A3	A5	A7	A10	A11	
NE Perkins Way and 15th Avenue NE	D	C	C	C	C	C	C	C	
North 180th Street and Meridian Avenue North	D	D	D	D	D	D	D	D	
NE 180th Street and 5th Avenue NE	D	B	B	B	B	B	B	B	
NE 180th Street and 10th Avenue NE	D	B	B	B	B	B	B	B	
NE 180th Street and 15th Avenue NE	D	B	B	B	B	B	B	B	
North175th Street and SR 99	D	D	D	D	D	D	D	D	
North 175th Street and Meridian Avenue North	D	E	E	E	E	E	E	E	
NE 175th Street and I-5 southbound ramps	D	D	D	D	D	D	D	D	
NE 175th Street and I-5 northbound ramps	D	D	D	D	D	D	D	D	
NE 175th Street and 5th Avenue NE	D	B	B	B	B	B	B	B	
NE 174th Street and 1st Avenue NE	D	A	A	A	A	A	A	A	

Notes:
[a] Improvements described include changes in intersection control, signal timing/phasing, and/or intersection channelization improvements that could be included as part of the project.
Gray = Location not analyzed for the specified station/alternative. Intersection would be expected to operate similar to the No Build Alternative.
Red = Intersection does not meet LOS standard.
Yellow = Intersection operates at acceptable LOS but is approaching LOS standard.
Green = Intersection operates at acceptable LOS.

Table 5-26. Forecast Year 2035 AM Peak Hour Intersection LOS—Segment A

Nearest Station/ Intersection	LOS Standard	Alternative: No Build	A1	A3	A5	A7	A10	A11	Assumed Project Improvements[a]
NE 130th Street Station					**Opt.1**	**Opt.2**	**Opt.1 (no park-and-ride)**	**Opt.2**	
North 130th Street and Aurora Avenue North	D	D			D	D	D	D	
North 130th Street and Meridian Avenue North	D	B			B	B	B	B	
North 130th Street and 1st Avenue North	D	D			D	D	D	D	
NE 130th Street and I-5 southbound on-ramp	D	A			B	A	B	A	
5th Avenue NE and park-and-ride driveway (north)	D					A		A	
5th Avenue NE and park-and-ride driveway (south)	D				B	B	B	B	
NE 130th Street and 5th Avenue NE	D	D			C	D	C	D	(PM) Opt. 1 – change signal control from fixed time to actuated operation (PM) Opt. 1 (no park-and-ride) – change signal control from fixed time to actuated operation
5th Avenue NE and I-5 northbound off-ramp	D	F				F		F	
NE 125th Street and 15th Avenue NE	D	D			D	D	D	D	
NE 145th/NE 155th Street Station			**Opt.1**	**Opt.2**	**155th**	**155th**	**Opt.1 (650-space park-and-ride)**	**Opt.2**	
North 145th Street and Aurora Avenue North	D	D	D	D			D	D	
North 145th Street and Meridian Avenue North	E	E	E	E			E	E	
NE 145th Street and I-5 southbound ramps	D	D	D	D			D	D	

Table 5-26. Forecast Year 2035 AM Peak Hour Intersection LOS—Segment A

Nearest Station/ Intersection	LOS Standard	Alternative: No Build	A1	A3	A5	A7	A10	A11	Assumed Project Improvements[a]
5th Avenue NE and park-and-ride driveway	D	C	C	C			D	C	(PM) Opt. 1 – includes two-way left-turn lane on 5th Avenue NE (PM) Opt. 1 (650-space park-and-ride) – includes two-way left-turn lane on 5th Avenue NE
5th Avenue NE and I-5 northbound on-ramp	D	C	D	D			D	D	
NE 145th Street and 5th Avenue NE	E	E	E	E			F	E	
5th Avenue NE and I-5 northbound off-ramp	D	F	F	F			F	F	
NE 145th Street and 15th Avenue NE	E	D	D	D			D	D	
North 155th Street and Aurora Avenue North	D	D			D	D			
North 155th Street and Meridian Avenue North	D	C			D	D			
NE 155th Street and 5th Avenue NE	D	A			B	B			
NE 155th Street and 15th Avenue NE	D	B			B	B			
NE 185th Street Station			**Opt.1**	**Opt.2**	**Opt.3**	**Opt.2**	**Opt.3**	**Opt.2**	
North 185th Street and SR 99	D	D	D	D	D	D	D	D	
North 185th Street and Meridian Avenue North	D	D	E	E	D	E	D	E	
NE 185th Street and 10th Avenue NE	D	A	B	B	B	B	B	B	
NE 175th Street and I-5 southbound ramps	D	D	D	D	D	D	D	D	
NE 175th Street and I-5 northbound ramps	D	D	D	D	D	D	D	D	

Notes:
[a] Improvements described include changes in intersection control, signal timing/phasing, and/or intersection channelization improvements that could be included as part of the project.
Gray = Location not analyzed for the specified station/alternative. Intersection would be expected to operate similar to the No Build Alternative.
Red = Intersection does not meet LOS standard.
Yellow = Intersection operates at acceptable LOS but is approaching LOS standard.
Green = Intersection operates at acceptable LOS.

City of Shoreline Arterial LOS

For Shoreline, the following arterials were also evaluated for v/c ratios to ensure consistency with City concurrency standards:

- NE 155th Street—Westminster Way North to 15th Avenue NE
- NE 185th Street—Aurora Avenue North to 10th Avenue NE
- 5th Avenue NE/7th Avenue NE—NE 145th Street to NE 185th Street
- Meridian Avenue North—North 145th Street to North 205th Street
- 15th Avenue NE—NE 145th Street to NE 205th Street
- NE 175th Street—Aurora Avenue North to 15th Avenue NE

The v/c ratios for these arterials, shown in Figure 5-23 for the No Build Alternative, were compared with the City's v/c standard of 0.90 or lower for most principal and minor arterials. Figure 5-24 shows additional locations where the light rail alternatives would cause v/c ratios to degrade below 0.90.

As shown in Figures 5-23 and 5-24, the following arterial segments would not meet the City of Shoreline's concurrency standards during the PM peak hour in 2035 with the No Build Alternative:

- Meridian Avenue North from North 155th Street to North 185th Street—northbound
- 5th Avenue NE from north of North 145th Street to NE 165th Street—northbound
- 15th Avenue NE south of and north of NE 155th Street—northbound (v/c ratio greater than 1.10, exceeds LOS standard)
- NE 175th Street west of 15th Avenue NE—westbound
- NE 185th Street west of 1st Avenue NE—eastbound
- NE 185th Street east of 1st Avenue NE—westbound

The arterial segments listed above would further degrade with the Lynnwood Link Extension. In addition, the following additional arterial segments would degrade to levels below the City of Shoreline's concurrency standards during the PM peak hour:

- NE 185th Street east of Meridian Avenue NE—westbound (all Segment A alternatives)
- NE 185th Street from 2nd Avenue NE to 5th Avenue NE—westbound (all Segment A alternatives)

Figure 5-23. Forecast Year 2035 PM Peak Arterial LOS for the No Build Alternative—City of Shoreline Arterials

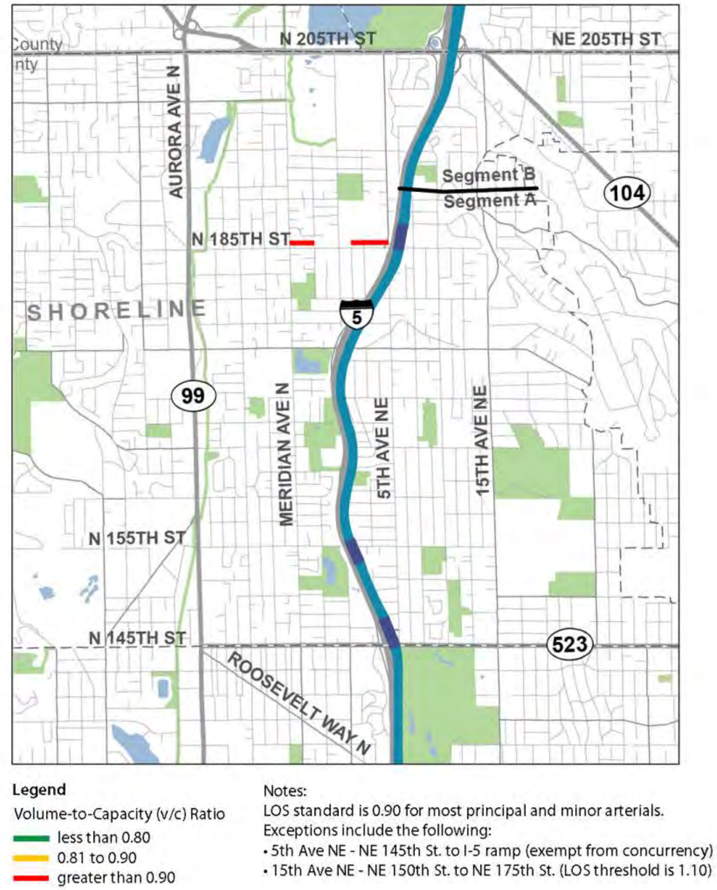


Figure 5-24. City of Shoreline Arterials Worsened by the Light Rail Alternatives

Alternative A1: At-grade/Elevated with NE 145th and NE 185th Street Stations

With Alternative A1, the following six intersections may require mitigation due to degraded operations below LOS standards and/or increased delays compared to the No Build Alternative:

- 5th Avenue NE and I-5 northbound on-ramp (north of NE 145th Street)
- NE 145th Street and 5th Avenue NE
- 5th Avenue NE and I-5 northbound off-ramp (south of NE 145th Street)
- NE 145th Street and 12th Avenue NE
- North 185th Street and Meridian Avenue North
- NE 185th Street and 2nd Avenue NE

NE 145th Street Station

With NE 145th Street Station Option 1, a two-way left-turn lane would be needed on 5th Avenue NE at the park-and-ride driveway location to maintain traffic operations within LOS standards.

New vehicle trips in the station vicinity would cause LOS at the intersection of NE 145th Street and 5th Avenue NE to degrade from LOS E with the No Build Alternative to LOS F during the PM peak hour. Delays would also increase at the NE 145th Street and 12th Avenue NE intersection during the PM peak hour; this location would already operate at LOS F with the No Build Alternative. In addition, AM and PM peak hour intersection delay would increase at the intersection of 5th Avenue NE and the I-5 northbound off-ramp; this location would also already operate at LOS F with the No Build Alternative in 2035.

In the AM peak hour, the VISSIM analysis indicates that the northbound left turn from 5th Avenue NE onto the northbound I-5 on-ramp is expected to operate more poorly than indicated with Synchro. One reason VISSIM indicates lower LOS is that it accounts for lane-changing maneuvers because the left-turn lane is a drop lane for northbound vehicles. In the VISSIM model, this movement changes from LOS E with the No Build Alternative to LOS F with the 145th Street Station Option 1. The resulting queues from this intersection are also expected to spill back to NE 145th Street and affect operations at this location, in particular, the eastbound left-turn movement.

The VISSIM analysis also indicates that the intersection of NE 145th Street with the I-5 southbound ramps would operate at LOS F with the No Build Alternative and most of the light rail alternatives in forecast year 2035. This is because VISSIM factors in the effects of back-ups from the eastbound approach of NE 145th Street to 5th Avenue NE (particularly from the eastbound left-turn) to movements through the intersection. Movements at this intersection with particularly high delay include the southbound left turn from the off-ramp and the eastbound right turn onto the on-ramp. The southbound approach at this intersection is expected to change from LOS E under the No Build Alternative to LOS F with the NE 145th Street Station Option 1.

NE 185th Street Station

With the NE 185th Street Station Option 1, vehicles would access the 500-space park-and-ride lot via 5th Avenue NE north of NE 185th Street. It is assumed that a majority of the traffic accessing the park-and-ride would turn to or from NE 185th Street using the center two-way left turn lane assumed to be built for the No Build condition.

A southbound right-turn pocket would be provided at the intersection of NE 185th Street and 5th Avenue NE to accommodate trips from the 500-space park-and-ride lot. In addition, the two-way left-turn lane on NE 185th Street at 5th Avenue NE would also extend east to the intersection of NE 185th Street and 7th Avenue NE to facilitate traffic movements from the transit center driveway.

New vehicle trips in the station vicinity would cause LOS at the intersection of NE 185th Street and 2nd Avenue NE to degrade to LOS F during the PM peak hour. In addition, the intersection of North 185th Street and Meridian Avenue North, already expected to operate at LOS F during the PM peak hour in 2035 with the No Build Alternative, would experience higher delays during the PM peak hour. This intersection would degrade to LOS E with the NE 185th Street Station Option 1 during the AM peak hour.

Alternative A3: Mostly Elevated with NE 145th and NE 185th Street Stations

With Alternative A3, the following seven intersections may require mitigation due to degraded operations below LOS standards and/or increased delays compared to the No Build Alternative:

- NE 145th Street and 5th Avenue NE
- 5th Avenue NE and I-5 northbound off-ramp (south of NE 145th Street)
- NE 145th Street and 6th Avenue NE
- 145th Street NE and 12th Avenue NE
- North 185th Street and Meridian Avenue North
- NE 185th Street and 2nd Avenue NE
- NE 185th Street and 8th Avenue NE

NE 145th Street Station

With the NE 145th Street Station Option 2 under Alternative A3, the I-5 northbound on-ramp would be moved to the north. A new stop-controlled intersection would also be provided just south of this location to provide access to the new park-and-ride lot.

New vehicle trips in the station vicinity would cause LOS at the intersections of NE 145th Street and 5th Avenue NE and NE 145th Street and 6th Avenue NE to degrade from LOS E with the No Build Alternative to LOS F during the PM peak hour. In addition, AM and PM peak hour intersection delay would increase at the intersections of 5th Avenue NE and the I-5 northbound off-ramp, and NE 145th Street and 12th Avenue NE. These locations would already operate at LOS F during the PM and/or AM peak hours with the No Build Alternative in 2035.

In the AM peak hour, the VISSIM analysis indicates that moving the on-ramp intersection north and farther away from NE 145th Street would improve lane maneuvering effects and provide enough storage so that queues from this intersection do not back up to NE 145th Street. Because of this action, the eastbound left turn from NE 145th Street to 5th Avenue NE would not be affected, which in turn would not affect operations at the NE 145th Street intersection with the I-5 southbound ramps. AM peak hour operations at this intersection are expected to improve from LOS F with the No Build Alternative to LOS E with the NE 145th Street Station Option 2.

NE 185th Street Station

NE 185th Street Station Option 2 would add a 500-space park-and-ride with access provided on 8th Avenue NE. Additional trips to and from the park-and-ride facility would cause the northbound approach at the intersection of NE 185th Street and 8th Avenue NE to operate at LOS F during the PM peak hour in 2035.

In addition, new vehicle trips in the station vicinity would cause LOS at the intersection of NE 185th Street and 2nd Avenue NE to degrade to LOS F during the PM peak hour. The intersection of North 185th Street and Meridian Avenue North, already expected to operate at LOS F during the PM peak hour in 2035 with the No Build Alternative, would experience higher delays during the PM peak hour. This intersection would degrade to LOS E with the NE 185th Street Station Option 2 during the AM peak hour.

Alternative A5: At-grade/Elevated with NE 130th, NE 155th, and NE 185th Street Stations

With Alternative A5, the following 11 intersections may require mitigation due to degraded operations below LOS standards and/or increased delays compared to the No Build Alternative:

- North 155th Street and Aurora Avenue North
- North 155th Street and Meridian Avenue North
- North 155th Street and 1st Avenue NE
- NE 155th Street and 8th Avenue NE
- NE 165th Street and 5th Avenue NE
- North 185th Street and Meridian Avenue North
- NE 185th Street and 2nd Avenue NE
- NE 185th Street and 5th Avenue NE
- NE 185th Street and 7th Avenue NE
- NE 185th Street and 8th Avenue NE
- NE 185th Street and 10th Avenue NE

NE 130th Street Station

With the NE 130th Street Station Option 1, the I-5 northbound off-ramp would be relocated to the south and southbound 5th Avenue NE would be moved below the off-ramp. The unsignalized intersection of 5th Avenue NE and the I-5 northbound off-ramp would operate at LOS F during the AM and PM peak hours with the No Build Alternative and with the NE 130th Street Station Option 1. Access to a potential surface park-and-ride lot east of 5th Avenue NE would be provided at an unsignalized location.

New vehicle trips and traffic circulation changes would cause LOS at the intersection of NE 130th Street/Roosevelt Way NE and 5th Avenue NE to degrade to LOS E during the PM peak hour.

NE 155th Street Station

With the NE 155th Street Station under Alternative A5, access to the 500-space park-and-ride lot would be provided on the south side of NE 155th Street via a new leg at 3rd Avenue NE and an unsignalized driveway.

New vehicle trips in the station vicinity would cause LOS to degrade below standards during the PM peak hour at the intersections of North 155th Street and Aurora Avenue North and North 155th Street and Meridian Avenue North. In addition, moderate intersection delay would worsen at the intersections of North 155th Street and 1st Avenue NE, NE 155th Street and 8th Avenue NE, and NE 165th Street and 5th Avenue NE. These intersections would already operate below LOS D with the No Build Alternative during the PM peak hour, although the NE 155th Street and 8th Avenue NE intersection is not subject to the City of Shoreline's LOS D standard.

NE 185th Street Station

The Alternative A5 NE 185th Street Station Option 3 would add a 150-space park-and-ride lot with driveway access west of 8th Avenue NE and a 200-space park-and-ride lot with driveway access west of 10th Avenue NE and north of NE 185th Street.

New vehicle trips in the station vicinity would cause LOS at the following intersections to degrade to LOS E or F during the PM peak hour (intersections marked with an asterisk [*] are not subject to the City of Shoreline's LOS D standard):

- NE 185th Street and 2nd Avenue NE*—southbound approach
- NE 185th Street and 5th Avenue NE—southbound approach
- NE 185th Street and 7th Avenue NE—northbound approach
- NE 185th Street and 8th Avenue NE*—northbound approach
- NE 185th Street and 10th Avenue NE

In addition, the intersection of NE 185th Street and Meridian Avenue NE, already expected to operate at LOS F during the PM peak hour in 2035 with the No Build Alternative, would experience higher delays during the PM peak hour.

Alternative A7: Mostly Elevated with NE 130th, NE 155th, and NE 185th Street Stations

With Alternative A7, the following nine intersections may require mitigation due to degraded operations below LOS D and/or increased delays compared to the No Build Alternative (intersections marked with an asterisk [*] are not subject to the City of Shoreline's LOS D standard):

- 5th Avenue NE and I-5 northbound off-ramp (south of NE 130th Street)
- North 155th Street and Aurora Avenue North
- North 155th Street and Meridian Avenue North
- North 155th Street and 1st Avenue NE
- NE 155th Street and 8th Avenue NE*
- NE 165th Street and 5th Avenue NE

- North 185th Street and Meridian Avenue North
- NE 185th Street and 2nd Avenue NE*
- NE 185th Street and 8th Avenue NE*

NE 130th Street Station

With NE 130th Street Station Option 2, access to a 100-stall surface park-and-ride lot west of 5th Avenue NE would be provided via two unsignalized driveways. No intersections would be expected to degrade below LOS standards. However, higher intersection delays are expected at the unsignalized 5th Avenue NE and I-5 northbound off-ramp intersection. In 2035, this intersection is expected to operate at LOS F during both the AM and PM peak hours with the No Build Alternative.

NE 155th Street Station

Alternative A7 would result in the same LOS as Alternative A5 with the NE 155th Street Station.

NE 185th Street Station

Alternative A7 would result in the same LOS as Alternative A3 with NE 185th Street Station Option 2.

Alternative A10: At-grade/Elevated with NE 130th, NE 145th, and NE 185th Street Stations

With Alternative A10, the following 11 intersections may require mitigation due to degraded operations below LOS D and/or increased delays compared to the No Build Alternative (intersections marked with an asterisk [*] are not subject to the City of Shoreline's LOS D standard):

- 5th Avenue NE and I-5 northbound on-ramp (north of NE 145th Street)
- NE 145th Street and 5th Avenue NE
- 5th Avenue NE and I-5 northbound off-ramp (south of NE 145th Street)
- NE 145th Street and 6th Avenue NE
- NE 145th Street and 12th Avenue NE
- North 185th Street and Meridian Avenue North
- NE 185th Street and 2nd Avenue NE*
- NE 185th Street and 5th Avenue NE
- NE 185th Street and 7th Avenue NE

- NE 185th Street and 8th Avenue NE*
- NE 185th Street and 10th Avenue NE

NE 130th Street Station

Alternative A10 would result in the same access changes as Alternative A5 with NE 130th Street Station Option 1, but no park-and-ride lot would be provided. Traffic impacts near the station would be similar but slightly better than with Alternative A5; moreover, the intersection of NE 130th Street/Roosevelt Way NE and 5th Avenue NE would operate at LOS D during the PM peak hour in 2035.

NE 145th Street Station

Alternative A10 would result in similar LOS as Alternative A1 with NE 145th Street Station Option 1. However, an additional 150 park-and ride spaces (650 total park-and-ride spaces) would be provided with Alternative A10. The additional trips generated by the 150 park-and ride spaces would increase the moderate delay at the intersection of NE 145th Street and 12th Avenue NE during the PM peak hour; this intersection would already operate at LOS F during the PM peak hour with the No Build Alternative in 2035. The intersection of NE 145th Street and 6th Avenue NE would also degrade from LOS E to LOS F with the additional trips during the PM peak hour.

NE 185th Street Station

Alternative A10 would result in the same LOS as Alternative A5 with NE 185th Street Station Option 3.

Alternative A11: Mostly Elevated with NE 130th, NE 145th, and NE 185th Street Stations

With Alternative A11, the following eight intersections may require mitigation due to degraded operations below LOS D and/or increased delays compared to the No Build Alternative (intersections marked with an asterisk [*] are not subject to the City of Shoreline's LOS D standard):

- 5th Avenue NE and I-5 northbound off-ramp (south of NE 130th Street)
- NE 145th Street and 5th Avenue NE
- 5th Avenue NE and I-5 northbound off-ramp (south of NE 145th Street)
- NE 145th Street and 6th Avenue NE
- NE 145th Street and 12th Avenue NE
- North 185th Street and Meridian Avenue North

- NE 185th Street and 2nd Avenue NE*
- NE 185th Street and 8th Avenue NE*

NE 130th Street Station

Alternative A11 would result in the same LOS as Alternative A7 with NE 130th Street Station Option 2.

NE 145th Street Station

Alternative A11 would result in the same LOS as Alternative A3 with NE 145th Street Station Option 2.

NE 185th Street Station

Alternative A11 would result in the same LOS as Alternatives A3 and A7 with NE 185th Street Station Option 2.

Segment B: Shoreline to Mountlake Terrace

Tables 5-27 and 5-28 show the PM and AM peak hour LOS results for the No Build Alternative and light rail alternatives in Segment B for forecast year 2035. As shown in Table 5-27, the intersection of 220th Street SW and SR 99 would operate below LOS standards in the PM peak hour with both the No Build Alternative and Alternative B2A. All other intersections would operate within LOS standards during the PM and AM peak hours.

Table 5-27. Forecast Year 2035 PM Peak Hour Intersection LOS—Segment B

Nearest Station/ Intersection	LOS Standard	Alternative: No Build	B1	B2	B2A	B4	Assumed Project Improvements[a]
Mountlake Terrace Station			**Transit Center**	**Transit Center**	**Transit Center**	**Freeway Station**	
Lakeview Drive and 65th Place West	E	B	C	C	C	C	
Lakeview Drive and 64th Avenue West	E	B	B	B	B	B	
236th Street SW and I-5 southbound collector-distributor on-ramp	D	A	A	A	A	A	
236th Street SW and I-5 northbound off-ramp	D	C	C	C	C	C	
236th Street SW and transit center driveway (out)	E		D	D	D		Transit center – includes two-way left-turn lane on 236th Street SW

Table 5-27. Forecast Year 2035 PM Peak Hour Intersection LOS—Segment B

Nearest Station/ Intersection	LOS Standard	Alternative: No Build	B1	B2	B2A	B4	Assumed Project Improvements[a]
236th Street SW and 58th Avenue West	E	B	B	B	B	B	
236th Street SW and 56th Avenue West	D	D	D	D	D	D	
220th Street SW Station					**220th**		
220th Street SW and SR 99	E	F			F		
220th Street SW and 70th Avenue West	E	C			C		
220th Street and 66th Avenue West	E	D			D		
220th Street and 64th Avenue West	E	C			C		
64th Avenue West and 222nd Street SW	E	A			A		
220th Street SW and I-5 southbound ramps	D	B			B		
220th Street SW and I-5 northbound ramps	D	C			C		
220th street SW and 58th Avenue West	E	A			A		
220th Street SW and 56th Avenue West	E	C			C		
220th Street SW and 55th Avenue West	E	B			B		
220th Street SW and 54th Avenue West	E	B			B		
220th Street SW and 53rd Avenue West	E	B			B		
220th Street SW and 52nd Avenue West	E	C			C		

Notes:
[a] Improvements described include changes in intersection control, signal timing/phasing, and/or intersection channelization improvements that could be included as part of the projectGray = Location not analyzed for the specified station/alternative. Intersection would be expected to operate similar to the No Build Alternative.
Red = Intersection does not meet LOS standard.
Yellow = Intersection operates at acceptable LOS but is approaching LOS standard.
Green = Intersection operates at acceptable LOS.

Table 5-28. Forecast Year 2035 AM Peak Hour Intersection LOS—Segment B

Nearest Station/ Intersection	LOS Standard	Alternative					Assumed Project Improvements[a]
		No Build	B1	B2	B2A	B4	
Mountlake Terrace Station			**Transit Center**	**Transit Center**	**Transit Center**	**Freeway Station**	
236th Street SW and I-5 southbound collector-distributor on-ramp	D	A	B	B	B	B	
236th Street SW and I-5 northbound off-ramp	D	C	C	C	C	C	
236th Street SW and transit center driveway (out)	E		D	D	D		Transit center – includes two-way left-turn lane on 236th Street SW
236th Street SW and 56th Avenue West	D	D	D	D	D	D	
220th Street SW Station					**220th**		
220th Street SW and SR 99	E	E			E		
220th Street SW and I-5 southbound ramps	D	C			C		
220th Street SW and I-5 northbound ramps	D	D			D		

Notes:
[a] Improvements described include changes in intersection control, signal timing/phasing, and/or intersection channelization improvements that could be included as part of the project.
Gray = Location not analyzed for the specified station/alternative. Intersection would be expected to operate similar to the No Build Alternative
Yellow = Intersection operates at acceptable LOS but is approaching LOS standard
Green = Intersection operates at acceptable LOS

Alternative B1: East Side to Mountlake Terrace Transit Center to Median

With Alternative B1, no intersections would require mitigation due to degraded operations below LOS standards and/or increased delays compared with the No Build Alternative.

Mountlake Terrace Transit Center Station

With Alternative B1, all intersections evaluated near the Mountlake Terrace Transit Center Station would operate at LOSs similar to the No Build Alternative. The proposed park-and-ride driveway at 236th Street SW and 58th Avenue West would operate at LOS D during both the PM and AM peak hours with a two-way left-turn lane on 58th Avenue West.

Alternative B2: East Side to Mountlake Terrace Transit Center to West Side

With Alternative B2, no intersections would require mitigation due to degraded operations below LOS standards and/or increased delays compared with the No Build Alternative.

Mountlake Terrace Transit Center Station

Alternative B2 would result in the same LOS as Alternative B1.

Alternative B2A: Optional 220th Street SW Station (elevated)

220th Street SW Station

The intersection of 220th Street SW and SR 99 would operate at LOS F during the PM peak hour with the No Build Alternative; intersection delay would not further degrade with Alternative B2A.

Alternative B4: East Side to Mountlake Terrace Freeway Station to Median

With Alternative B4, no intersections would require mitigation due to degraded operations below LOS standards and/or increased delays compared with the No Build Alternative.

Mountlake Terrace Freeway Station

With Alternative B4, vehicle trips and local access near the Mountlake Terrace Freeway Station are expected to be the same as with the Mountlake Terrace Transit Center (Alternatives B1 and B2). Therefore, Alternative B4 would also result in the same intersection LOS as Alternatives B1 and B2.

Segment C: Mountlake Terrace to Lynnwood

Tables 5-29 and 5-30 show the PM and AM peak hour LOS results for the No Build Alternative and light rail alternatives (forecast year 2035) in Segment C. As shown in Table 5-29, five out of the 20 intersections evaluated in Segment C would operate below LOS standards with the No Build Alternative and light rail alternatives during the PM peak hour. With the light rail alternatives, most of these intersections would operate with delays similar to the No Build Alternative. The two exceptions are the 196th Street SW and 50th Avenue West and 200th Street SW and 44th Avenue West intersections, which would have higher delays than the No Build Alternative with all of the Segment C light rail alternatives. For the AM peak hour (Table 5-30), none of the intersections would operate below LOS standards with the No Build Alternative, but the intersection of 200th Street SW and 44th Avenue West would degrade below LOS standards during the AM peak hour with all of the light rail alternatives.

Table 5-29. Forecast Year 2035 PM Peak Hour Intersection LOS—Segment C

Nearest Station/ Intersection	LOS Standard	Alternative					Assumed Project Improvements[a]
		No Build	C1	C2	C3a	C3b	
Lynnwood Station			200th	Transit Center	Park-and-Ride Opt.1	Park-and-Ride Opt.2	
196th Street SW and 52nd Avenue West	E	C	C	C	C	C	
196th Street SW and 50th Avenue West	E	F	F	F	F	F	
196th Street SW and 48th Avenue West	E	C	D	D	D	D	
196th Street SW and 44th Avenue West	E	F	F	F	F	F	
196th Street SW and 40th Avenue West	E	F	F	F	F	F	
196th Street SW and 36th Avenue West	D	D	D	D	D	D	
198th Street and 44th Avenue West	E	C	C	C	C	C	
198th Street and 40th Avenue West	E	B	B	B	B	B	
200th Street SW and 50th Avenue West	D	D	D	D	D	D	
200th Street SW and 48th Avenue West	D	B	C	C	C	C	
200th Street SW and 46th Avenue West	E	C	C	C	C	C	
200th Street SW and 44th Avenue West	E	F	F	F	F	F	
200th Street SW and 40th Avenue West	E	C	C	C	C	C	
52nd Avenue West and 204th Street SW	E	C	C	C	C	C	
52nd Avenue West and 208th Street SW	E	D	D	D	D	D	
52nd Avenue West and 212th Street SW	E	F	F	F	F	F	
48th Avenue West and west garage driveway	E		B				
48th Avenue West and east garage driveway	E		B				

Table 5-29. Forecast Year 2035 PM Peak Hour Intersection LOS—Segment C

Nearest Station/ Intersection	LOS Standard	Alternative					Assumed Project Improvements[a]
		No Build	C1	C2	C3a	C3b	
46th Avenue West and Lynnwood Transit Center HOV direct access ramps	D	B	B	C	C	C	(AM) Park-and-Ride Opt.1 – add southbound left-turn pocket
44th Avenue West and I-5 southbound on-ramp	D	B	B	B	B	B	
44th Avenue West and 204th Street SW	D	D	D	D	D	D	
44th Avenue West and I-5 northbound off-ramp	D	D	D	D	D	D	

Notes:
[a] Improvements described include changes in intersection control, signal timing/phasing, and/or intersection channelization improvements that could be included as part of the project.
Gray = Location not analyzed for the specified station/alternative. Intersection would be expected to operate similar to the No Build Alternative.
Red = Intersection does not meet LOS standard.
Yellow = Intersection operates at acceptable LOS but is approaching LOS standard.
Green = Intersection operates at acceptable LOS.

Table 5-30. Forecast Year 2035 AM Peak Hour Intersection LOS—Segment C

Nearest Station/ Intersection	LOS Standard	Alternative					Assumed Project Improvements[a]
		No Build	C1	C2	C3a	C3b	
Lynnwood Station			**200th**	**Transit Center**	**Park-and-ride Opt. 1**	**Park-and-ride Opt. 2**	
196th Street SW and 50th Avenue West	E	E	E	E	E	E	
196th Street SW and 44th Avenue West	E	D	E	E	E	E	
196th Street SW and 36th Avenue West	D	C	C	C	C	C	
200th Street SW and 50th Avenue West	D	C	C	C	C	C	
200th Street SW and 48th Avenue West	D	C	C	C	C	C	
200th Street SW and 46th Avenue West	E	B	B	C	B	B	
200th Street SW and 44th Avenue West	E	E	F	F	F	F	

Table 5-30. Forecast Year 2035 AM Peak Hour Intersection LOS—Segment C

Nearest Station/ Intersection	LOS Standard	Alternative					Assumed Project Improvements[a]
		No Build	C1	C2	C3a	C3b	
48th Avenue West and west garage driveway	E		B				
48th Avenue West and east garage driveway	E		B				
46th Avenue West and Lynnwood Transit Center HOV direct access ramps	D	C	C	D	C	C	Park-and-ride Opt. 1 – add southbound left-turn pocket
44th Avenue West and I-5 southbound on-ramp	D	B	B	B	B	B	
44th Avenue West and I-5 northbound off-ramp	D	B	B	B	B	B	

Notes:
[a] Improvements described include changes in intersection control, signal timing/phasing, and/or intersection channelization improvements that could be included as part of the project.
Gray = Location not analyzed for the specified station/alternative. Intersection would be expected to operate similar to the No Build Alternative.
Red = Intersection does not meet LOS standard.
Yellow = Intersection operates at acceptable LOS but is approaching LOS standard.
Green = Intersection operates at acceptable LOS.

Alternative C1: 52nd Avenue West to 200th Street SW

With Alternative C1, the following two intersections may require mitigation due to degraded operations below LOS standards and/or increased delays compared with the No Build Alternative:

- 196th Street SW and 50th Avenue West
- 200th Street SW and 44th Avenue West

200th Street SW Station

With Alternative C1, all intersections evaluated near the proposed 200th Street SW Station location would operate at LOS similar to the No Build Alternative. However, the following two intersections, projected to operate at LOS F with the No Build Alternative during the PM peak hour, would have higher delays with Alternative C1:

- 196th Street SW and 50th Avenue West
- 200th Street SW and 44th Avenue West

The following three intersections would operate at LOS F during the PM peak hour with the No Build Alternative and would not be expected to degrade further with Alternative C1:

- 196th Street SW and 44th Avenue West
- 196th Street SW and 40th Avenue West
- 52nd Avenue West and 212th Street SW

In the AM peak hour, the intersection of 200th Street SW and 44th Avenue West would degrade below LOS standards with Alternative C1.

Alternative C2: 52nd Avenue West to Lynnwood Transit Center

With Alternative C2, the following two intersections may require mitigation due to degraded operations below LOS standards and/or increased delays compared with the No Build Alternative:

- 196th Street SW and 50th Avenue West
- 200th Street SW and 44th Avenue West

Lynnwood Transit Center Station

Alternative C2 would result in the same LOS as Alternative C1.

Alternative C3: Along I-5 to Lynnwood Park-and-Ride

With Alternative C3, the following two intersections may require mitigation due to degraded operations below LOS standards and/or increased delays compared with the No Build Alternative:

- 196th Street SW and 50th Avenue West
- 200th Street SW and 44th Avenue West

Lynnwood Park-and-Ride Station

With Lynnwood Park-and-Ride Option 1, a southbound left-turn pocket was assumed to be provided at the intersection of 46th Avenue West and the Lynnwood Transit Center HOV direct access ramps to maintain intersection operations at the LOS standard.

All other intersections in Alternative C3 would result in the same LOS as Alternatives C1 and C2.

5.4.3 Property Access and Local Circulation

Implementation of light rail from Northgate to Lynnwood could affect property access and local circulation where roadway modifications are needed for guideway or station construction. The conceptual design indicates some locations where changes may occur, and some adjustments to the conceptual designs of the alternatives may be needed to maintain property access and local circulation. The assessment of property access and local circulation with the light rail alternatives is based on review of the conceptual design of the light rail alignment and station alternatives.

Segment A: Seattle to Shoreline

Property access and local circulation would be affected in Segment A where alternatives would modify interchange ramp configurations, including modifications to NE 130th Street and NE 145th Street interchanges. These potential impacts are discussed below by alternative.

Alternative A1: At-grade/Elevated with NE 145th and NE 185th Street Stations

No change in property access or local circulation would result with Alternative A1 north of NE Northgate Way to North 117th Street. 1st Avenue NE would be reconstructed with the same access and connections as currently exist, including the trail connection to 3rd Avenue NE along NE 116th Street alignment. The alternative would maintain and restore access to properties along the alignment that would remain, including the sole access to the church at the end of 3rd Avenue NE north of NE 117th Street.

Alternative A1 would include the reconstruction of the NE 130th Street interchange, which could result in changes to property access and local circulation on 5th Avenue NE. See Figure 5-25 for an illustration of the reconfigured interchange, including the grade-separation of the northbound off-ramp. The conceptual design for the interchange modifications would revise the intersection of 5th Avenue NE at NE 127th Street to right turns only. Access to and from NE 131st Place at 5th Avenue NE would need to be maintained, with a gap in the raised median. Access to and from the North Seattle Church of the Nazarene would need to be maintained, with a revised median for full access.

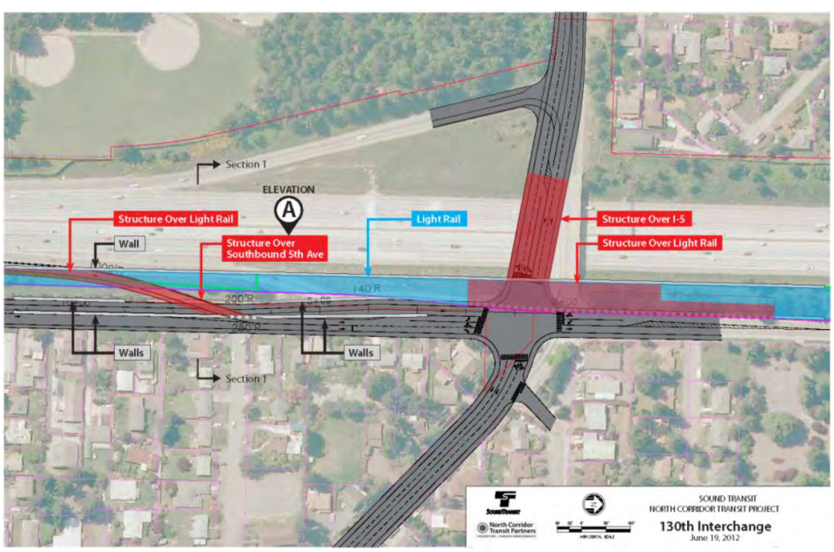


Figure 5-25. Proposed Improvements to the NE 130th Street Interchange Area

No changes in property access or local circulation are expected along 5th Avenue NE south of NE 145th Street with Alternative A1.

NE 145th Street Station

No change in property access or local circulation would be needed with Alternative A1, with Option 1, along 5th Avenue NE near the NE 145th Street Station.

North of NE 155th Street, the light rail guideway construction would include reconstruction of the local street, 2nd Avenue NE, to maintain access and circulation to NE 158th Street, NE 159th Street, and NE 161st Street. Alternative A1 would reconstruct 1st Avenue NE north of NE 170th Street to maintain access and circulation to NE 174th Street.

NE 185th Street Station

Alternative A1 would reconstruct 5th Avenue NE north of NE 180th Street to maintain access to residences along the new roadway. 5th Avenue NE north of NE 185th Street would be rerouted to a new intersection, and property access would be maintained with Alternative A1. A new local roadway connection would be constructed to 8th Avenue NE from the proposed station. There is some potential for cut-through traffic to access the station via local streets between 8th Avenue NE and 10th Avenue NE, north of NE 185th Street.

Alternative A3: Mostly Elevated with NE 145th and NE 185th Street Stations

The Alternative A3 guideway alignment would require reconstruction of the trail connection between the NE 117th Street overcrossing at 1st Avenue NE and 3rd Avenue NE (along NE 116th Street) and would require a new driveway access to a church from NE 117th Street at 3rd Avenue NE. Access along the Alternative A3 guideway would remain the same as existing from approximately NE 120th Street through the NE 130th Street interchange area and north to NE 145th Street.

NE 145th Street Station

Alternative A3 with Option 2 would relocate the northbound on-ramp to I-5 from 5th Avenue NE. The conceptual design for this alternative indicates that the access along 5th Avenue NE could be revised to right turns only to minimize conflicts with station area or ramp traffic. This revision could affect additional residential parcels that need access to be maintained to 5th Avenue NE.

North of NE 148th Street to NE 158th Street, there would be no change in access or circulation with Alternative A3. Similar to Alternative A1, reconstruction of 2nd Avenue NE from NE 158th Street to NE 161st Street, and reconstruction of 1st

Avenue NE from NE 170th Street to NE 174th Street, would maintain property access and local circulation.

NE 185th Street Station

The Alternative A3 guideway would cross 5th Avenue NE south of NE 185th Street, where property driveways could be affected by limited sight distance (which could be mitigated through design).

Alternative A3 would add two access points at the station area—a driveway to 8th Avenue NE and a fourth leg to the existing intersection of 5th Avenue NE at NE 185th Street. This access would have signal control with the station implementation. The potential for cut-through traffic to access the station is similar to Alternative A1.

Alternative A5: At-grade/Elevated with NE 130th, NE 155th, and NE 185th Street Stations

The Alternative A5 guideway alignment would require reconstruction of the trail connection between the NE 117th Street overcrossing at 1st Avenue NE and 3rd Avenue NE (along NE 116th Street), and also require a new driveway access to the church from NE 117th Street at 3rd Avenue NE.

NE 130th Street Station

Similar to Alternative A1, Alternative A5 would include the reconstruction of the NE 130th Street interchange, and there could be changes in property access and local circulation on 5th Avenue NE. The conceptual design for the interchange modifications would revise the intersection of 5th Avenue NE at NE 127th Street to right turns only. Access to and from NE 131st Place at 5th Avenue NE would need to be maintained, with a gap in the raised median. Access to and from the North Seattle Church of the Nazarene would need to be maintained, with a revised median for full access.

No change in property access or local circulation would be needed along 5th Avenue NE south of NE 148th Street. No change in access or circulation would be required south of NE 155th Street.

NE 155th Street Station

Alternative A5 would replace the 2nd Avenue NE cul-de-sac south of NE 155th Street (and 10 residences) with a park-and-ride garage with two driveways to NE 155th Street. Station access and on-street bus activity under the I-5 bridges may increase potential conflicts near the 1st Avenue NE and NE 155th Street intersection just west of I-5. Station area design would incorporate bus stops, crosswalks, and driveway configurations to accommodate the range of travel modes expected at the station.

There is some potential for cut-through traffic to access the station via local streets between 3rd Avenue NE and 5th Avenue NE north of NE 155th Street.

Same as for Alternative A1, the reconstruction of 2nd Avenue NE from NE 158th Street to NE 161st Street under Alternative A5 would maintain access and local circulation.

NE 185th Street Station

Property access and local circulation with Alternative A5 would be the same as for Alternative A1. Alternative A5 would reconstruct 5th Avenue NE north of NE 180th Street and maintain access to residences along the new roadway. Three new access driveways to 8th Avenue NE would be constructed with the station. Alternative A5 would need to maintain access to residences along the guideway from NE 189th Street, west of 8th Avenue NE.

Alternative A7: Mostly Elevated with NE 130th, NE 155th, and NE 185th Street Stations

NE 130th Street Station

Alternative A7 impacts would be the same as for Alternative A3 from Northgate Station to NE 130th Street. At NE 131st Street and 5th Avenue NE (a residential cul-de-sac) and at the North Seattle Church of the Nazarene access, Alternative A7 would need to maintain current access with an opening in the raised median opposite the station.

Access or circulation would not be changed from NE 130th Street Station to NE 155th Street.

NE 155th Street Station

Property access and local circulation with Alternative A7 in the NE 155th Street Station area would be the same as with Alternative A5.

NE 185th Street Station

Property access and local circulation with Alternative A7 in the NE 185th Street Station area would be the same as with Alternative A3.

Alternative A10: At-grade/Elevated with NE 130th, NE 145th, and NE 185th Street Stations

NE 130th Street Station

Same as for Alternative A5, Alternative A10 would affect property access and local circulation from Northgate Station through the NE 130th Street Station area.

NE 145th Street Station

Same as for Alternative A1, Alternative A10 would affect property access and local circulation from the NE 145th Street Station area to NE 180th Street.

NE 185th Street Station

Property access and local circulation with Alternative A10 would be the same as for Alternative A5. Alternative A10 would affect property access and local circulation from NE 180th Street through the NE 185th Street Station area.

Alternative A11: Mostly Elevated with NE 130th, NE 145th, and NE 185th Street Stations

Same as for Alternative A3, Alternative A11 would affect property access and local circulation from the Northgate Station along the guideway to NE 125th Street.

NE 130th Street Station

Same as for Alternative A7, Alternative A11 would affect property access and local circulation from NE 125th Street through the NE 130th Street station area. Along the guideway from NE 140th Street to NE 158th Street, property access and local circulation would be affected in the same ways as under Alternative A3.

NE 145th Street Station

Property access and local circulation with Alternative A11 in the NE 145th Street Station area would be the same as Alternative A3.

Along the guideway from NE 158th Street to NE 180th Street, property access and local circulation would be affected in the same ways as under Alternative A1.

NE 185th Street Station

Along the guideway from NE 180th Street and through the NE 185th Street Station, property access and local circulation would be affected in the same ways as under Alternative A3.

Segment B: Shoreline to Mountlake Terrace

Alternative B1: East Side to Mountlake Terrace Transit Center to Median

Mountlake Terrace Transit Center Station

Alternative B1 would have no effects on property access and local circulation. Reconstruction of the NE 195th Street pedestrian bridge over I-5 would maintain connections for nonmotorized travel to the NE 195th Street corridor. Property access to the school property south of the Mountlake Terrace Transit Center Station would be maintained with the guideway alignment. One new access driveway would be added to the transit center and station, with a connection to 236th Street SW.

Alternative B2: East Side to Mountlake Terrace Transit Center to West Side

Mountlake Terrace Transit Center Station

Similar to Alternative B1, Alternative B2 would affect property access and local circulation from the Mountlake Terrace Transit Center Station to the south.

Reconstruction of the approach to the 228th Street SW roadway crossing over I-5 would maintain local circulation. Reconstruction of a cul-de-sac on 227th Street SW west of I-5 would maintain the same access as currently exists. The guideway alignment along the west side of I-5 would maintain property access and not change local circulation through Segment B.

Alternative B2A: Optional 220th Street SW Station (elevated)

220th Street SW Station (elevated)

Property access and local circulation for Alternative B2A with a station over 220th Street SW would be affected the same as with the Alternative B2 alignment. The I-5 southbound ramp intersection with 220th Street SW would be relocated eastward to allow for the station location. Station access would be provided to 219th Street SW with an arterial connection on 64th Avenue West at 220th Street SW. There is some potential for cut-through traffic to access the station via local streets between 66th Avenue West and 64th Avenue West, north of 220th Street SW.

Alternative B4: East Side to Mountlake Terrace Freeway Station to Median

Mountlake Terrace Freeway Station

Alternative B4 would not affect property access or local circulation through the Segment B portion of the project corridor. The guideway alignment within the I-5 median would require reduced shoulder width (to 3 feet) at the south approach to the Mountlake Terrace Freeway Station in the median.

Segment C: Mountlake Terrace to Lynnwood

Alternative C1: 52nd Avenue West to 200th Street SW

200th Street SW Station

Alternative C1 would affect property access and local circulation with the connection to the rail alignment in the median of I-5. This effect would include changes to 10 property driveways along the east side of 52nd Avenue West/Cedar Valley Road where driveway operation may be constrained due to limited sight distance, based on column locations for the elevated guideway. The guideway would cross 208th Street SW, 206th Street SW, and 204th Street SW, including the Interurban Trail where column locations may restrict sight distance. This alternative would need to maintain full access, as much as possible, for these property driveways.

The guideway would cross an apartment complex west of 48th Avenue West, where site driveway access would be changed and on-site circulation would need to be modified to maintain site access to 200th Street SW.

The guideway would cross 48th Avenue West adjacent to the existing traffic signal. The tail track would be elevated over the 46th Avenue West signal and three driveways to 200th Street SW, where visibility may be limited by the column locations; in addition, driveways could be restricted to right turns only.

Alternative C1 connecting to a rail alignment along the west side of I-5 would affect two additional driveways on 52nd Avenue West with column locations for the elevated guideway.

Alternative C2: 52nd Avenue West to Lynnwood Transit Center

Lynnwood Transit Center Station

Property access and local circulation for Alternative C2 would be affected in the same ways as under Alternative C1 south of 204th Street SW (with five driveways affected). At 204th Street SW, the guideway turns east across properties where on-site circulation would need to be modified for the remaining buildings and access to Cedar Valley Road. Parking lots could be redesigned to connect under the light rail guideway.

The Alternative C2 tail track and crossover would extend above the park-and-ride facility, the Interurban Trail, and the southbound on-ramp to I-5. On-site circulation of the park-and-ride would be modified to accommodate the columns.

Alternative C3: Along I-5 to Lynnwood Park-and-Ride

Lynnwood Park-and-Ride Station

Alternative C3 would affect property access and local circulation with the reconstruction of the 208th Street SW access roadway along the west side of I-5 for maintaining access to properties north of the Interurban Trail and east of 52nd Avenue West. Property access may be modified with the design but maintained with the relocated driveway. Property access is from 204th Street SW and 208th Street SW.

The guideway would cross the extension of 208th Street SW, the Interurban Trail, and the HOV direct access ramp on the approach to the Lynnwood Park-and-Ride Station. The tail track and crossover would extend above the Interurban Trail and pedestrian bridge, over the southbound on-ramp to I-5, over 44th Avenue West, and extend over a retail property development. This alignment would affect on-site access to parking lots that serve buildings set back from 44th Avenue West. Alternative C3 would include reconfiguration of parking lots and circulation to maintain access and parking circulation for these properties east of 44th Avenue West.

5.5 Nonmotorized Facilities

This section discusses forecasted conditions of nonmotorized facilities in the future (forecast year 2035) for the project corridor, and the anticipated impacts of the Lynnwood Link Extension project on these facilities. Key observations and findings are as follows:

- With the No Build Alternative, pedestrian and bicycle activities would have a modest increase due to new developments, new pedestrian and bicycle facilities, and/or a mode shift to walking and bicycling.
- Lynnwood Link Extension would substantially increase the number of pedestrians around stations.
- The highest pedestrian flows would occur during the PM peak period when riders are leaving the stations in a surge.
- Most pedestrians would use station area facilities to move between the station and the park-and-ride, passenger pick-up and drop-off area, and bus stops.
- Pedestrian flows would function at very high service levels due to wide plaza areas and sidewalks from the stations to park-and-rides, passenger pick-up and drop-off areas, and bus stops. Some pedestrian facilities could become a little more crowded due to the project around the Lynnwood Transit Center Station; however, they would still function at acceptable levels of service.

- Station construction often includes reconstruction of adjacent streets, which would include construction of pedestrian and bicycle facilities at or above local jurisdictional standards.

5.5.1 Pedestrian Facilities

Pedestrian facilities were analyzed within 0.50 mile of the proposed light rail stations. The Lynnwood Link Extension would substantially increase the number of pedestrians in and around the stations. The inventory of pedestrian facilities discussed in Chapter 4 also identified the activity centers that would generate higher volumes of pedestrians between the activity center and the station, including multifamily housing, commercial areas, community centers, and community colleges (see Section 4.5.1).

Pedestrian LOS was analyzed within 300 feet of the station entrances. Pedestrian LOS for sidewalks was analyzed using the methodology from the *Highway Capacity Manual* (Transportation Research Board 2000) and the TCQSM. Pedestrian LOS is a measure of the walking conditions on a sidewalk. LOS A represents ample spacing between pedestrians on a sidewalk for free-flow walking speeds. LOS F represents unavoidable crossings between pedestrians on a sidewalk or path, preventing free-flow walking speed and movement.

The worst condition LOS would occur as trains are unloading during the PM peak hour, when riders leave the trains in a surge. The number of pedestrians using sidewalks within 300 feet was based on an estimate of the number of alighting transit riders that would walk to a park-and-ride lot, passenger pick-up and drop-off area, and bus stops, including those walking to their destinations. The Sound Transit Ridership Model provided the number of PM peak hour maximum alightings as "walk trips" and "bus trips." The walk trips were distributed to the park-and-ride lot based on the number of stalls and an assumption that the park-and-ride empties in 3 hours. The walk trips were distributed to passenger pick-up/drop-off based on 2035 peak hour passenger pick-up/drop-off forecasts. The "bus trips" at each station are a walk trip through the station area and then distributed to the bus stops. Some additional pedestrian volumes may be generated by those using nearby on-street parking. A summary of the estimated pedestrian volumes during a 5-minute pulse from passengers alighting during the PM peak hour is presented in Table 5-31. The 5-minutes pulse values were converted to an hourly equivalent for the purposes of calculating a pedestrian level of service.

Table 5-31. 2035 Estimated Pedestrian Trips at Stations – PM Peak Hour 5-minute Pulse from Light Rail Station to Mode Transfer

Station	Walk[a]	Bus[a]	Park-and-Ride[b]	Kiss-and-Ride[c]	TOTAL
130th Street	6	3	3	1	13
145th Street	8	3	14	2	27
155th Street	3	2	14	1	20
185th Street	13	7	10	3	33
Mountlake Terrace	13	6	24	5	48
220th Street	3	2	6	1	12
Lynnwood	22	90	53	10	175

Sources:
[a] Sound Transit Ridership Model
[b] Number parking stalls and park-and-ride empties in three hours
[c] 2035 Passenger Pick-up/Drop-off Forecasts.

The estimates prepared using this methodology are approximately equal to a full train with all passengers alighting. A full train leaving the Northgate Station would carry 300 passengers, and the total number of passegners estimated as alighting based on the methodology presented in Table 5-31 is approximately 328. Variation from these numbers would be expected on completion of the system and stations, depending on many factors.

Conceptual station area design concepts were used to estimate walkway widths. Sidewalk widths on street segments were based on the local jurisdiction sidewalk standards for the facility. The narrowest sidewalk width would result in the lowest pedestrian LOS condition, which was evaluated as a worst-case condition. In general, plazas and walking areas surrounding the station are constructed with wide pedestrian areas. A detailed analysis of pedestrian impacts at and between stations is presented below. Unless otherwise noted, pedestrian flows are discussed in terms of the PM peak period, when the primary movement is away from the station.

Segment A: Seattle to Shoreline

No Build Alternative

Pedestrian facilities in the vicinity of the proposed light rail stations within Segment A are expected to be LOS A in 2035 without the project.

Alternative A1: At-grade/Elevated with NE 145th and NE 185th Street Stations

NE 145th Street Station Option 1 (elevated)

Park-and-ride users would access the station at the north end directly from the parking garage. The passenger pick-up/drop-off platform is inside the parking garage, and these users would access the station similarly. The highest volume of pedestrians would occur within the station plaza areas; these areas would function at LOS A.

Light rail passengers transferring to a southbound bus would use the station plaza to access the bus stop. Passengers transferring to a northbound bus would walk across the station plazas to the intersection of NE 145th Street and 5th Avenue NE, cross 5th Avenue NE on the north side of NE 145th Street, and arrive at the bus stop. The sidewalk on 5th Avenue NE would be a minimum of 6 feet wide, consistent with City of Shoreline design guidelines.

Passengers transferring to a westbound bus would walk within the station area to the bus stop on NE 145th Street. Riders transferring to an eastbound bus would cross the west leg of NE 145th Street and 5th Avenue NE. The anticipated number of pedestrians on a 6-foot-wide sidewalk and a 12-foot-wide crosswalk would experience LOS A walking conditions.

Station area directional signage would direct pedestrians away from the I-5 on-ramps; however, some pedestrians may choose to cross the I-5 northbound on-ramp if they were unfamiliar with the park-and-ride, or if they have destinations north of the station on the west side of 5th Avenue NE. There would be few gaps in the traffic stream for pedestrians to cross the ramp terminal.

Pedestrians walking to other destinations would use the existing sidewalks beyond the reconstructed segments of NE 145th Street and 5th Avenue NE. The freeway flyer stops and the pedestrian paths to NE 145th Street from the flyer stops are assumed to be removed with the project.

NE 185th Street Station Option 1 (at-grade)

Park-and-ride users would leave the NE 185th Street Station at its south end and cross over I-5 using a 10-foot-wide pedestrian walkway on the north side of a reconstructed bridge to access the parking garage on the west side of I-5. The 10-foot-wide sidewalk is estimated to function at LOS A.

Pick-up and drop-off passengers would walk from the station onto the plaza, along the bus access driveway that intersects NE 185th Street opposite 5th Avenue NE, and then cross the driveway to the pick-up and drop-off area on the north side of NE 185th Street. A 12-foot-wide crosswalk would operate at LOS A. Light rail passengers transferring to a bus would walk across the plaza to the bus platforms located on the east edge of the reconstructed NE 185th Street bridge. Those transferring to eastbound buses would need to cross NE 185th Street on the west side of 5th Avenue NE.

Light rail passengers walking to their destinations would use the reconstructed sidewalks that are at least 6 feet wide and meet City of Shoreline design guidelines. These new sidewalks would function at LOS A. Pedestrians walking beyond the reconstructed street segments would walk on existing sidewalks that are also expected to function at LOS A conditions.

Alternative A3: Mostly Elevated with NE 145th and NE 185th Street Stations

NE 145th Street Station Option 2 (elevated)

With Option 2, park-and-ride users would access the parking garage using the plaza area at the center of the station, as would pedestrians walking to the pick-up and drop-off platform. Passengers transferring to southbound buses on 5th Avenue NE would need to cross the parking garage entrance. This entrance would be designed with a crosswalk and enhanced with variation in pavement materials or pavement markings. Passengers transferring to northbound buses on 5th Avenue would follow the same routes as in Alternative A1, Option 1, also resulting in an LOS A condition.

In the project design, the freeway flyer stops and the pedestrian paths to NE 145th Street would be removed.

NE 185th Street Station Option 2 (elevated)

Park-and-ride users leaving the station would have to walk across the plaza and cross the park-and-ride and bus access roadway to enter the parking garage. Assuming a 12-foot-wide crosswalk is provided, this crossing would function at LOS A.

Pick-up and drop-off passengers would walk to the south end of the station, along a sidewalk on the north side of NE 185th Street, and cross the bus entrance/exit to reach the pick-up and drop-off platform on the north side of NE 185th Street. These pedestrians would also experience LOS A conditions.

As in Option 1, light rail passengers transferring to a bus would walk across the plaza to the bus platforms located on the east edge of the reconstructed NE 185th Street bridge. Those transferring to eastbound buses would need to cross NE 185th Street on the west side of 5th Avenue NE.

Light rail passengers walking to their destinations would use the reconstructed sidewalks and experience LOS A conditions. Pedestrians walking beyond the reconstructed street segments would walk on existing sidewalks and experience LOS A conditions. Note that pedestrians walking from the station to the North City business district would encounter a missing sidewalk segment on NE 180th Street between 9th Avenue NE and 15th Avenue NE.

Alternative A5: At-grade/Elevated with NE 130th, NE 155th, and NE 185th Street Stations

NE 130th Street Station Option 1 (at-grade)

Park-and-ride users would need to walk across 5th Avenue NE in the vicinity of the potential leased park-and-ride lot. Pedestrians would experience LOS A conditions with a 12-foot-wide sidewalk. Passengers would access the pick-up and drop-off platform adjacent to the station.

Light rail passengers leaving the station to transfer to a westbound bus would walk to the south end of the station, along a 6-foot-sidewalk along the reconstructed bridge, to a bus stop on the bridge. Light rail passengers transferring to an eastbound bus would cross NE 130th Street and walk along the new sidewalk on the reconstructed bridge to the bus platform. These pedestrians would also experience LOS A conditions.

Light rail passengers walking to destinations west of the station would use new sidewalks on the reconstructed bridge along NE 130th Street. Traveling east of the station, passengers would walk on reconstructed portions of 5th Avenue NE and Roosevelt Way NE. Sidewalks would be at least 6 feet wide consistent with City of Seattle design guidelines and function at LOS A. Beyond the reconstructed street segments, pedestrians would walk on the existing sidewalks. North of the station there is a sidewalk on the east side of 5th Avenue NE up to the Jackson Park Golf Course, but not north of that point. At this location, however, pedestrians could connect with the planned Jackson Park Perimeter Trail, which would provide a unique walking environment to neighborhoods north and east of the golf course. This trail may not be feasible for nighttime use. The existing 5-foot-wide sidewalk would function at LOS A.

NE 155th Street Station (elevated)

At the NE 155th Street Station, the passenger drop-off/pick-up is on the south side of NE 155th Street adjacent to the parking garage. Park-and-ride users would walk across from Level 1 of the parking garage to a walkway on the south side of the fire station, and then access the elevated station platform using stairs, escalator, or elevator. Passengers walking to the pick-up and drop-off platform would descend from the station at the south end and use a pedestrian walkway along the south and east side of the fire station. The wide plaza would operate at LOS A conditions.

Load and unload zones for buses would be located on both sides of NE 155th Street under the station, with the westbound bus platform approximately 300 feet to the west of the station. Light rail passengers transferring to a bus would take the stairs or an elevator to street level on either side of NE 155th Street to reach the bus zones. Platforms and plazas would operate at LOS A for pedestrian volume.

Passengers walking to their destinations would use reconstructed sidewalk segments that are 6 feet wide, consistent with City of Shoreline standards. Beyond the reconstructed street segments pedestrians would use existing sidewalks. These facilities would also operate at LOS A.

NE 185th Street Station Option 3 (at-grade)

With Alternative A5, Option 3 would function the same as Option 2 for pedestrians, except for a heavier volume of pedestrians walking east on NE 185th Street to access the additional park-and-ride spaces that would be located at the Seattle City light property. Pedestrians accessing this park-and-ride would cross 8th Avenue NE using a 12-foot-wide crosswalk that would function at LOS A (the crosswalk location would be identified in the later design); however, the short stretch of sidewalk between 8th Avenue NE and the additional park-and-ride space is currently 6 feet wide and would operate at LOS C unless widened further.

Alternative A7: Mostly Elevated with NE 130th, NE 155th, and NE 185th Street Stations

NE 130th Street Station Option 2 (elevated)

With Alternative A7, park-and-ride users would walk to the north end of the NE 130th Street Station to access the surface park-and-ride lot using wide plazas. Passengers would access the passenger pick-up and drop-off area adjacent to the station. These facilities would function at LOS A.

Light rail passengers leaving the station to transfer to a westbound bus would walk to the south end of the station, and then on a 6-foot-wide sidewalk along the reconstructed bridge. Light rail passengers transferring to an eastbound bus would cross NE 130th Street and walk along the new sidewalk to the bus platform. The sidewalks and crosswalks would function at LOS A.

Light rail passengers walking to their destinations would use the reconstructed sidewalk up to the bridge abutment, on reconstructed portions of 5th Avenue NE and Roosevelt Way NE. Sidewalks would be a minimum of 6 feet wide consistent with City of Seattle design guidelines. Beyond the reconstructed street segments, pedestrians would walk on the existing sidewalks. Pedestrians would also use the existing sidewalks over the bridge. Across the NE 130th Street bridge north of the station, there is a sidewalk on the east side of 5th Avenue NE that extends only to the golf course. At this location pedestrians could connect with the planned Jackson Park Perimeter Trail, which would provide a unique walking environment to neighborhoods north and east of the golf course. The existing 5-foot-wide sidewalk would function at LOS A.

NE 155th Street Station (elevated)

The pedestrian impacts with Alternative A7 would be the same as with Alternative A5.

NE 185th Street Station (at-grade)

The pedestrian impacts with Alternative A7 would be the same as with Alternative A3.

Alternative A10: At-grade/Elevated with NE 130th, NE 145th, and NE 185th Street Stations

NE 130th Street Station Option 1 (at-grade)

The pedestrian impacts with Alternative A10 would be the same as with Alternative A5.

NE 145th Street Station Option 1 (elevated)

The pedestrian impacts with Alternative A10 would be the same as with Alternative A1, except that 150 more park-and-ride spaces would be provided at the NE 145th Street Station, resulting in more transit riders walking to the park-and-ride lot.

NE 185th Street Station Option 3 (at-grade)

The pedestrian impacts with Alternative A10 would be the same as with Alternative A5.

Alternative A11: Mostly Elevated with NE 130th, NE 145th, and NE 185th Street Stations

NE 130th Street Station Option 2 (elevated)

The pedestrian impacts with Alternative A11 would be the same as with Alternative A7.

NE 145th Street Station Option 2 (elevated)

The pedestrian impacts with Alternative A11 would be the same as with Alternative A3.

NE 185th Street Station Option 2 (elevated)

The pedestrian impacts with Alternative A10 would be the same as with Alternative A3.

Segment B: Shoreline to Mountlake Terrace

No Build Alternative

Pedestrian facilities in the vicinity of the light rail stations within Segment B are expected to be LOS A in 2035 without the Lynnwood Link Extension project.

Alternative B1: East Side to Mountlake Terrace Transit Center to Median

The NE 195th Street pedestrian and bicycle bridge over I-5 would be reconstructed with all Segment B alternatives. The facility will be constructed to meet or exceed WSDOT and local jurisdiction standards.

Mountlake Terrace Transit Center Station (elevated)

With Alternative B1, park-and-ride users would walk to the surface parking lot on the east side of the light rail station using station area plazas, or walk across the internal roadway to the park-and-ride garage. The passenger pick-up/drop-off area would be within the surface parking lot.

Light rail passengers transferring to a bus would either walk to bus stops along the internal roadway using station plazas, or walk directly from the station platform down to either side of 236th Street SW to the bus stops. These facilities would function at LOS A conditions.

A multi-use pedestrian/bicycle facility is under design along the north side of 236th Street SW and Lakeview Drive, from the west side of the freeway interchange to the Interurban Trail. From the station, pedestrians walking west from the station would walk on the north side of the 236th Street SW bridge over I-5 (the sidewalk is on the north side) until connecting to the planned Lakeview Drive multi-use trail. Pedestrians walking east toward the Town Center could use the existing sidewalks along 236th Street SW and 56th Avenue West, or the trail through Veteran's Memorial Park. These facilities would all function at LOS A conditions, except for the 5-foot-wide sidewalk on the north side of 236th Street SW across I-5, which is expected to function at LOS B.

Alternative B2: East Side to Mountlake Terrace Transit Center to West Side

Mountlake Terrace Transit Center Station (elevated)

The pedestrian impacts of Alternative B2 would be the same as Alternative B1.

Alternative B2A: Optional 220th Street SW Station (elevated)

220th Street SW Station (elevated)

Park-and-ride users would walk within the garage to stairs and elevators at the southeast end of the parking garage and access the elevated light rail station at the north end of the platform. The passenger pick-up/drop-off areas would be provided on both sides of 220th Street SW near the bus stops. Pick-up and drop-off could also occur within the parking garage. Light rail passengers transferring to a bus would use stairs or elevators on either sides of 220th Street SW and walk along the sidewalks on 220th Street SW. Pedestrians crossing 220th Street would use the light rail station platform or the nearest signalized intersection. The sidewalks would be a minimum of 6 feet wide, consistent with the City of Mountlake Terrace design guidelines. The sidewalks would function at LOS A conditions.

Alternative B4: East Side to Mountlake Terrace Freeway Station to Median

Mountlake Terrace Freeway Station (at-grade in median)

Light rail passengers walking to the park-and-ride, passenger pick-up/drop-off area, and bus stops would walk on the existing pedestrian bridge that leads to the parking garage. The passenger pick-up/drop-off area would be within the surface lot on the east side of the garage, just as with the existing transit center. Transfers to buses would be the same as today, along the existing internal roadway and on 236th Street SW. Pedestrian paths would be the same as existing conditions.

An additional pedestrian overcrossing of the I-5 northbound lanes would be provided at the north end of the station to 232nd Street SW. ADA-accessible ramps and elevators would be provided to manage the uphill grade. This walkway would function at LOS A conditions.

Segment C: Mountlake Terrace to Lynnwood

No Build Alternative

Pedestrian facilities in the vicinity of the light rail stations within Segment C are expected to be LOS A or LOS B in 2035 without the project.

Alternative C1: 52nd Avenue West to 200th Street SW

200th Street SW Station (elevated)

Park-and-ride users would walk along either 48th Avenue West or 46th Avenue West to the park-and-ride lots. Pick-up and drop-off passengers would use a platform on the east side of 48th Avenue West, south of the station. Light rail passengers transferring to an eastbound bus would walk from the station platform, down an escalator or stairs, and to the on-street bus stop. Passengers transferring to a westbound bus would cross the east leg of 200th Street SW to the bus stop on the north side of 200th Street SW. Bus transfers would also continue at the bus bays within the existing transit center through the plaza.

With Alternative C1, park-and-ride users would access lots adjacent to the station and the existing surface lots. Pedestrian access to the surface lots would be through the station area and transit center or along sidewalks at the perimeter. The highest pedestrian volume, based on a distribution of pedestrians to park-and-ride stalls, would occur at the intersection of 46th Avenue West/48th Avenue West. Pedestrians were assumed to cross the west leg to the surface lots, while pedestrians continuing to the east surface lot would cross the south leg of the intersection. The 12-foot-wide crosswalk on the west leg would function at LOS C. In actual use, pedestrians could be expected to walk diagonally across the intersection.

Alternative C2: 52nd Avenue West to Lynnwood Transit Center

Lynnwood Transit Center Station (elevated)

Park-and-ride users would walk to vertical circulation facilities (stairs, escalators, or elevators) and to the station plazas, and then walk to the south to the parking garage or use the crosswalk across the direct access ramp roadway/46th Avenue West to the existing surface parking lot. The passenger pick-up/drop-off platform would be along the north side of the station plaza along 48th Avenue NE. Light rail passengers that transfer to buses would walk along 48th Avenue West, or between the two parking garage structures to the existing bus transit center. The pedestrian LOS would function at LOS C on the two crosswalks between the station area plaza, across 48th Avenue West to the transit center. The concept design shows approximately a 16-foot-wide sidewalk, which would function at LOS C. A wider sidewalk would result in a higher level of service during a 5-minute pulse.

Alternative C3: Along I-5 to Lynnwood Park-and-Ride

Lynnwood Transit Center Station (elevated)

Park-and-ride users would take the stairs, escalators, or elevators to the station plaza and then would have two options for walking to the parking garage just west of the direct access ramp. With Option 1, they would walk along a pedestrian path underneath the direct access ramp to the proposed garage; and with Option 2, they would walk up the diagonal pathway to the junction of 46th Avenue West and the direct access ramp and cross the ramp roadway at that point to reach the garage. The diagonal pedestrian path in the concept design is approximately 32 feet wide and would function at LOS E. A wider path would result in a higher level of service. The crosswalks at the intersection of 46th Avenue West/48th Avenue West would function at LOS E to LOS F across the south leg. This assumes all pedestrians would use the 12-foot-wide crosswalks. In actual use, pedestrians could be expected to walk diagonally across the intersection.

Light rail passengers who transfer to buses would walk across the intersection of 46th Avenue West/direct access ramp to the existing transit center in Option 1. As a worst-case condition, all pedestrians would use the 12-foot-wide crosswalk, resulting in LOS C conditions. However, pedestrians currently cross at various locations across 46th Avenue West because it has only bus and HOV traffic and no general purpose traffic. In Option 2, the bus transfer facilities would be located immediately adjacent to the station; hence, light rail passengers would simply walk across the plaza to the buses. Passengers walking to the pick-up and drop-off platform in Option 1 would walk across the plaza. Pedestrian movement would also occur from the plaza area to the Interurban Trail across 46th Avenue West using the intersection crosswalk. In Option 2, pick-up and drop-off passengers would walk along the pedestrian path under the direct access ramp to the platform adjacent to the parking garage.

5.5.2 Bicycle Facilities

Bicycle facilities were analyzed within 1 mile of the proposed light rail stations. The project would increase the number of bicycles in the proposed station areas. Activity centers that would generate an increase in bicycle travel to and from the stations were also included in the analysis, including multifamily housing, commercial areas, community centers, and community colleges. Secure and covered bicycle parking and access would be provided at each station.

Segment A: Seattle to Shoreline

The City of Seattle June 2007 *Recommended Bicycle Facilities*, *Seattle Bicycle Master Plan* identifies recommended bicycle facilities in north Seattle. The North 117th Street bridge would be replaced by light rail alignment construction. A bicycle climbing lane is identified on 5th Avenue NE and the North 117th Street bridge.

The City of Shoreline 2011 *Bicycle System Plan*, *City of Shoreline Transportation Master Plan* identifies recommended bicycle facilities north of NE 145th Street. The City has identified NE 145th Street as an arterial needing further study for all modes of transportation. The *Bicycle System Plan* identifies improvements (described below) in the vicinity of the NE 155th Street Station and the NE 185th Street. In addition, the planned improvements are intended to complete bicycle facilities to connect the Interurban Trail to the Burke-Gilman Trail in Lake Forest Park.

At each station option in Segment A, there would be 50 covered bicycle parking spaces provided when the stations open and space to provide up to 50 additional bicycle parking spaces in the future.

Alternative A1: At-grade/Elevated with NE 145th and NE 185th Street Stations

NE 145th Street Station Option 1 (elevated)

With Alternative A1, NE 145th Street would be reconstructed to City of Seattle and/or City of Shoreline standards. Bicycles would share lanes with general purpose traffic. The reconstructed portion of 5th Avenue NE south of NE 145th Street would include a wide curb lane to address the City of Seattle's recommended bicycle facility as a paved shoulder. North of NE 145th Street, the *Bicycle System Plan* identifies a bicycle lane on 5th Avenue NE; therefore, the reconstructed portion of 5th Avenue NE north of NE 145th Street would also include a bicycle lane. Beyond the reconstructed street segments, bicycles would continue to travel in the general purpose lanes.

NE 185th Street Station Option 1 (at-grade)

The reconstructed portion of NE 185th Street between the west side of the reconstructed 5th Avenue NE west of I-5, including the east side of the reconstructed 5th Avenue NE on the east side of I-5, would have bicycle lanes consistent with the City of Shoreline's *Bicycle System Plan*. However, there would still be a gap in the bicycle lane on NE 185th Street between reconstructed 5th Avenue NE on the west side of I-5 and the existing bicycle lane that extends west of 1st Avenue North. Another gap would occur on NE 185th Street east of the reconstructed portion of NE 185th Street between 5th Avenue NE (west of I-5) and 10th Avenue NE. 10th Avenue NE has an existing 6-foot-wide paved shoulder and is designated as a sharrow lane in the City of Shoreline's *Bicycle System Plan*.

5th Avenue NE (north of NE 185th Street and west of I-5) and 5th Avenue NE east of I-5 and to the south of NE 185th Street would be reconstructed with bicycle lanes consistent with the City of Shoreline's *Bicycle System Plan*. Beyond the reconstructed street segments of 5th Avenue NE, bicycles would continue to travel in the general purpose lanes.

Alternative A3: Mostly Elevated with NE 145th and NE 185th Street Stations

NE 145th Street Station Option 2 (elevated)

The impacts of Option 2 with Alternative A3 would be the same as Option 1 described above for Alternative A1.

NE 185th Street Station Option 2 (elevated)

With Alternative A3, the impacts of Option 2 would be the same as Option 1 with Alternative A1, except that the reconstructed portion of NE 185th Street would end east of I-5, and 5th Avenue NE would not be reconstructed on either the west or east side of I-5; therefore, they would not have bicycle facilities. Bicycles would continue to travel in the general purpose lanes between the east end of the I-5 bridge and 1st Avenue NE to the existing bicycle lanes on NE 185th Street west of 1st Avenue NE.

Alternative A5: At-grade/Elevated with NE 130th, NE 155th, and NE 185th Street Stations

NE 130th Street Station Option 1 (at-grade)

With Alternative A5, the reconstructed portion of NE 130th Street would include a wide outside lane consistent with the City of Seattle's *Recommended Bicycle Facilities*. Beyond the reconstructed portion, bicycles would continue to travel in general purpose lanes on NE 130th Street west of I-5, and east along NE 130th Street and Roosevelt Way NE to NE 125th Street.

The reconstructed portion of 5th Avenue NE would include a wide curb lane to address the City of Seattle's planned paved shoulder. Beyond the reconstructed portion, bicycles would travel with general purpose traffic along curbed segments and on the paved shoulder north of the station area.

NE 155th Street Station (elevated)

The reconstructed portion of NE 155th Street would replace the existing bicycle lanes, consistent with the City of Shoreline's *Bicycle System Plan*. Beyond the reconstructed portion of NE 155th Street to the east of 5th Avenue NE, bicycles would continue to use the general purpose lanes.

NE 185th Street Station Option 3 (at-grade)

The impacts of the NE 185th Street Station Option 3 with Alternative A5 would be the same as Option 2 with Alternative A3.

Alternative A7: Mostly Elevated with NE 130th, NE 155th, and NE 185th Street Stations

NE 130th Street Station Option 2 (elevated)

The impacts of the NE 130th Street Station Option 2 with Alternative A7 would be the same as Option 1 with Alternative A1, except that the NE 130th Street bridge would not be reconstructed. Bicycles would continue to travel in general purpose lanes over the NE 130th Street bridge to the west.

NE 155th Street Station (elevated)

The impact of the NE 155th Street Station with Alternative A7 would be the same as with Alternative A5.

NE 185th Street Station Option 2 (elevated)

The impact of the NE 185th Street Station with Alternative A7 would be the same as with Alternative A3.

Alternative A10: At-grade/Elevated with NE 130th, NE 145th, and NE 185th Street Stations

NE 130th Street Station Option 1 (at-grade)

The impact of the NE 130th Street Station with Alternative A10 would be the same as with Alternative A5.

NE 145th Street Station Option 1 (elevated)

The impact of the NE 145th Street Station with Alternative A10 would be the same as with Alternative A1.

NE 185th Street Station Option 3 (at-grade)

The impact of the NE 185th Street Station with Alternative A10 would be the same as with Alternative A5.

Alternative A11: Mostly Elevated with NE 130th, NE 145th, and NE 185th Street Stations

NE 130th Street Station (elevated)

The impact of the NE 130th Street Station with Alternative A11 would be the same as with Alternative A7.

NE 145th Street Station Option 2 (elevated)

The impact of the NE 145th Street Station with Alternative A11 would be the same as with Alternative A3.

NE 185th Street Station Option 2 (elevated)

The impact of the NE 185th Street Station with Alternative A11 would be the same as with Alternative A3.

Segment B: Shoreline to Mountlake Terrace

At each station option in Segment B, there would be 50 covered bicycle parking spaces provided when the stations open and space to provide up to 50 additional bicycle parking spaces in the future.

Alternative B1: East Side to Mountlake Terrace Transit Center to Median

Mountlake Terrace Transit Center Station (elevated)

The reconstructed portion of 236th Street SW would include bicycle lanes consistent with the Bike Route Facility Recommendations, Future Bicycle Plan in the City of Mountlake Terrace 2007 *Mountlake Terrace Transportation Master Plan*. Traveling west from the station, bicycles would continue to use the general purpose lanes on the 236th Street bridge over I-5 and then connect to the multi-use trail along Lakeview Drive. The Lakeview Trail, a mixed-use paved trail, is currently under design and will be located in the north side of 236th Street SW west of the I-5 southbound ramp.

East of the reconstructed portion of 236th Street SW bicycles would continue to ride in the general purpose lanes.

Alternative B2: East Side to Mountlake Terrace Transit Center to West Side

Mountlake Terrace Transit Center Station (elevated)

The bicycle impacts of Alternative B2 in the Mountlake Terrace Transit Center Station area would be the same as with Alternative B1.

Alternative B2A: Optional 220th Street SW Station (elevated)

220th Street SW Station (elevated)

With Alternative B2A, bicycles would access the 220th Street SW Station parking garage from the driveway entrance at 60th Avenue West, or by using the elevators on either side of 220th Street SW. Bicyclists would then walk their bicycles through the station to the garage. Bicycle enhancements could be designed to facilitate the movement of bicycles from 220th Street SW to the station elevators to avoid the additional travel distance to 60th Avenue West for some bicyclists. There would be no designated bicycle facilities in this station area except the Interurban Trail, which is located approximately 0.50 mile to the west and north of the station location.

Alternative B4: East Side to Mountlake Terrace Freeway Station to Median

Mountlake Terrace Freeway Station (at-grade)

There would be no effect on bicycles with Alternative B4 because all construction activity would be in the median of I-5. Bicycles would continue to access the transit center from 236th Street SW, use existing bicycle parking, and then riders would walk to the freeway station.

Segment C: Mountlake Terrace to Lynnwood

At each station option in Segment C there would be 200 covered bicycle parking spaces provided when the station opens and space to provide up to 200 additional bicycle parking spaces in the future. The multi-use Interurban Trail passes by all station alternatives in this segment, providing bicycle access to the north and south of the stations

Within 1 mile of the proposed light rail station, the City of Lynnwood planned “Bicycle Skeleton System” in their Comprehensive Plan includes 5-foot-wide bicycle lanes on all arterials except 196th Street SW and 44th Avenue West south of 194th Street SW. In addition, improvements to the Interurban Trail are planned in the vicinity of 200th Street SW and 52nd Avenue West.

Alternative C1: 52nd Avenue West to 200th Street SW

Two segments of Alternative C1 would result in reconstruction of portions of the east side of 52nd Avenue West in the vicinity of the on-street portion of the Interurban Trail and on Cedar Valley Road. Reconstruction would include replacement of the existing bicycle lanes. There is a programmed improvement to the Interurban Trail in the vicinity of 208th Street SW and 52nd Avenue West. This constructed improvement would remain in place following construction of the light rail line.

200th Street Station SW Station

The reconstructed segment of 200th Street SW would include bicycle lanes consistent with the City of Lynnwood’s Comprehensive Plan. The reconstructed segment extends from approximately 335 feet west of 48th Avenue West to 46th Avenue West on the south side of 200th Street SW. There could be a missing bicycle lane segment on the south side of 200th Street SW between the west end of the reconstructed portion to the existing bicycle lanes at 50th Avenue West. The reconstruction would not include the north side of 200th Street SW.

Alternative C2: 52nd Avenue West to Lynnwood Transit Center

There is a segment of Alternative C2 that would result in reconstruction of portions of the east side of 52nd Avenue West in the vicinity of the on-street portion of the Interurban Trail. Reconstruction would include replacement of the existing bicycle lanes. There is a programmed improvement to the Interurban Trail in the vicinity of 208th Street SW and 52nd Avenue West. This constructed improvement would remain in place after construction of the light rail line.

Lynnwood Transit Center Station

The tail tracks at the Lynnwood Transit Center Station would be over the Interurban Trail and the ramp to the 44th Street West pedestrian/bicycle bridge. Both facilities would remain in place after construction of Alternative C2.

Alternative C3: Along I-5 to Lynnwood Park-and-Ride

The Alternative C3 light rail line would cross over the Interurban Trail east of 208th Street West and 48th Avenue West. A segment of the light rail line would result in reconstruction of portions of the east side of 52nd Avenue West in the vicinity of the on-street portion of the Interurban Trail. Reconstruction would include replacement of the existing bicycle lanes. There is a programmed improvement to the Interurban Trail in the vicinity of 208th Street SW and 52nd Avenue West. This constructed improvement would remain in place following construction of the light rail line.

Lynnwood Park-and-Ride Station

The tail tracks at the Lynnwood Transit Center Station would be over the Interurban Trail and the ramp to 44th Street West pedestrian/bicycle bridge. Both facilities would remain in place after construction of Alternative C3.

5.6 Freight Mobility and Access

No changes to freight mobility and access are expected with the No Build Alternative beyond the increases in delay and roadway congestion that could occur over time.

With the light rail alternatives, freight truck traffic is expected to continue using designated FGTS and city streets for the movement of freight. In some locations, designated truck routes would travel alongside at-grade light rail profiles. At these locations, roadway and intersection conditions with the light rail alternatives would be similar to those with the No Build Alternative. Some intersection operations may improve through mitigation for the project alternatives, which could benefit freight movement. Beyond these potential project effects, modifications to the roadway network associated with the project alternatives that could result in changes in freight mobility and access are described for each segment. These modifications are not anticipated to negatively affect truck circulation or change the truck route designations on the regional and local street network.

Key observations and findings related to freight traffic include the following:

- In Segment A, some I-5 access modifications would be made near NE 130th Street with Alternatives A1, A5, and A10, and at the NE 145th Street Station with Alternatives A3 and A11. However, these modifications are not expected to result in negative effects on truck circulation.

- In Segment A, NE 145th Street is a truck route serving freight traffic between I-5 and commercial activities to the west and east. Any increased queuing at the I-5 interchange ramps or other NE 145th Street intersections would be mitigated to prevent adverse effects to freight movement.
- The Segment B and C alternatives are not expected to affect truck circulation.

Segment A: Seattle to Shoreline

The six Segment A alternatives are not expected to result in negative effects on truck circulation, although some I-5 access modifications would be made near NE 130th Street with Alternatives A1, A5, and A10, and at the NE 145th Street Station with Alternatives A3 and A11. All alternatives would extend from the Northgate Station to the north side of NE 185th Street.

Alternative A1: At-grade/Elevated with NE 145th and NE 185th Street Stations

Alternative A1 begins at the Northgate Station and continues north in a mix of elevated and at-grade profiles on the east side of I-5, with an elevated station at NE 145th Street and an at-grade station at NE 185th Street.

Near NE 130th Street, the I-5 northbound off-ramp would be relocated to the south and would be grade-separated from southbound 5th Avenue NE, which would be below the off-ramp. The NE 130th Street bridge over I-5 would be rebuilt and realigned slightly to the south. This access modification may result in slightly improved freight access between I-5 and NE 130th Street.

Alternative A3: Mostly Elevated with NE 145th and NE 185th Street Stations

Alternative A3 is similar to Alternative A1, but would be mostly elevated between the Northgate Station and NE 145th Street. North of NE 145th Street, the alignment would continue in a mix of elevated and at-grade profiles to an elevated station at NE 185th Street.

At the NE 145th Street Station, the northbound on-ramp to I-5 would be relocated to approximately the north edge of the existing surface park-and-ride lot to accommodate a new parking garage south of the relocated ramp. This would result in a modification to freight access between NE 145th Street, 5th Avenue NE, and I-5. Truck circulation is not likely to be negatively affected by this access modification.

Alternative A5: At-grade/Elevated with NE 130th, NE 155th, and NE 185th Street Stations

Alternative A5 also begins at the Northgate Station and continues north in a mix of elevated and at-grade profiles on the east side of I-5 to an at-grade station at NE 130th Street. North of the NE 130th Street Station, the alignment continues north in a predominantly at-grade profile on the east side of I-5 to an elevated station at NE 155th Street. The alignment then continues north in a predominantly at-grade profile to an at-grade station at NE 185th Street.

Near NE 130th Street, the I-5 northbound off-ramp would be relocated to the south and would be grade-separated from southbound 5th Avenue NE, which would be below the off-ramp. The NE 130th Street bridge over I-5 would be rebuilt and realigned slightly to the south. This access modification may result in slightly improved freight access between I-5 and NE 130th Street.

Alternative A7: Mostly Elevated with NE 130th, NE 155th, and NE 185th Street Stations

Alternative A7 is similar to Alternative A5, but with a mostly elevated alignment to NE 145th Street. Elevated stations would be provided at NE 130th Street, NE 155th Street, and NE 185th Street. The Alternative A7 alignment and stations are not expected to affect any freight routes identified by the FGTS and the Cities of Seattle and Shoreline.

Alternative A10: At-grade/Elevated with NE 130th, NE 145th, and NE 185th Street Stations

Similar to Alternative A5, Alternative A10 begins at the Northgate Station and continues north in a mix of elevated and at-grade profiles on the east side of I-5 to an at-grade station at NE 130th Street. North of NE 130th Street, the alignment would continue on the east side of I-5 in a predominantly at-grade profile, with short sections of elevated alignment (similar to Alternative A1). An elevated station would be provided at NE 145th Street and an at-grade station at NE 185th Street.

As with Alternative A5, the I-5 northbound off-ramp near NE 130th Street would be relocated to the south and would be grade-separated from southbound 5th Avenue NE, which would be below the off-ramp. The NE 130th Street bridge over I-5 would be rebuilt and realigned slightly to the south. This access modification may result in slightly improved freight access between I-5 and NE 130th Street.

Alternative A11: Mostly Elevated with NE 130th, NE 145th, and NE 185th Street Stations

Similar to Alternative A7, Alternative A11 follows the east side of I-5 from the Northgate Station in a mostly elevated alignment to NE 145th Street. Elevated stations would be provided at NE 130th Street, NE 145th Street, and NE 185th Street.

As with Alternative A3, the I-5 northbound on-ramp adjacent to the NE 145th Street Station would be relocated to approximately the northern edge of the existing surface park-and-ride lot to accommodate a new parking garage south of the relocated ramp. This would result in a modification to freight access between NE 145th Street, 5th Avenue NE, and I-5. Truck circulation is not likely to be negatively affected by this access modification.

Segment B: Shoreline to Mountlake Terrace

The three Segment B alignment alternatives are not expected to affect truck circulation. All alternatives would extend from the north end of the NE 185th Street Station to approximately 212th Street SW.

Alternative B1: East Side to Mountlake Terrace Transit Center to Median

Alternative B1 extends north from the NE 185th Street Station in a mix of elevated and at-grade profiles on the east side of I-5 to an elevated Mountlake Terrace Transit Center Station at 236th Street SW. North of the Mountlake Terrace Transit Center Station, the alignment would continue north on an elevated structure, cross over the northbound lanes of I-5, and continue north at-grade in the median of I-5 to approximately 212th Street SW. The Alternative B1 alignment and station is not expected to affect any freight routes identified by the FGTS and the Cities of Shoreline and Mountlake Terrace.

Alternative B2: East Side to Mountlake Terrace Transit Center to West Side

Alternative B2 is the same as Alternative B1 between the NE 185th Street Station and the north side of the elevated Mountlake Terrace Transit Center Station. North of the Mountlake Terrace Transit Center Station, the alignment continues north on an elevated structure, crossing over I-5 to the west side. The alignment then continues north in a mix of at-grade and elevated profiles until south of 220th Street SW where it continues north with an elevated profile to approximately 212th Street SW. The Alternative B2 alignment and station(s) is not expected to affect any freight routes identified by the FGTS and the Cities of Shoreline and Mountlake Terrace.

Alternative B2A: Optional 220th Street SW Station (elevated)

An optional elevated station at 220th Street SW would be provided with Alternative B2A. Alternative B2A is not expected to affect any freight routes identified by the FGTS and the Cities of Shoreline and Mountlake Terrace.

Alternative B4: East Side to Mountlake Terrace Freeway Station to Median

Similar to Alternative B1, the Alternative B4 alignment continues north from the NE 185th Street Station in a mix of elevated and at-grade profiles on the east side of I-5 to approximately 239th Street SW. The alignment would then cross over northbound I-5 to an at-grade Mountlake Terrace Freeway Station. North of the Mountlake Terrace Freeway Station, the alignment would continue north at-grade in the I-5 median to approximately 212th Street SW. The Alternative B4 alignment and station are not expected to affect any freight routes identified by the FGTS and the Cities of Shoreline and Mountlake Terrace.

Segment C: Mountlake Terrace to Lynnwood

The three Segment C alignment alternatives are not expected to affect truck circulation. All alternatives would extend from the north end of the NE 185th Street Station to approximately 212th Street SW.

Alternative C1: 52nd Avenue West to 200th Street SW

The Alternative C1 alignment continues northbound either at-grade in the median or elevated on the west side of I-5 and leaves the I-5 right-of-way at approximately 210th Street SW. The alignment then turns to the north and continues in an elevated profile along the east side of 52nd Avenue West, turns to the northeast along the east side of Cedar Valley Road, and then turns east along the south side of 200th Street SW, arriving at the elevated Lynnwood 200th Street SW Station on the east side of 48th Avenue West. The Alternative C1 alignment and station are not expected to affect any freight routes identified by the FGTS. The elevated guideway of Alternative C1 would install columns that may affect location and operation of driveways along the east side of 52nd Avenue West and Cedar Valley Road where light industrial properties would take truck deliveries. This could be mitigated in the design process.

Alternative C2: 52nd Avenue West to Lynnwood Transit Center

The Alternative C2 alignment is the same as the Alternative C1 alignment until approximately 204th Street SW, where the elevated alignment turns to the northeast and continues north to the elevated Lynnwood Transit Center Station. The Alternative C2 alignment and station are not expected to affect any freight routes identified by the FGTS. The elevated guideway of Alternative C2 would install columns that may affect location and operation of driveways along the east side of 52nd Avenue West where light industrial properties would take truck deliveries. This could be mitigated in the design process.

Alternative C3: Along I-5 to Lynnwood Park-and-Ride

The Alternative C3 alignment continues along I-5 in the median or elevated on the west side of I-5 to approximately 208th Street SW, where the alignment leaves the I-5 right-of-way and turns to the north. The alignment then crosses the Interurban right-of-way and parallels I-5 to the elevated Lynnwood Park-and-Ride Station located on the east side of the existing Lynnwood direct access ramp. The Alternative C3 alignment and station are not expected to affect any freight routes identified by the FGTS. The elevated guideway of Alternative C3 would install columns that may affect location and operation of driveways and parking lot circulation where light industrial properties would take truck deliveries. This could be mitigated in the design process.

5.7 Parking

The Lynnwood Link Extension light rail stations would include new, replacement, and additional park-and-ride capacity. The additional park-and-ride lots are proposed near most stations based on anticipated parking demand. These park-and-ride lots have generally been sized to accommodate forecasted parking demand. However, there could be some parking spillover at stations if the vehicle demand exceeds park-and-ride capacity, or if users park on the street based on perceived convenience, particularly at the NE 130th Street Station, where limited new parking supply is proposed. At the NE 145th Street, NE 155th Street and NE 185th Street stations, there is currently a relatively large amount of unrestricted on-street parking in the vicinity of the stations; however, the potential for spillover parking is low due to the relatively large proposed supply of park-and-ride parking. In station areas that currently lack available on-street parking supply, such as near the Lynnwood, 220th Street SW, and Mountlake Terrace station options, the potential for hide-and-ride parking activity would be limited. In these cases, if spillover parking occurred, it would likely be on privately owned off-street parking facilities. The amount of parking provided at each station may be further refined in future phases of the project. At some station areas, the street reconstruction adjacent to the light rail station would permanently remove on-street parking. Parking impacts and proposed park-and-ride parking spaces for each segment and alternative are described below. As part of this analysis, Sound Transit considered parking supply within 0.25 mile of each proposed station. Refer to Section 4.7, Parking, in Chapter 4 for figures showing the area inventoried for each proposed station.

Key observations and findings related to parking include the following:

- For all segments, park-and-ride capacity has been sized to generally accommodate the forecasted parking demand under typical situations. Some parking spillover could occur at stations if the vehicle demand exceeds park-and-ride capacity, or if users park on the street based on perceived convenience.
- In Segment A, the light rail alternatives would result in a loss of between 29 and 96 on-street parking spaces, and no loss of off-street parking.
- In Segment B, the light rail alternatives would result in a loss of between 0 and 11 on-street parking spaces, and no loss of off-street parking.
- In Segment C, the light rail alternatives would result in a loss of between zero and eight off-street parking spaces, and no loss of on-street parking.

Segment A: Seattle to Shoreline

Table 5-32 summarizes the parking impacts along Segment A by alternative for on-street parking and off-street parking. The Table 5-32 summary does not include the existing park-and-ride lots and any off-street parking spaces associated with properties that might be acquired by the project; that is not considered a parking impact because the need for the associated parking is removed. Alternative A1 would result in a loss of 29 parking spaces, while the loss with the remaining alternatives ranges from 73 to 96 spaces.

Table 5-32. Segment A Parking Impacts

	Parking Spaces Removed[a]		
Alternative	**On-Street**	**Off-Street[b]**	**Total**
Alternative A1	29	0	29
Alternative A3	73	0	73
Alternative A5	89	0	89
Alternative A7	77	0	77
Alternative A10	96	0	96
Alternative A11	84	0	84

[a] Includes parking spaces removed for column placement where applicable.
[b] Off-street does not include park-and-ride spaces.

Table 5-33 shows the park-and-ride lot spaces removed and proposed new park-and-ride spaces at each station and by alternative.

Table 5-33. Segment A Park-and-Ride Impacts and Proposed New Parking Spaces

Station	Alternative	Total Existing Parking Spaces	Removed Parking Spaces[a]	Proposed New Parking Spaces	Parking Spaces after project	Net Change in Parking Spaces
NE 130th Street Station - Option 1, with park-and-ride	A5	46	46	100[a]	100[b]	54
NE 130th Street Station - Option 1, no park-and-ride	A10	46	46	0	0	-46
NE 130th Street Station - Option 2	A7, A11	46	4	100	142	96
NE 145th Street Station - Option 1	A1	68	68	500	500	432
NE 145th Street Station - Option 1	A10	68	68	650	650	582
NE 145th Street Station - Option 2	A3, A11	68	68	500	500	432
NE 155th Street Station	A5, A7	0	0	500	500	500
NE 185th Street Station - Option 1	A1	0	0	500	500	500
NE 185th Street Station - Option 2	A3, A7, A11	0	0	500	500	500
NE 185th Street Station - Option 3	A5, A10	0	0	350	350	350

[a] Includes parking spaces removed for column placement where applicable.

[b] Possible surface parking lot available for lease located adjacent to the station

Alternative A1: At-grade/Elevated with NE 145th and NE 185th stations

Parking Impacts along the Light Rail Alignment

There could be approximately 12 on-street parking spaces removed along the Alternative A1 light rail alignment.

The South Jackson Park-and-Ride, with 46 spaces, located to the north of NE 130th Street along 5th Avenue NE, would also be removed with construction of the alignment. The demand for park-and-ride space would shift to the NE 145th Street station with Alternative A1.

NE 145th Street Station Impacts Option 1

At the NE 145th Street Station, 17 on-street parking spaces would be removed along NE 148th Street, relative to the 450 on-street parking spaces within 0.25 mile of the proposed station. The existing North Jackson Park-and-Ride lot would be removed and replaced by a park-and-ride garage with 500 spaces, resulting in 432 additional park-and-ride spaces.

NE 185th Street Station Option 1

At the NE 185th Street Station, approximately 40 on-street parking spaces would be removed along 7th Avenue NE and NE 185th Street, relative to 700 on-street parking spaces within 0.25 mile of the proposed station. A park-and-ride garage with 500 spaces is proposed for Alternative A1 and would be located on the west side of I-5 north of NE 185th Street.

Alternative A3: Mostly Elevated with NE 145th and NE 185th Street Stations

Parking Impacts along the Light Rail Alignment

A few parking spaces would be removed at the existing South Jackson Park-and-Ride lot, located north of NE 130th Street on 5th Avenue NE, due to the column placement for the Alternative A3 elevated guideway alignment.

NE 145th Street Station Option 2

Parking impacts with Alternative A3 would be approximately the same as with Alternative A1.

NE 185th Street Station Option 2

Approximately 56 on-street parking spaces would be removed along 7th Avenue NE, 8th Avenue NE, and NE 185th Street relative to 700 on-street parking spaces within 0.25 mile of the proposed NE 185th Street Station.

A park-and-ride garage with 500 spaces is proposed for Alternative A3 and would be located on 8th Avenue NE.

Alternative A5: At-grade/Elevated with NE 130th, NE 155th, and NE 185th Street Stations

Parking Impacts along the Light Rail Alignment

Parking impacts along the Alternative A5 alignment would be approximately the same as with Alternative A1.

NE 130th Street Station Option 1

Approximately 11 on-street parking spaces would be removed along 5th Avenue NE relative to 430 on-street parking spaces within 0.25 mile of the proposed NE 130th Street Station Option 1.

The existing South Jackson Park-and-Ride lot would be removed, resulting in a loss of 46 parking spaces. A park-and-ride lot with up to 90 spaces may be leased from a property located on 5th Avenue NE across the street from the proposed station location, resulting in up to 44 additional park-and-ride spaces. Other nearby leased parking options could also be investigated.

NE 155th Street Station

Approximately 10 on-street parking spaces would be removed on NE 155th Street relative to 580 on-street parking spaces within 0.25 mile of the proposed station. A park-and-ride garage with 500 spaces would be added at the station to accommodate light rail users.

NE 185th Street Station Option 3

Approximately 56 on-street parking spaces would be removed along 7th Avenue NE, 8th Avenue NE, and NE 185th Street relative to 700 on-street parking spaces within 0.25 mile of the proposed NE 185th Street Station location.

Two surface park-and-ride lots are proposed for this station with Alternative A5: one with 158 spaces located at the station and the other with up to 205 spaces located east of 8th Avenue NE.

Alternative A7: Mostly Elevated with NE 130th, NE 155th, and NE 185th Street Stations

Parking Impacts along the Light Rail Alignment

Parking impacts along the Alternative A7 alignment would be approximately the same as with Alternative A3.

NE 130th Street Station Option 2

Approximately 11 on-street parking spaces would be removed along 5th Avenue NE relative to 430 on-street parking spaces within 0.25 mile of the proposed NE 130th Street Station.

A new surface park-and-ride lot with 100 spaces would be provided north of the station on 5th Avenue NE with Alternative A7.

NE 155th Street Station

Parking impacts with Alternative A7 would be approximately the same as with Alternative A5.

NE 185th Street Station Option 2

Parking impacts with Alternative A7 would be approximately the same as with Alternative A3.

Alternative A10: At-grade/Elevated with NE 130th, NE 145th, and NE 185th Street Stations

Parking Impacts along the Light Rail Alignment

Parking impacts along the Alternative A10 alignment would be approximately the same as with Alternatives A1 and A5.

NE 130th Street Station Option 1

Parking impacts with Alternative A10 would be approximately the same as with Alternative A5.

NE 145th Street Station Option 1

Parking impacts with Alternative A10 would be similar to Alternative A1, except the existing North Jackson Park-and-Ride lot would be removed and replaced by a park-and-ride garage with 650 spaces, resulting in 582 additional park-and-ride spaces.

NE 185th Street Station Option 3

Parking impacts with Alternative A10 would be approximately the same as with Alternative A5.

Alternative A11: Mostly Elevated with NE 130th, NE 145th, and NE 185th Street Stations

Parking Impacts along the Light Rail Alignment

Parking impacts along the Alternative A11 alignment would be approximately the same as with Alternatives A3 and A7.

NE 130th Street Station Option 2

Parking impacts with Alternative A11 would be approximately the same as with Alternative A7.

NE 145th Street Station Option 2

Parking impacts with Alternative A11 would be approximately the same as with Alternative A3.

NE 185th Street Station Option 2

Parking impacts with Alternative A11 would be approximately the same as with Alternatives A3 and A7.

Segment B: Shoreline to Mountlake Terrace

Table 5-34 summarizes the parking impacts along the Segment B alignment by alternative, not including the existing park-and-ride lots. Approximately 7 on-street parking spaces could be lost with Alternative B2 and 11 on-street spaces could be lost with Alternative B2A. There would be no loss of off-street parking due to the alignments.

Table 5-34. Segment B Parking Impacts

	Parking Spaces Removed		
Alternative	**On-Street**	**Off-Street[a]**	**Total**
Alternative B1	0	0	0
Alternative B2	7	0	7
Alternative B2A	11	0	11
Alternative B4	0	0	0

[a]Off-street does not include park-and-ride spaces.

Table 5-35 shows the proposed change in park-and-ride capacity at stations with each alternative. There are no changes to the existing Mountlake Terrace Park-and-Ride lot with Segment B alternatives.

Table 5-35. Segment B Park-and-Ride Impacts and Proposed New Parking Spaces

Station	Alternative	Total Existing Parking Spaces	Removed Parking Spaces	Proposed New Parking Spaces	Parking Spaces after Project	Net Change in Parking Spaces
Mountlake Terrace Transit Center Station	B1, B2, B2A	880	0	0	880	0
Mountlake Terrace Freeway Station	B4	880	0	0	880	0
220th Street SW Station	B2A	0	0	200	200	200

Alternative B1: East Side to Mountlake Terrace Transit Center to Median

Mountlake Terrace Transit Center Station

With Alternative B1, there would be no impacts to on-street parking, off-street parking, or to the park-and-ride lot spaces at the Mountlake Terrace Transit Center Station.

Alternative B2: East Side to Mountlake Terrace Transit Center to West Side

Mountlake Terrace Transit Center Station

With Alternative B2, there would be no impacts to on-street parking, off-street parking, or to the park-and-ride lot spaces at the Mountlake Terrace Transit Center Station.

Alternative B2A: Optional 220th Street SW Station (elevated)

220th Street SW Station

The 220th Street SW Station park-and-ride lot would require a new driveway along 60th Avenue West. There is existing on-street parking along 60th Avenue West, and approximately four on-street parking spaces would likely be removed to accommodate the driveway. There would be no impacts to off-street parking.

A 200-space surface park-and-ride lot is proposed for the 220th Street SW Station.

Alternative B4: East Side to Mountlake Terrace Freeway Station to Median

Mountlake Terrace Freeway Station

With Alternative B4, there would be no impacts to on-street parking, off-street parking, or to the park-and-ride lot spaces at the Mountlake Terrace Transit Center Station.

Segment C: Mountlake Terrace to Lynnwood

Table 5-36 summarizes the parking impacts along the Segment C alignment by alternative. There are several locations along Segment C where the alignment or light rail station would acquire a building. The parking associated with these buildings was not considered a parking impact because the parking need would be removed.

Table 5-36. Segment C Parking Impacts

	Parking Spaces Removed		
Alternative	**On-Street**	**Off-Street[a]**	**Total**
Alternative C1	0	8	8
Alternative C2	0	4	4
Alternative C3	0	0	0

[a]Off-street does not include park-and-ride spaces.

Table 5-37 shows the proposed change in park-and-ride capacity at stations under each Segment C alternative. There would be approximately 1,900 park-and-ride spaces after construction of the proposed new park-and ride spaces with each alternative.

Table 5-37. Segment C Park-and-Ride Impacts and Proposed New Parking Spaces

Station	Alternative	Total Existing Parking Spaces	Removed Parking Spaces[a]	Proposed New Parking Spaces	Parking Spaces after Project	Net Change in Parking Spaces
200th Street SW Station	C1	1,370	370	900	1,900	530
Lynnwood Transit Center Station	C2	1,370	670	1,200	1,900	530
Lynnwood Park-and-Ride Station - Option 1	C3	1,370	1,170	1,700	1,900	530
Lynnwood Park-and Ride Station - Option 2	C3	1,370	1,370	1,900	1,900	530

[a] Includes parking spaces removed for column placement where applicable.

Alternative C1: 52nd Avenue West to 200th Street SW

200th Street SW Station

At the 200th Street SW Station there would be 370 spaces removed and 900 new spaces constructed, resulting in a 1,900-space park-and-ride facility. The park-and-ride is located south of 200th Street SW between 48th Avenue West and 46th Avenue West.

Alternative C2: 52nd Avenue West to Lynnwood Transit Center

Lynnwood Transit Center Station

At the Lynnwood Transit Center Station there would be 670 spaces removed and 1,200 new spaces constructed, resulting in a 1,900-space park-and-ride facility.

Alternative C3: Along I-5 to Lynnwood Park-and-Ride

Lynnwood Park-and-Ride Station Option 1

With Option 1, at the Lynnwood Park-and-Ride Station there would be 1,170 parking spaces removed and 1,700 new spaces constructed, resulting in a 1,900-space park-and-ride facility.

Lynnwood Park-and-Ride Station Option 2

With Option 2, at the Lynnwood Park-and-Ride Station all of the existing 1,370 parking spaces would be removed and 1,900 new spaces would be constructed, resulting in a 1,900-space park-and-ride facility.

5.8 Safety

Traffic safety impacts associated with the light rail alternatives were assessed. Factors considered were changes near existing HALs, and any changes in the transportation network that could result in an increase in the potential conflicts between modes of travel that could affect overall safety.

Guideway and Alignment

The Lynnwood Link Extension light rail would be constructed in the public right-of-way, with some segments at-grade and some elevated. The light rail guideway would be elevated where it would cross public streets and private driveways or property access. Where the guideway is at-grade, there would be no street crossings or the guideway would pass below the street.

Along elevated segments, column locations may constrain sight distance for some modes of travel (e.g., pedestrian, bicycle, transit, freight, or automobiles); careful design is needed to maintain existing visibility and access for public intersections and private driveways. If column placement restricts sight distance, mitigation may be required.

The guideway and train operation parallel and adjacent to streets and I-5 travel lanes may create glare from train headlights that could require mitigation such as glare screens.

Along at-grade segments, the public must be kept from accessing the trackway by an effectively designed and installed fence.

The increase in general traffic volumes, transit movements, pedestrians, and bicyclists near stations could increase the risk of traffic conflicts and conflicts between travel modes.

Interchanges and Intersections

Several alternatives in Segment A would include interchange modifications at the NE 130th Street and NE 145th Street interchanges—two locations with identified HALs. These changes to the interchange ramp configurations would help to address the safety risks at the HALs but could also result in a safety benefit. The reconstruction of the NE 130th Street interchange would include grade-separation for the northbound off-ramp, which would eliminate one HAL. With a station at NE 145th Street, the intersection of 5th Avenue NE at NE 145th Street (and 5th Avenue NE adjacent to the station) would be reconstructed with features to enhance pedestrian, bicycle, and transit safety through this HAL intersection.

Common to all alternatives, pedestrian and bicycle volumes are expected to increase at intersections near the proposed stations. This increase could result in a greater potential for pedestrian/vehicle, pedestrian/bicycle, or bicycle/vehicle conflicts; however, much of this can be addressed with careful design of station area and right-of-way features.

Key observations and findings related to safety include the following:

- Light rail stations are being considered at or near existing HALs, notably the NE 130th Street Station (northbound off-ramp to 5th Avenue NE), NE 145th Street Station (northbound off-ramp to 5th Avenue NE, 5th Avenue NE at NE 145th Street, northbound on-ramp from 5th Avenue NE), 200th Street SW Station (200th Street SW at 48th Avenue West), and the Lynnwood Park-and-Ride and Transit Center Stations (I-5 direct access at 46th Avenue West).
- Alternatives A1, A5, and A10 would reconstruct the NE 130th Street interchange and could improve safety conditions at a HAL at the NE 130th Street northbound off-ramp to 5th Avenue NE. Mitigation for the northbound off-ramp to 5th Avenue NE could include signal control, without reconstruction of the interchange.
- NE 145th Street Station is in the immediate vicinity of three HALs: northbound off-ramp to 5th Avenue NE, NE 145th Street at 5th Avenue NE, and northbound on-ramp from 5th Avenue NE. Design of this station would need to address the HALs, which appear to be caused by high volumes and high conflicts at these locations. Mitigation could include signal control at the northbound off-ramp at 5th Avenue NE. Station design would need to reflect the increase in pedestrian traffic and potential for at-grade conflicts between pedestrians and vehicle movements at the ramps to and from I-5. If a station is selected for NE 145th Street, the station design and design of adjacent streets would need to address the current and expected increase in conflicts between vehicles and between travel modes near the station, as reflected in the existing HALs.
- Lynnwood Park-and-Ride and Transit Center Station locations would both increase traffic through the HAL at 46th Avenue West and the direct access ramps with increased volumes of pedestrians and bicyclists. Mitigation may need to include refined design and/or signal control, beyond an added southbound left-turn lane at the intersection.

Segment A: Seattle to Shoreline

Alternatives A1, A5, and A10 would improve safety at an existing HAL with the reconstruction of the NE 130th Street interchange, including grade-separation of southbound 5th Avenue NE at the NE 130th Street northbound off-ramp from I-5. This reconfiguration of the off-ramp is expected to improve safety and to significantly reduce accident occurrence at this location.

Alternatives A3and A11 would relocate the NE 145th Street interchange northbound on-ramp to I-5 from 5th Avenue NE, which would affect an identified HAL and could improve safety at this on-ramp.

Alternative A1: At-grade/Elevated with NE 145th and NE 185th Street Stations

With Alternative A1, the guideway would be grade-separated at the new NE 130th Street interchange and the northbound off-ramp. An elevated guideway would cross the NE 145th Street interchange. Emergency access must be maintained to the fire station at NE 155th Street with all Segment A alternatives. This can be managed as part of the design of the light rail system.

The guideway would result in reconstruction and some relocation of local streets from NE 158th Street to NE 174th Street. Column locations may slightly affect property/driveway access. The design would maintain sight distance at intersections and driveways.

NE 145th Street Station

Three HALs were identified near the NE 145th Street Station: 5th Avenue NE at NE 145th Street intersection, I-5 northbound off-ramp to 5th Avenue NE, and I-5 northbound on-ramp from 5th Avenue NE. Operation of both the 5th Avenue NE/NE 145th Street intersection, and the northbound off-ramp to 5th Avenue NE would not change with Alternative A1.

Changes to the location of the northbound on-ramp to I-5 from 5th Avenue NE could affect safety, with an increase in potential conflicts between pedestrians and vehicles. This could be mitigated with design of the ramp control and possible signalization of the ramp intersection.

Two private schools are located within a 0.50 mile radius of the proposed station (Lakeside High School and Lakeside Middle School), both on the west side of I-5. The Evergreen School, located on Meridian Avenue North, and Parkwood Elementary on North 155th Street are just beyond the 0.50 mile radius from the proposed station. Some increase in traffic is expected adjacent to the sidewalks and pedestrian paths that connect from the station to the schools. This increase in traffic is not expected to affect pedestrian safety. Both 5th Avenue NE and North/NE 145th Streets are designated as T-3 freight facilities. Increased station area traffic on NE 145th Street or 5th Avenue NE is not expected to adversely affect freight movement or safety along these facilities.

NE 185th Street Station

No HAL was identified near the NE 185th Street Station.

With Alternative A1, a fourth leg would be added to the intersection of 5th Avenue NE at NE 185th Street at the station, which would increase the number of conflicting movements at the intersection. This, in turn, could increase the potential for accidents. Careful design could mitigate this increased risk of accidents.

There are two preschools at NE 190th Street, with walk access along 8th Avenue NE near the station. St. Mark Catholic School is located within a 0.50 mile radius from the proposed station. The increase in station area traffic is not expected to adversely affect the movements of pedestrians to and from these schools.

NE 185th Street is designated as a T-2 freight facility. Increased station area traffic on NE 185th Street is not expected to adversely affect freight movement or safety along this facility.

Alternative A3: Mostly Elevated with NE 145th and NE 185th Street Stations

Traffic safety concerns along the Alternative A3 alignment are similar to those identified for Alternative A1 except for the following locations: where the alignment would cross 1st Avenue NE near NE 117th Street, at the curve along 1st Avenue NE, and where the elevated alignment would cross the NE 130th Street ramp and intersection of 5th Avenue NE at NE 130th Street. Column locations for the guideway would be designed to avoid visibility obstructions along the curve.

NE 145th Street Station

Traffic safety issues and impacts with Alternative A3 would be the same as with Alternative A1.

NE 185th Street Station

Traffic safety issues and impacts with Alternative A3 would be the same as with Alternative A1.

Alternative A5: At-grade/Elevated with NE 130th, NE 155th, and NE 185th Street Stations

Traffic safety concerns along the Alternative A5 alignment would be similar to those identified for Alternative A3; however, there is a potential sight distance constraint where the alignment would pass under the northbound off-ramp at the NE 130th Street interchange.

NE 130th Street Station

One HAL was identified near the NE 130th Street Station area, at the I-5 northbound off-ramp to 5th Avenue NE. Similar to Alternative A1, safety would be improved with the reconstruction of the NE 130th Street interchange and grade-separation at the northbound off-ramp.

There are three private schools within 0.50 mile of the proposed NE 130th Street station (Lakeside Middle School, Seattle Jewish Community School, and St. Matthews School) and two high schools (Ingraham High School and Lakeside High School) just beyond the 0.50 mile radius. Some increase in traffic is expected along the sidewalks that connect from the station to the schools. This increase in traffic is not expected to affect pedestrian safety.

North/NE 130th Street is designated as a T-3 freight facility, and Roosevelt Way NE east of 5th Avenue NE is designated as a T-4 freight facility. Increased station area traffic on NE 130th Street is not expected to adversely affect freight movement or safety along this facility.

NE 155th Street Station

The NE 155th Street Station has two design options with Alternative A5. The difference is in the location of the paratransit and drop-off facility for the station. Both options would locate the bus stops on NE 155th Street near the station.

Option 1A would locate the paratransit function on-street, westbound on NE 155th Street under the station and adjacent to the south elevator. On-street bus stops would be located on NE 155th Street under (eastbound) and just east of the station (westbound). Escalators would be located south of NE 155th Street, which could result in increased numbers of pedestrians crossing NE 155th Street near the station and lead to increased conflicts and risk of pedestrian accidents. The passenger pick-up/drop-off area would be adjacent to the parking garage on the south side of NE 155th Street, with pedestrian access to the station along the east and south sides of the fire station. Combination of transit, drop-off, and pedestrian crossing activity could increase potential conflicts under I-5 and near the 1st Ave NE/NE 155th Street intersection. Station design would need to carefully coordinate these access modes and traffic circulation.

Option 1B would locate the paratransit and passenger pick-up/drop-off functions off-street, adjacent to the north end of the station, with elevator and escalator access to the north end of the platform. Locating the on-street bus stops under the station would provide station access without crossing NE 155th Street at-grade. The proximity of bus stops to 1st Avenue NE at NE 155th Street intersection would warrant careful design for station access and circulation.

Parkwood Elementary School and The Evergreen School are located within a 0.50 mile radius of the proposed station. A marked school crossing with an overhead flashing beacons is located on North 155th Street at Wallingford Avenue North at Parkwood Elementary. Both Parkwood Elementary and The Evergreen School connect to the proposed station along arterials with sidewalks. Lakeside High School is at NE 145th Street and 1st Avenue NE, near the 0.50 mile radius from the proposed station. 1st Avenue NE would be the most direct connection from Lakeside High School to the proposed station; however, there is no continuous walkway/sidewalk facility on 1st Avenue NE.

NE 155th Street and 5th Avenue NE are designated T-3 freight facilities. Fire Station access is a critical truck activity near the NE 155th Street Station. Increased station area traffic and transit operations are not expected to adversely affect freight safety or operation at these facilities.

No HAL was identified near the NE 155th Street Station. No net change in traffic safety is expected near the NE 155th Street Station.

NE 185th Street Station

Traffic safety issues and impacts with Alternative A5 would be the same as with Alternative A1.

Alternative A7: Mostly Elevated with NE 130th, NE 155th, and NE 185th Street Stations

Traffic safety concerns along Alternative A7 would be the same as for Alternative A3.

NE 130th Street Station

One HAL was identified near the NE 130th Street Station area and at the I-5 northbound off-ramp to 5th Avenue NE. Alternative A7 would not affect safety in the vicinity of the station.

NE 155th Street Station

Traffic safety issues and impacts would be the same with Alternative A7 as with Alternative A5.

NE 185th Street Station

Traffic safety issues and impacts would be the same with Alternative A7 as with Alternative A1.

Alternative A10: At-grade/Elevated with NE 130th, NE 145th, and NE 185th Street Stations

Traffic safety concerns with Alternative A10 would be the same as with Alternative A5 from Northgate to the NE 130th Street Station, the same as Alternative A1 from the NE 130th Street Station to NE 185th Street, and the same as Alternative A5 at the NE 185th Street Station.

NE 130th Street Station

Traffic safety issues and impacts with Alternative A10 would be the same as with Alternatives A1 and A5.

NE 145th Street Station

Traffic safety issues and impacts with Alternative A10 would be the same as with Alternative A1.

NE 185th Street Station

Traffic safety issues and impacts with Alternative A10 would be the same as with Alternative A1.

Alternative A11: Mostly Elevated with NE 130th, NE 145th, and NE 185th Street Stations

Traffic safety concerns with Alternative A11 would be the same as with Alternative A3 from Northgate to the NE 130th Street interchange, the same as Alternative A7 at the NE 130th Street Station, the same as Alternative A3 from the NE 130th Street Station to NE 158th Street, the same as Alternative A1 from NE 158th Street to NE 174th Street, and the same as Alternative A3 near the NE 185th Street Station.

NE 130th Street Station

Traffic safety issues and impacts with Alternative A11 would be the same as with Alternative A7.

NE 145th Street Station

Traffic safety issues and impacts with Alternative A11 would be the same as with Alternative A1.

NE 185th Street Station

Traffic safety issues and impacts with Alternative A11 would be the same as with Alternative A1.

Segment B: Shoreline to Mountlake Terrace

Removing the freeway median bus station would result in fewer accidents on I-5, with removal of the ramps to and from the HOV lanes.

Common to all Segment B alternatives, pedestrian and bicycle volumes are expected to increase at intersections near the proposed stations. This increase could result in a greater potential for pedestrian/vehicle, pedestrian/bicycle, or bicycle/vehicle conflicts; however, much of this can be addressed with careful design of station area and right-of-way features.

Alternative B1: East Side to Mountlake Terrace Transit Center to Median

Under Alternative B1, there would be no street crossings along the at-grade alignment. The guideway would pass under the reconstructed pedestrian bridge over I-5. Column locations would be designed to ensure adequate sight distance and visibility within the SR 104 interchange areas.

The alignment would be elevated over 236th Street SW adjacent to the signalized northbound off-ramp.

In the vicinity of the Mountlake Terrace Transit Station, the guideway would cross I-5 to the median, passing under 228th Street SW and under 220th Street SW without any safety issues. Light rail operation in the median may affect adjacent traffic on I-5 where headlight glare could affect drivers. This could be mitigated with glare screens. The elevated guideway would cross 212th Street SW.

Mountlake Terrace Transit Center Station

No HAL was identified near the Mountlake Terrace Transit Center.

Private schools (Cedar Park Christian School, The Expedition School, The Cornerstone School, and Snohomish County Christian High School) are located east of 56th Avenue West (within and at the 0.50 mile radius). No change in vehicle traffic is expected along the streets adjacent to these schools due to the Mountlake Terrace Transit Center Station with Alternative B1. Terrace Park Elementary school is located beyond 0.50 mile from the proposed station, and no change in traffic along walk routes to this school due to the Mountlake Terrace Transit Center Station is expected.

The increase in station area traffic, along with a general increase in all modes with Alternatives B1 and B2, could increase the potential for conflict and accidents.

Both 236th Street SW and 56th Avenue West are T-3 freight facilities. No change in freight safety or operation is expected due to the Mountlake Terrace Transit Center Station because there would be no increase in park-and-ride spaces or expected change in general traffic volumes.

Alternative B2: East Side to Mountlake Terrace Transit Center to West Side

The Alternative B2 alignment would be similar to Alternative B1, except that the guideway would cross to the west side of I-5, without operating in the I-5 median. Where light rail would operate parallel to I-5 traffic, there may be headlight glare that could be mitigated with glare screens. The elevated guideway would cross 220th Street SW near the southbound ramps.

Mountlake Terrace Transit Center Station

Traffic safety issues and impacts with Alternative B2 would be the same as with Alternative B1.

Alternative B2A: Optional 220th Street SW Station (elevated)

Traffic safety issues with Alternative B2A would be the same as with Alternative B2.

220th Street SW Station (elevated)

Access to the 220th Street SW Station over 200th Street SW would be provided from the park-and-ride garage driveway at 219th Street SW. This station option would require relocation of the southbound I-5 ramp intersection on 220th Street SW to the east.

Passenger pick-up/drop-off, paratransit function, and bus stops would be on 220th Street SW to the west of the relocated ramp intersection. Connection to the station platform would be via a walkway along 220th Street SW with access to elevators and escalators. Passenger pick-up/drop-off and bus stops would be approximately 200 feet to the west, and this may become an area of potential conflicts and safety concerns adjacent to a major arterial and close to the I-5 ramps. Careful design will be needed to manage transit, passenger pick-up/drop-off , and paratransit activities on-street.

Bicycle access to the station could occur along 220th Street SW, with connection via the on-street bus stops or along 64th Avenue West, similar to the vehicle access to the parking garage and station.

Transit, pedestrian, and bicycle concerns would occur with the proposed on-street bus stops on 220th Street SW; however, the concerns would be the same as for any on-street arterial bus stop.

220th Street SW is designated as a T-3 freight facility. There would be no expected change in freight safety.

Two HALs were identified near the 220th Street SW Station: 222nd Street SW at 64th Avenue West and 220th Street SW at 66th Avenue West. The intersection of 222nd Street SW at 64th Avenue West has all-way stop control and low volumes of traffic through the intersection. With increased pedestrian and bicycle traffic to and from the 220th Street SW Station, this intersection would experience an increase in potential conflicts between pedestrians or bicyclists and vehicles. This could be an intersection where station mitigation could address both intersection operation and safety.

The intersection of 220th Street SW at 66th Avenue West is signalized and could experience an increase in pedestrian, bicycle, and transit traffic, which may increase potential conflicts between travel modes, and could reduce intersection safety.

Alternative B4: East Side to Mountlake Terrace Freeway Station to Median

The Alternative B4 alignment would cross the northbound on-ramp from SR 104 and the northbound off-ramp to 236th Street SW, where column locations would be designed to ensure adequate sight distance. The alignment would cross to the I-5 median, where the inside shoulders would be reduced 2 feet to 3 feet for approximately 1,500 feet along northbound and southbound I-5. The narrow shoulder could affect safety and reliability of operation along I-5 because there would be no shoulder area for disabled vehicles in this segment of the freeway. The reduced shoulder widths would occur over a relatively short distance and may not adversely affect accident occurrence. Glare screens could be needed to reduce glare impacts on motorists on I-5 from light rail operation in the median.

Mountlake Terrace Freeway Station

No HAL was identified near the Mountlake Terrace Freeway Station. Traffic safety issues and impacts with Alternative B4 would be the same as with Alternative B1.

Segment C: Mountlake Terrace to Lynnwood

Six HALs were identified near the Lynnwood Transit Center and Park-and-Ride:

- 200th Street SW at 48th Avenue West
- I-5 direct access ramp at 46th Avenue West
- 196th Street SW at 36th Avenue West
- 196th Street SW at 40th Avenue West
- 196th Street SW at 44th Avenue West
- 196th Street SW at 48th Avenue West

No changes are proposed to network or facilities near the HALs on 196th Street SW; thus, no change in safety is expected for these HALs.

No public schools are located within 0.50 mile of the Lynnwood station options.

44th Avenue West is designated as a T-3 freight facility. There is no expected change in safety for freight with any of the Lynnwood stations.

Common to all alternatives, pedestrian and bicycle volumes are expected to increase at intersections near the proposed stations. This increase could result in a greater potential for pedestrian/vehicle, pedestrian/bicycle, or bicycle/vehicle conflicts;

however, much of this can be addressed with careful design of the station area and right-of-way features.

Alternative C1: 52nd Avenue West to 200th Street SW

The elevated guideway along Alternative C1 would require attention to column locations to avoid affecting sight distance and visibility at intersections, side streets, and driveways.

200th Street SW Station

Traffic safety issues and impacts are expected to stay approximately the same near the 200th Street SW Station with Alternative C1.

The 200th Street SW Station may increase transit activity at the in-lane bus stops on this street adjacent to the station. The main transfer function would occur at the Lynnwood Transit Center, south of the station, with no expected change in safety.

Two HALs were identified near the 200th Street SW Station where increased pedestrian and bicycle traffic is expected. Reconstruction of the intersection at 200th Street SW may be required with the project, where careful design could help to mitigate this increased potential for conflicts between travel modes.

The direct access ramp at 46th Avenue West intersection has all-way stop control and may require signal control with the increase in vehicle, transit, pedestrian, and bicycle traffic through the intersection. This change could improve safety for this HAL.

Alternative C2: 52nd Avenue West to Lynnwood Transit Center

Traffic safety impacts would be the same with Alternative C2 as with Alternative C1 to 204th Street SW. Property access and circulation under the elevated guideway would be affected; however, site circulation and access modifications would be integrated with the guideway design. The guideway would be elevated through the park-and-ride facility and at the station.

Lynnwood Transit Center Station

An increase is expected in pedestrians crossing from the station to the transit center, and crossing the east-west section of 48th Avenue West, which is a main circulator route within the park-and-ride and transit center facility. Site-specific design features could manage the pedestrian flows and reduce the safety risks.

Alternative C3: Along I-5 to Lynnwood Park-and-Ride

Safety impacts with Alternative C3 would be similar to Alternatives C1 and C2 along the elevated guideway alignment. Visibility is important for safety along curved roadways, where column location could restrict visibility. Locations of concern include the reconstructed 208th Street SW, the Interurban Trail crossing, and 44th Avenue West crossing near the HOV direct access ramps to I-5.

Lynnwood Park-and-Ride Station

The Lynnwood Park-and-Ride Station would increase the focus of pedestrian flows through the intersection of 46th Avenue West at 48th Avenue West and across the access to the HOV direct access ramp. This station would bring more traffic into the site for passenger pick-up/drop-off at the station, crossing transit vehicle and pedestrian movements at and near the transit center, and thereby increasing the potential for pedestrian and vehicle conflicts.

6 CONSTRUCTION IMPACTS

This chapter discusses and compares potential transportation mobility impacts caused by construction of the light rail alternatives. Key observations and findings include the following:

- The shoulders on I-5 could be closed periodically to provide space for construction activities adjacent to the freeway. All modes of travel could experience an increase in congestion and travel times. Construction activity will be planned to minimize the need for closures, and lane and shoulder width reductions.
- Sound Transit and WSDOT will work to minimize the duration and impact of lane closures and reductions by (a) maintaining the same number of travel lanes except for short-duration closures, (b) maintaining WSDOT traffic management systems – closed circuit television (CCTV) cameras and monitoring, ramp metering, data stations, and variable message signing, and (c) providing mitigation through supplemental incident response team service and Transportation Demand Management strategies.
- At-grade rail alignment alternatives (A1, A5, and A10) include bridge reconstruction over I-5. The construction of the bridge column in the median of I-5 could require closures of one lane in each direction for approximately 1 month. Construction techniques to minimize closures will be developed during final design.
- Wherever an elevated alignment is constructed over a street, I-5 and local streets would be closed at night.
- For all street reconstruction, travel lanes on local streets along the guideway would experience periodic daytime closures. Truck access to the guideway construction will be along city arterials leading to streets adjacent to the guideway.
- At the Mountlake Terrace Transit Center Station, Alternatives B1 and B2/2A require construction in the median of I-5 adjacent to the existing transit center. This construction activity will require closure of the direct access bus ramps and thus would close the freeway station for 1 to 2 months.
- In Lynnwood, construction of the light rail station options would temporarily reduce park-and-ride spaces; Alternative C1 would lose approximately 250 parking spaces, Alternative C2 660 spaces, and Alternative C3 560 spaces.

6.1 General Corridorwide Construction Effects

Along segments of I-5 where the light rail alignment is adjacent to I-5 or in the median, access to construction areas may be from an I-5 shoulder. Shoulders could be closed to provide space for construction activities and construction access points.

Construction traffic management plans would reduce the need for or duration of shoulder closures and lane reductions to minimize the impact. Access points from I-5 would be identified to provide adequate acceleration and deceleration for trucks and to minimize impacts on general purpose traffic and interchange operations on I-5. Portions of the alignment would have construction access from the local streets to allow construction work.

All alternatives could have some impacts on traffic operations on I-5 during construction where the guideway crosses the freeway. This could result in nighttime closures in each direction of mainline I-5, with traffic detours to install girders for the guideway bridges. Vertical clearance would be maintained on I-5. Construction access points, closures, and changes in I-5 operations will require approval from FHWA and WSDOT. A Maintenance of Traffic Plan that addresses all modes will be prepared during final design for agency approval. Figures 6-1 through 6-6 provide a graphical summary of construction staging areas and haul routes throughout the project corridor. The graphics identify potential effects in the following general categories, which are indicated on the maps by the associated number:

1. Construction access from city streets
2. Construction access from I-5
3. I-5 shoulder closed for staging and construction access
4. One-lane closure on I-5, both directions (approximately 1 month) in the vicinity of bridge reconstruction
5. Road closed for reconstruction:

   5a—Short-term closure (up to 2 months)

   5b—Long- term closure (greater than 2 months)
6. Temporary closures (e.g., structure placement)— typically nights and/or weekends only

The light rail guideway requires crossing I-5 to connect from Northgate on the east side of I-5 to the Lynnwood Transit Center on the west side of I-5. In addition, several alternatives include local street bridge reconstruction over I-5. Nighttime closures of I-5 would be required where the guideway or other bridges cross over I-5 during the placement of structural elements. Reconstruction of bridges over I-5 may require a one-lane closure in each direction on I-5 to provide space in the median for construction of the bridge column.

Several options would require the replacement of local street bridges over I-5. This is a result of the guideway alignment affecting a column or abutment of a bridge. Several options are possible for conducting bridge reconstruction in phases, which would help to accommodate traffic during construction or reduce construction costs by closing a road to expedite efficient construction activity. This project assumes using these phasing methods dependent on the local road traffic volumes and alternative routes. Where bridges are closed during reconstruction, detours will be provided; however, detours could have secondary impacts on general purpose traffic, bus transit, bicyclists, and pedestrians. Strategic phasing or sequencing of overcrossing closures will minimize the cumulative closure impacts; construction phasing will be addressed accordingly in construction specifications.

All alternatives would affect traffic operations on arterials adjacent to the guideway and stations; as a mitigation measure, the contractor would keep roadways open, but with flagger control or other means. All alternatives may require utility relocations along the alignment and near the stations. Utility relocations may require temporary lane closures and traffic control plans to maintain property access and circulation. Access to residents and businesses will be maintained. Impacts on general purpose traffic, transit operations, nonmotorized travel, and parking are discussed in more detail below, by segment and station areas.

Generally, construction truck traffic to station construction sites would use city streets. Peak truck trips are expected to occur during earthwork operations and during concrete delivery for both guideway and station construction. For at-grade construction, 4 to 12 trucks per hour are estimated from each work zone. For elevated guideway construction, peak truck trips are estimated at 4 to 8 trucks per hour for the concrete delivery. Multiple work zones may be used during peak operations that would result in higher total project peak truck trips; however, these trips would generally not overlap with each other on the same local streets. Parking by construction workers would be provided on-site where possible. Parking could occur on city streets where parking is unrestricted.

Some loss of available parking at park-and-ride lots is expected during construction, at the Lynnwood Park-and-Ride lot. The potential for parking loss during construction is acknowledged, and temporary parking would be provided as needed and where feasible to mitigate the impacts.

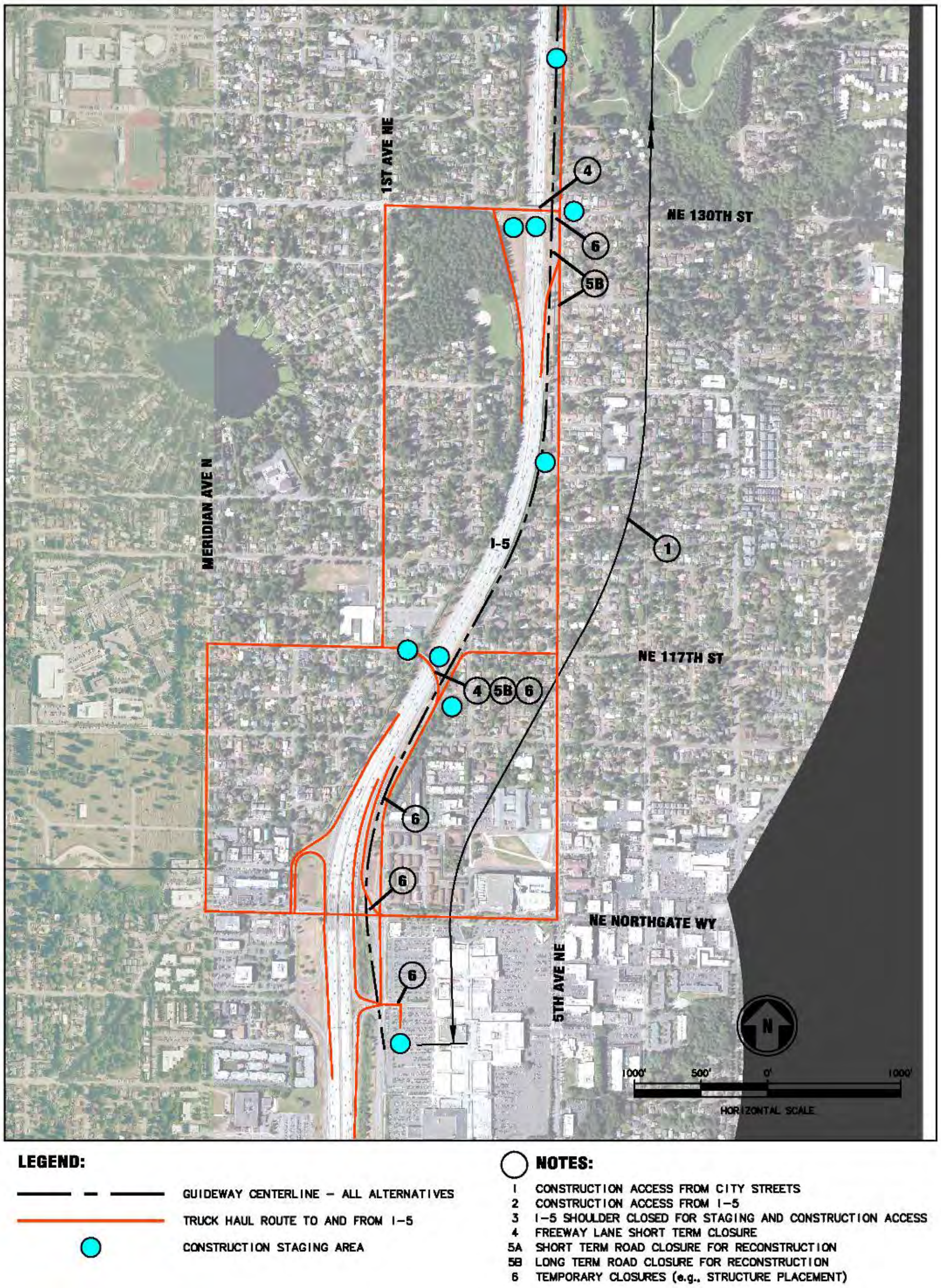


Figure 6-1. Potential Construction Staging Areas and Truck Routes – Segment A (Northgate Station Area to NE 135th Street)

Figure 6-2. Potential Construction Staging Areas and Truck Routes – Segment A (NE 135th Street to NE 165th Street)

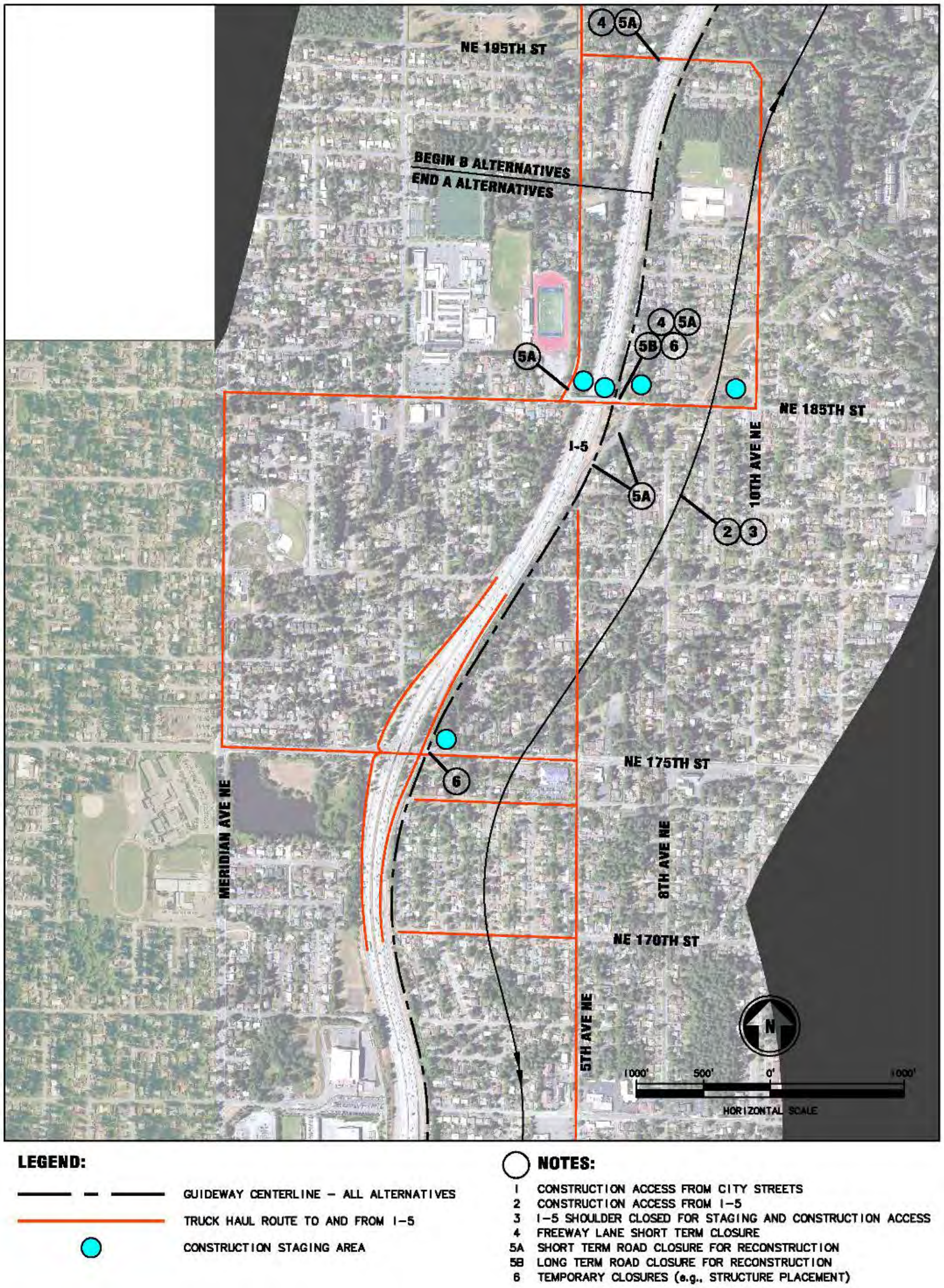


Figure 6-3. Potential Construction Staging Areas and Truck Routes – Segments A and B (NE 165th Street to NE 195th Street)

Figure 6-4. Potential Construction Staging Areas and Truck Routes – Segment B (NE 195th Street to 228th Street SW)

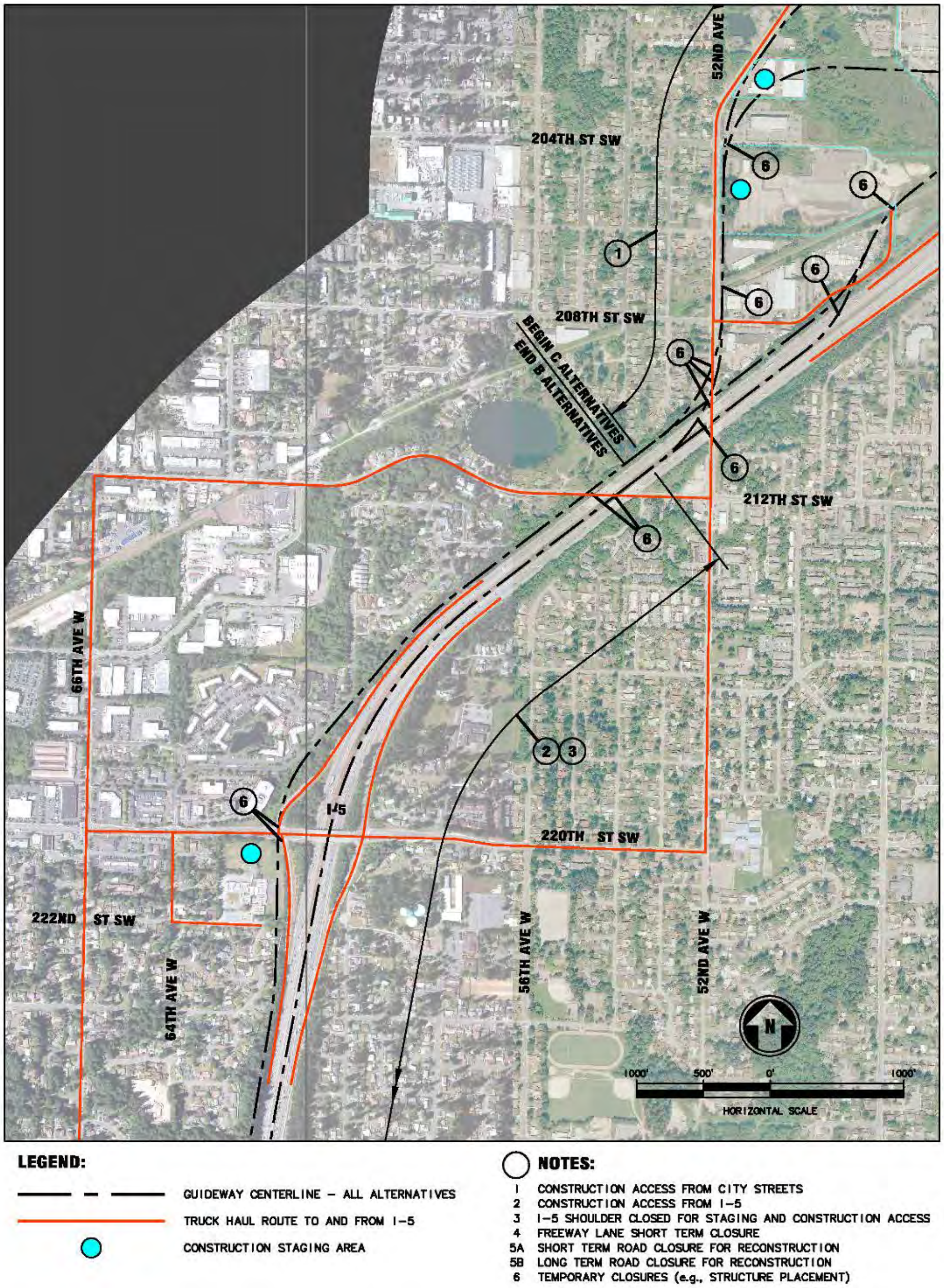


Figure 6-5. Potential Construction Staging Areas and Truck Routes – Segments B and C (224th Street SW to 204th Street SW)

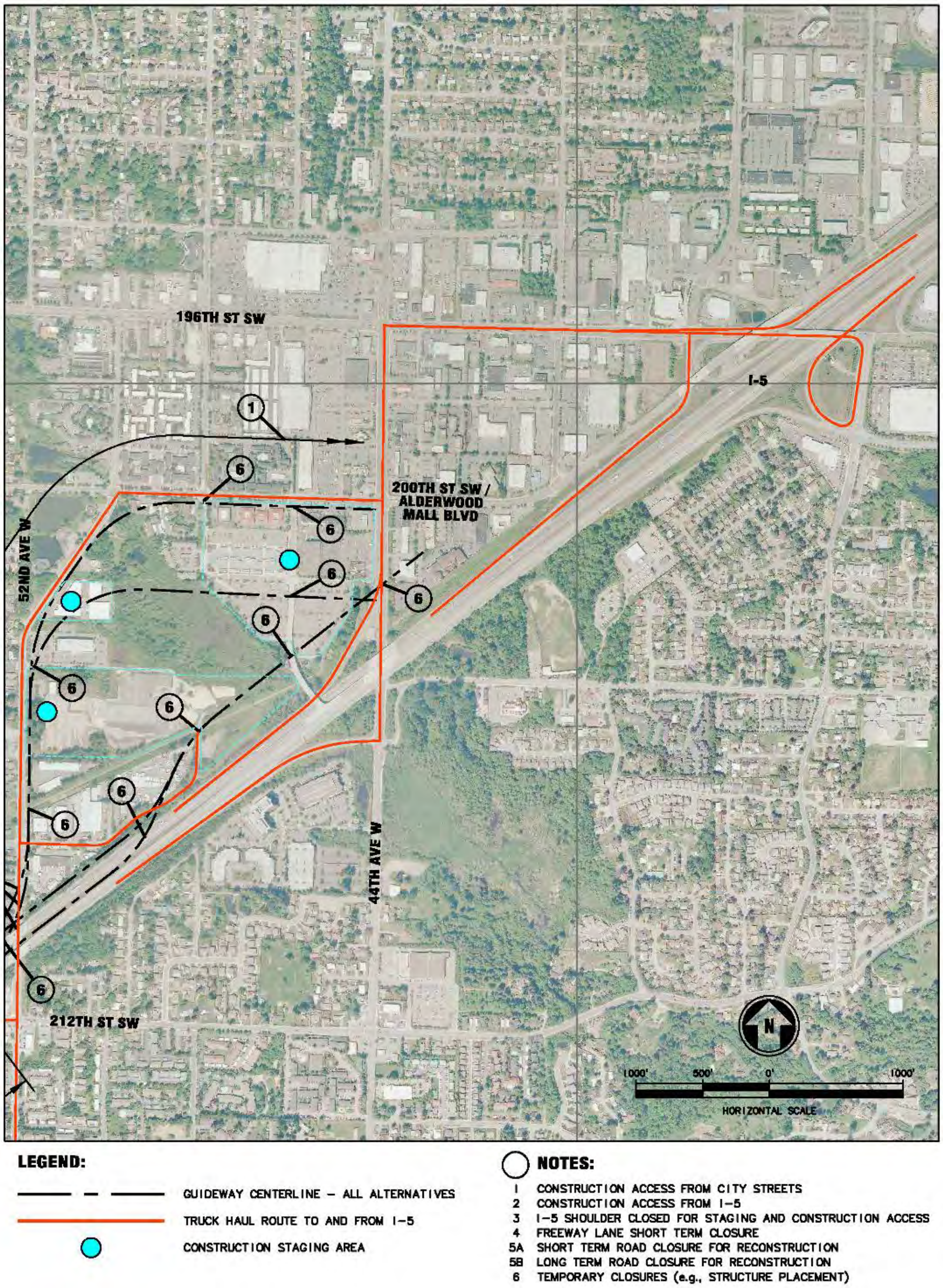


Figure 6-6. Potential Construction Staging Areas and Truck Routes – Segment C (212th Street SW to 196th Street SW)

6.2 Segment A: Seattle to Shoreline

General Purpose Traffic Impacts

Construction of all Segment A alternative alignments would primarily be conducted from staging space within the WSDOT I-5 right-of-way and city streets between Northgate and NE 145th Street. For construction adjacent to I-5, shoulder width and lane width could be revised to incorporate barrier and work zone areas for the contractor. Capacity and travel time reliability could be reduced due to shoulder reductions and narrowed lanes, and the reduced availability of the shoulder refuge for breakdowns or incidents.

Bridge reconstruction at NE 117th Street and NE 185th Street in Alternatives A1, A5, and A10 could require a 1-month closure of one lane on I-5 in each direction due to construction activity in the median of I-5 as well as nighttime closures of I-5. While at NE 130th Street, bridge reconstruction could require up to two months of a lane closure in each direction (one month for each of two phases). The closure of a freeway lane could cause an increase in congestion and delay to I-5 traffic. The nighttime closures of I-5 would be conducted for one direction at a time, with detours to the surface street network. Other periodic night time closures of I-5 could occur for delivery of materials to construction sites.

Local street construction activity could include nighttime closures, intermittent daytime closures, and lane closure in one direction. Locations include 1st Avenue NE (North 113th Street to North 117th Street), NE 117th Street, and 5th Avenue NE, depending on the alternative. Options that include construction of elevated guideway over vehicular traffic would require nighttime closures of the affected facility (i.e., street, ramps, or I-5). Table 6-1 summarizes the major roadway closures in Segment A.

Transit Impacts

In Segment A, buses and transit riders traveling northbound on I-5 could be affected by the decrease in capacity and increase in delay that would result from the narrower lanes and shoulder width. Bus schedules could also be less reliable as congestion and delay increase.

During a 1-month closure of one lane of I-5 in each direction for replacement bridges over I-5, transit could also have increased travel time impacts, although maintaining an HOV lane could reduce these impacts.

Construction of the light rail alignment in the vicinity of multiple arterials used by transit would affect those services as described for each alternative below.

Table 6-1. Segment A: Roadway Closures and Duration

	Alternative					
Roadway	**A1**	**A3**	**A5**	**A7**	**A10**	**A11**
NE Northgate Way	●	●	●	●	●	●
1st Avenue NE	●	●	●	●	●	●
Northbound I-5 off- and on-ramps to/from 1st Avenue NE	●	●	●	●	●	●
Northbound on-ramp from Northgate Way	●	●	●	●	●	●
NE 117th Street	9 to 12 months	●	●	●	●	●
One lane northbound, southbound I-5 in vicinity of NE 117th Street	Night time or up to 1 month per direction	---	---	---	---	---
NE 130th Street Station Area						
NE 130th Street Bridge	●[1] One lane each direction (9 to 12 months)	●	●[1] One lane each direction (9 to 12 months)	●	●[1] One lane each direction (9 to 12 months)	●
One lane northbound, southbound I-5 in vicinity of NE 130th Street	Nighttime or up to 1 month for each of two phases	---	Nighttime or up to 1 month for each of two phases	---	Nighttime or up to 1 month for each of two phases	---
5th Avenue NE northbound off-ramp	●	●	●	●	●	●
5th Avenue NE southbound, south of NE 130th Street for braided ramp	12 months	●	12 months	●	12 months	●
NE 145th Street Station Area						
NE 145th Street	●	●	●	●	●	●
5th Avenue NE northbound off-ramp	●	●	●	●	●	●
5th Avenue NE northbound on-ramp	●	●	●	●	●	●
NE 155th Street Station Area						
NE 155th Street	●	●	●	●	●	●
NE 185th Street Station Area						
NE 175th Street	●	●	●	●	●	●
NE 185th Street Bridge	9 to 12 months	●	1 month	●	1 month	●
One lane northbound, southbound I-5 in vicinity of NE 185th Street	Nighttime or up to 1 month per direction	---	---	---	---	---

● = Nighttime periodic closures for the placement of bridge girders
●[1] = Nighttime, more frequent; the alterative will result in more frequent nighttime closures than other alternatives.
--- Denotes not affected by alternative

Nonmotorized Impacts

Nonmotorized traffic would not be affected due to construction within the I-5 alignment in Segment A. Impacts from the reconstruction of stations and freeway overcrossings are described by alternative. Nonmotorized traffic would be affected by construction activity on local streets.

Freight Impacts

Impacts on the movement of trucks carrying freight would be approximately the same as for general purpose traffic.

Parking Impacts

On-street parking along reconstructed street segments that have on-street parking and roadways adjacent to the guideway construction would temporarily lose parking spaces.

Property Access Impacts

Construction activities along the guideway may reduce or restrict property access and the contractor would need to maintain access during construction.

6.2.1 Alternative A1: At-grade/Elevated with NE 145th and NE 185th Street Stations

General Purpose Traffic Impacts

Construction would temporarily close the NE 117th Street crossing with nighttime closures over I-5 for 9 to 12 months, depending on the final design and construction method. The construction work would affect 1st Avenue NE north of Northgate Way and would require a staging area near 1st Avenue NE and NE 117th Street on the west side of I-5. The northbound on-ramp from 1st Avenue NE to I-5 would remain open. A potential 1-month closure of a northbound and southbound I-5 traffic lane due to median construction would adversely affect I-5 operations for general purpose traffic, trucks, and buses.

The at-grade/elevated alignment would require reconstruction of the NE 130th Street interchange and 5th Avenue NE, including a braided northbound off-ramp with 5th Avenue NE, to accommodate the light rail under NE 130th Street adjacent to I-5. Construction of the NE 130th Street bridge is proposed as a two-phase construction where half of the new bridge (two lanes wide) is constructed while the existing bridge remains in operation for the first phase. The second phase would demolish the existing bridge and complete the second half of the bridge. This activity would close one lane in each direction on the bridge for 9 to 12 months.

Depending on the construction approach, bridge construction could cause a nighttime closure of a northbound and/or a southbound I-5 traffic lane for up to one month due to construction activity in the median. The duration of closure also depends on the final design and construction method.

Construction of the 5th Avenue NE braid could take 1 year and would close southbound traffic on 5th Avenue NE from NE 125th Street to NE 130th Street. Local north-south traffic (all modes) could detour along 8th Avenue NE between NE 125th Street and Roosevelt Way NE. The northbound off-ramp would be kept open throughout construction.

Construction of the light rail alignment north of NE 130th Street would occur in limited space, and would require intermittent one-lane closures on 5th Avenue NE.

Diversion and detours to other interchanges (NE 145th Street and Northgate Way interchanges) would be expected for access to I-5 and east-west traffic circulation. Traffic on 5th Avenue NE could divert and detour to 15th Avenue NE east of I-5, and to 1st Avenue NE west of I-5. Construction staging and the light rail guideway would displace the existing park-and-ride facility.

Transit Impacts

With Alternative A1, King County Metro Routes 242 and 243, on 5th Avenue NE north of NE 130th Street, could be affected by an increase in travel time due to temporary lane closures southbound on 5th Avenue NE caused by light rail alignment construction. King County Metro subscription bus routes that serve Lakeside High School (986, 987, and 995) travel on NE 130th Street. These buses would be affected by temporary lane closures and longer-term bridge closures on NE 130th Street. Bus stops on both sides of 5th Avenue NE, north of NE 130th Street, would be maintained or relocated.

The South Jackson Park Park-and-Ride, with 46 spaces, is approximately 700 feet north of the NE 130th Street Station. This park-and-ride, which is currently underutilized at 25 percent utilization, would be closed during construction and upon completion of the light rail alignment for the at-grade alternatives. Park-and-ride users would need to use other park-and-ride lots or change their mode of access during construction.

Nonmotorized Impacts

Pedestrian and bicycle access across I-5 would be limited to NE Northgate Way during the closure of NE 117th Street, approximately 0.33 mile to the south. Advance information would be provided to pedestrians and bicyclists.

Closure of the NE 130th Street bridge means that pedestrians and bicyclists would detour to the NE 117th Street crossing of I-5, approximately 1 mile to the south;

Northgate Way crossing of I-5, approximately 1.3 miles to the south; or to NE 145th Street, approximately 0.75 mile to the north.

NE 145th Street Station Option 1 (elevated)

General Purpose Traffic Impacts

With Alternative A1, the elevated guideway would have columns close to 5th Avenue NE and cross the northbound off-ramp from I-5. NE 145th Street would remain open during construction of the guideway, but the traffic signals may need to be modified at the intersection of NE 145th Street and 5th Avenue NE. Traffic lanes on 5th Avenue NE could be reduced to one lane in each direction during construction of the station and park-and-ride facility.

Transit Impacts

King County Metro Routes 242 and 243 on 5th Avenue NE, and Routes 373 and 347 on NE 145th Street would be affected by an increase in travel time due to temporary lane closures southbound on 5th Avenue NE and nearby construction activity.

King County Metro Routes 304 and 308 that travel on I-5 to the south of NE 145th Street and then exit at NE 145th Street to travel on NE 145th Street would also be affected by an increase in travel time due to narrow shoulders and lanes on I-5 and then construction activity at NE 145th Street.

The North Jackson Park Park-and-Ride, with 68 spaces, is located in the northwest quadrant of the I-5 northbound on-ramp and 5th Avenue NE. This park-and-ride would be closed for construction staging for Alternative A1. This facility is currently well utilized at 96 percent utilization. Temporary replacement parking will be considered to accommodate these users. Otherwise, park-and-ride users would need to use other park-and-ride lots or change their mode of access during construction. The bus stop at the I-5 off-ramp terminal south of NE 145th Street could be maintained or moved to the south on 5th Avenue NE, depending on construction phasing.

Nonmotorized Impacts

Pedestrians would be limited to travel on the east side of 5th Avenue NE through the construction activity area. This restriction would avoid pedestrians crossing the high volume of northbound traffic turning left to the I-5 on-ramp. Pedestrians would be directed to a safe crossing location north of the construction activity. Bicyclists would travel in mixed traffic.

NE 185th Street Station Option 1 (at-grade)

General Purpose Traffic Impacts

Construction of the at-grade center-platform station for Alternative A1 would require reconstruction of the NE 185th Street bridge over I-5, which could be closed for 9 to 12 months, depending on final design and final construction method. I-5 would be closed at nighttime for one direction at a time, with detours to the surface street network. Construction in the median of I-5 could require closure of one lane in each direction. This could be either nighttime closures or 24-hour closures for up to 1 month, depending on final design and final construction method.

5th Avenue NE would be reconstructed in a new alignment north of NE 185th Street in conjunction with the construction of the parking garage west of I-5. Intermittent daytime closures of one lane could be expected. This reconstruction could be completed in advance of the new bridge over I-5 to allow for west side circulation to continue when the bridge over I-5 is closed. Construction of 5th Avenue NE in a new alignment south of NE 185th Street would also be required for Alternative A1 and could be completed in advance of the trackway construction approaching the station from the south. The early relocation of both segments of 5th Avenue NE would allow for local circulation near the NE 185th Street alignment reconstruction.

Two sections of 1st Avenue NE would be reconstructed for continued local access along the guideway construction—from NE 158th Street to NE 161st Street and from NE 170th Street to NE 174th Street. Property access would be maintained throughout construction and circulation, although constrained, would be available.

Transit Impacts

King County Metro Route 348, on NE 185th Street, would need to use a detour route (potentially along NE 175th Street) during the closure of NE 185th Street. Existing bus stops on NE 185th Street would be maintained or relocated during construction.

Nonmotorized Impacts

The NE 185th Street bridge could be reconstructed before or after the replacement of the NE 195th Street pedestrian bridge for Alternative A1 so as to maintain east-west nonmotorized crossings of I-5 in the general vicinity. (Segment B alignment options require replacement of the NE 195th Street pedestrian/bicycle bridge, approximately 0.50 mile to the north.)

Station construction will require sidewalk closures in the vicinity. Pedestrians would be re-routed as needed to maintain adequate pedestrian access and circulation in the area.

6.2.2 Alternative A3: Mostly Elevated with NE 145th and NE 185th Street Stations

Alternative A3 alignment construction would have fewer impacts on traffic and mobility than Alternative A1 construction. Impacts along the guideway would be similar, but without reconstructing the NE 117th Street, NE 130th Street, and NE 185th Street overcrossings, and avoiding reconstruction of local streets as well.

NE 145th Street Station

Construction impacts at the NE 145th Street Station with Alternative A3 would be the same as with Alternative A1.

NE 185th Street Station

Construction of the elevated station, parking structure, and bus facility would require site access from NE 185th Street and 8th Avenue NE. NE 185th Street would remain open for one lane of traffic in each direction during construction. Local access for some residential properties could be temporarily affected during construction activities.

Transit and nonmotorized movements would be affected by Alternative A3 construction less than with Alternative A1 because there would be no need to reconstruct NE 185th Street over I-5. Pedestrian and bicycle circulation impacts east of I-5 would be similar to Alternative A1.

6.2.3 Alternative A5: At-grade/Elevated with NE 130th, NE 155th, and NE 185th Street Stations

Construction of the Alternative A5 alignment would have fewer impacts than Alternative A1 but more than Alternative A3. Alternative A5 would require reconstruction of the NE 130th Street overcrossing and northbound off-ramp. At NE 185th Street, the suppressed alignment would require reconstruction of the bridge approach on the east side of I-5. Along the guideway, construction impacts would be approximately the same as Alternative A1.

NE 130th Street Station

General Purpose Traffic Impacts

The NE 130th Street bridge closure with Alternative A5 would have the same impacts as with Alternative A1.

At-grade station construction would require reconstruction of the west half of 5th Avenue NE, north of NE 130th Street, as a cantilever over the proposed station.

This reconstruction would disrupt traffic on 5th Avenue NE because the roadway would likely need to be closed and/or narrowed to one lane during construction.

Transit Impacts

King County Metro Routes 242 and 243, on 5th Avenue NE in the vicinity of the 130th Street Station, would be affected by an increase in travel time due to temporary lane closures southbound on 5th Avenue NE. King County Metro subscription bus routes serving Lakeside High School (986, 987, and 995) travel on NE 130th Street. These buses would be affected by temporary lane closures and longer-term bridge closures on NE 130th Street. Bus stops on both sides of 5th Avenue NE, north of NE 130th Street, would be maintained or relocated.

The South Jackson Park Park-and-Ride, with 46 spaces, is approximately 700 feet north of the NE 130th Street Station. This park-and-ride, which is currently underutilized at 25 percent utilization, would be closed during Alternative A5 construction and upon completion of the alignment. Park-and-ride users would need to use other park-and-ride lots or change their mode of access during construction.

Nonmotorized Impacts

The closure of the South Jackson Park Park-and-Ride lot would reduce some pedestrian activity. Pedestrians traveling to bus stops in the vicinity of NE 130th Street would need to be informed of a safe crossing location on the east side of 5th Avenue NE in advance of the station area construction. The crossing should take into account the vertical curve, which limits sight distance north of the end of the sidewalk. Bicyclists would travel in mixed traffic.

Closure of the NE 130th Street bridge means that pedestrians and bicyclists would detour to the NE 117th Street crossing of I-5, approximately 1 mile to the south; Northgate Way crossing of I-5, approximately 1.3 miles to the south; or to NE 145th Street, approximately 0.75 mile to the north.

NE 155th Street Station

General Purpose Traffic Impacts

Construction of the NE 155th Street Station and park-and-ride structure would affect NE 155th Street with intermittent lane closures during Alternative A5 construction. Emergency vehicle access and response to and from the adjacent Shoreline Fire Station 65 must be maintained throughout construction.

Transit Impacts

One-lane operations and periodic lane restrictions on NE 155th Street could result in delays for King County Metro Route 330.

Nonmotorized Impacts

Construction of the bus load and unload areas adjacent to NE 155th Street could cause long-term closures to pedestrian travel along one side of NE 155th Street, followed by the same closures on the other side of the street. Pedestrians would be directed to travel on one side of NE 155th Street at the nearest intersection. Intermittent lane closures during Alternative A5 construction would also affect the bicycle lane with intermittent closures. Space for construction activity could reduce access to the bicycle lane but would be minimized wherever possible.

NE 185th Street Station

General Purpose Traffic Impacts

With Alternative A5, the at-grade NE 185th Street Station would require cut-and-cover construction of a structure under NE 185th Street at the south approach to the station, which would require closing NE 185th Street for approximately 1 month. Construction of the station, bus facility, and park-and-ride at the station area would affect traffic on NE 185th Street and 8th Avenue NE, but two-way traffic could be maintained on both roadways (after completing the cut-and-cover work for the trackway under NE 185th Street). Reconstruction of 5th Avenue NE south of NE 185th Street must be completed before construction of the trackway/guideway approach from the south to maintain local street circulation and access throughout construction. Surface park-and-ride construction under the Seattle City Light power lines would require access to both NE 185th Street and 10th Avenue NE.

Transit Impacts

During Alternative A5 construction, King County Metro Route 348 would be similarly affected as with Alternative A1, except that the closure of NE 185th Street would be shorter (approximately 1 month). Route 348 would use a detour route along NE 175th Street.

Nonmotorized Impacts

Impacts on nonmotorized movements with Alternative A5 would be the same as with Alternative A1.

6.2.4 Alternative A7: Mostly Elevated with NE 130th, NE 155th, and NE 185th Street Stations

Construction impacts of the Alternative A7 elevated alignment would be the same as with Alternative A3 south of NE 145th Street. Construction impacts of Alternative A7 would be the same as Alternative A5 from NE 145th Street to the north.

NE 130th Street Station

Construction of the elevated station would have some impacts on traffic at NE 130th Street and 5th Avenue NE near the station staging area, with intermittent lane closures. Local circulation and property access would be maintained. The South Jackson Park Park-and-Ride between I-5 and 5th Avenue NE would be closed during Alternative A7 construction and used for project staging.

NE 155th Street Station

Construction impacts at the NE 155th Street Station with Alternative A7 would be the same as with Alternative A5.

NE 185th Street Station

Construction impacts at the NE 185th Street Station with Alternative A7 would be the same as with Alternative A5.

6.2.5 Alternative A10: At-grade/Elevated with NE 130th, NE 145th, and NE 185th Street Stations

The at-grade/elevated alignment for Alternative A10 would have similar impacts on the guideway construction as Alternative A5.

NE 130th Street Station

Construction impacts at the NE 130th Street Station with Alternative A10 would be the same as with Alternative A5.

NE 145th Street Station

Construction impacts at the NE 145th Street Station with Alternative A10 would be the same as with Alternative A1.

NE 185th Street Station

Construction impacts at the NE 185th Street Station with Alternative A10 would be the same as with Alternative A5.

6.2.6 Alternative A11: Mostly Elevated with NE 130th, NE 145th, and NE 185th Street Stations

Construction impacts of the Alternative A11 elevated alignment would be similar to Alternative A3.

NE 130th Street Station

Construction impacts at the NE 130th Street Station with Alternative A11 would be the same as with Alternative A7.

NE 145th Street Station

Construction impacts at the NE 145th Street Station with Alternative A11 would be the same as with Alternative A1.

NE 185th Street Station

Construction impacts at the NE 185th Street Station with Alternative A11 would be the same as with Alternative A3.

6.3 Segment B: Shoreline to Mountlake Terrace

General Purpose Traffic Impacts

Construction of the light rail alignment adjacent to I-5 on the east side (south of the Mountlake Terrace Transit Center) would require access from I-5 within the WSDOT right-of-way; shoulders could be reduced down to a 2 foot minimum width and a concrete barrier installed to define the work zone along the freeway, with openings in the barrier for truck and construction traffic ingress and egress. All Segment B alternatives would require replacement of the NE 195th Street pedestrian bridge over I-5. Further design work will determine if a center column is needed. If so, then one lane in each direction on I-5 could be closed for approximately 1 month to provide the space to construct the center column.

Construction through the SR 104 interchange area would include construction staging and work within the cloverleaf interchange. This activity could have some affect on traffic operations due to the proximity of construction near the freeway and interchange. Nighttime closures could also occur during construction. Other periodic nighttime closures of I-5 could occur for delivery of materials to construction sites.

Each Segment B alternative would cross I-5, which would involve constructing a multi-foundation support system (straddle bents) that would likely require falsework and cast-in-place construction. Nighttime closures would likely be necessary to install the straddle bents and girders and construct the guideway bridges to cross to the median or to the west side of I-5. Other design and construction techniques will be explored through final design. Detours to local streets would be implemented for these nighttime closures. All Segment B alternatives cross over 212th Street SW, requiring staging and possible lane closures or nighttime full closures on that facility.

The Mountlake Terrace Freeway Transit Station would be affected by all alternatives during construction, but each would have a different impact. Alternatives B1 and B2/2A would require construction in the median of I-5 north of the existing Mountlake Terrace Freeway Station. This construction activity would require temporary closures of the direct access bus ramps. The ramp closure with Alternative B1 is required for column construction and placement of the elevated guideway over the ramps. It would also be affected by the retained fill section as the elevated guideway transitions to an at-grade alignment. The bus ramps can possibly be redesigned to allow the transit station to operate while the guideway is under construction. Temporary closures could be 2 months, but the length of time could be longer as design details are further developed. The bus ramp closure with Alternatives B2/2A could be for approximately 2 months plus nightly closures beyond that timeframe for column construction and guideway placement over the I-5 mainline and ramps. The bus ramps would be permanently closed with Alternative B4 because the light rail station would replace the freeway bus stop. Table 6-2 summarizes roadway closures and duration for Segment B.

Table 6-2. Segment B: Roadway Closures and Duration

	Alternative		
Roadway/Facility	**B1**	**B2/B2A**	**B4**
I-5 mainline northbound	●	●[1]	● One lane each direction, 1 month
I-5 mainline southbound	---	●[1]	One lane each direction, 1 month
NE 195th Street pedestrian/bicycle bridge, I-5 lane in vicinity of NE 195th Street	6 months	6 months	6 months
Direct access bus ramps and freeway station	Up to 2 months	2 months + nighttime closures	Permanently closed
SR 104/NE 205th Street	●	●	●
236th Street SW	●	●	---
228th Street SW	---	1 month	---
220th Street SW	---	●	---
212th Street SW	●	●	---
60th Avenue W	●	●	---

● = Nighttime would have periodic closures for the placement of bridge girders.
●[1] = Nighttime, more frequent; the alternative would result in more frequent nighttime closures than other alternatives. Crossing both I-5 northbound and southbound lanes all at once would result in less frequent nighttime closures.
--- Not affected by alternative

Transit Impacts

Buses and transit riders traveling northbound on I-5 could be affected by the decrease in capacity and increase in delay that would be caused by the narrower lanes and shoulder width where the light rail alignment is adjacent to I-5 on the east side (south of the Mountlake Terrace Transit Center).

Nonmotorized Impacts

The reconstruction of the NE 185th Street overcrossing approximately 0.50 mile south of the NE 195th Street pedestrian bridge in Segment B could be completed before or after the closure of the NE 195th Street bridge to maintain nonmotorized access across I-5.

Parking Impacts

Currently, on-street parking is not available along Segment B alignments; therefore, there would be no on-street parking impacts.

6.3.1 Alternative B1: East Side to Mountlake Terrace Transit Center to Median

Mountlake Terrace Transit Center Station

General Purpose Traffic Impacts

Access to the Mountlake Terrace Transit Center would be disrupted in the short term during Alternative B1 construction, with short-term impacts on general purpose traffic, transit, and nonmotorized travel.

Transit Impacts

As indicated above, there would be approximately a 2-month closure of the freeway bus ramps to the existing Mountlake Terrace Bus Freeway Station. Buses would be rerouted to the Mountlake Terrace Park-and-Ride to drop off and pick up passengers, resulting in additional travel time. Buses with few users of the freeway stop could remain on I-5 and skip the existing Mountlake Terrace Bus Freeway Station.

Construction of the Mountlake Terrace Transit Center Station would require closing the surface park-and-ride lot that contains approximately 230 spaces; the parking garage would remain open throughout construction. Bus circulation may be constrained, but not restricted during Alternative B1 construction. Provision of temporary replacement parking nearby will be investigated.

Nonmotorized Impacts

Construction of the bus load and unload areas on 236th Street SW would interrupt pedestrian and bicycle travel. Construction phasing could ensure that one sidewalk is open on one or the other side of the street at all times.

There is no sidewalk on the south side of the 236th Street SW bridge. Pedestrians would be directed to cross at the signalized intersection of 236th Street SW and the transit center entrance so that they walk on the sidewalk on the north side of the bridge.

6.3.2 Alternative B2: East Side to Mountlake Terrace Transit Center to West Side of I-5

Mountlake Terrace Transit Center Station

General Purpose Traffic Impacts

General purpose traffic would be affected by Alternative B2 the same as by Alternative B1 at the Mountlake Terrace Transit Center Station; however, additional impacts would occur with the guideway crossing of the southbound I-5 lanes as well as reconstructing the 228th Street SW west approach. Construction of the guideway in retained cut or fill sections could require work space and staging in the WSDOT I-5 right-of-way, along the southbound lanes, by reducing shoulder and lane widths for southbound I-5. Reconstructing the roadway would close 228th Street SW for 1 month.

Transit Impacts

Construction of Alternative B2 would require closure of the freeway station and freeway bus ramps for 1 to 1.5 years. Buses would be rerouted to the park-and-ride facility or could remain on I-5 and skip the Mountlake Terrace Freeway Station.

Nonmotorized Impacts

Construction would disrupt pedestrian and bicycle travel, similar to Alternative B1, and would also affect pedestrian and bicycle circulation with the short-term closure of 228th Street SW.

6.3.3 Alternative B2A: Optional 220th Street SW Station

220th Street SW Station (elevated)

With Alternative B2A, the southbound ramps would be relocated to the east before construction of the 220th Street SW Station and alignment begins so that the ramp traffic can proceed uninterrupted. For the station, construction site access could be from the old ramps. For the parking garage, construction site access would be from 60th Avenue West. The trackway would be elevated at the station and over 220th

Street SW. During construction, transit would experience some delay and bus stops could be temporarily relocated. Pedestrian and bicycle travel on 220th Street SW and the freeway overcrossing would be maintained during construction.

6.3.4 Alternative B4: East Side to Mountlake Terrace Freeway Station to Median

Mountlake Terrace Freeway Station

General Purpose Traffic Impacts

The Mountlake Terrace Freeway Station would require work space within the I-5 median by reducing inside shoulder width for both northbound and southbound I-5. Construction of the guideway crossing I-5 to the median would require the closure of one lane on I-5 in each direction for 1 month to provide space for installing the columns for the guideway bridge. Nighttime detours would be required via the arterials for northbound freeway traffic. North of the freeway transit station, impacts with Alternative B4 would be similar to Alternative B1.

Transit Impacts

The bus ramps would be permanently closed with Alternative B4 because the light rail station would replace the freeway bus stop. Construction activities would be adjacent to the HOV lane and would therefore affect capacity and travel speed for vehicles and buses using the lane.

Nonmotorized Impacts

Nonmotorized travel would not be affected by the construction of the freeway station.

6.4 Segment C: Mountlake Terrace to Lynnwood

Two scenarios exist for all Segment C alternatives in terms of how they connect with Segment B alternatives. If connecting with Alternatives B2/B2A, the guideway in Segment C would be located on the west side of I-5. If connecting with Alternative B1 or B4, the guideway in Segment C would be located in the median of I-5. The elevated guideway along I-5 could require shoulder and lane width reductions to provide the work zone. When in the median, crossing the southbound lanes of I-5 would involve constructing straddle bents, which would require nighttime closures of southbound I-5 traffic to install girders for the guideway bridge. Nighttime closures on I-5 would require detours onto surface streets. Nighttime closures would also be necessary where the guideway crosses over local streets and the Interurban Trail. Table 6-3 summarizes the roadway closures and duration in Segment C.

Table 6-3. Segment C: Roadway Closures and Duration

Roadway	Alternative C1	Alternative C2	Alternative C3
I-5 mainline southbound[a]	●	●	●
52nd Avenue West	●	●	●
208th Street SW	●	●	●
204th Street SW	●	●	
200th Street SW, west of 48th Avenue West to 44th Avenue West	●	●	----
Interurban Trail	●and detour	●and detour	●and detour
46th Avenue West	●	●	●
44th Avenue West	●	●	●
I-5 southbound on-ramp at 44th Avenue West			●

[a] These nighttime closures would occur for connecting to Segment B I-5 median alignments only.
● = Nighttime would have periodic closures for the placement of bridge girders.
--- Not affected by alternative.

There is currently no on-street parking on streets that would be affected by the Segment C alternative alignments; therefore, no on-street parking impacts are expected during construction of the alternative alignments.

6.4.1 Alternative C1: 52nd Avenue West to 200th Street SW Station

General Purpose Traffic Impacts

Alternative C1 construction activity on the east side of 52nd Avenue West could affect traffic operations with possible lane reductions to add space for installation of the column foundations and caps. The three-lane roadway could be reduced to two lanes to provide the space for construction, maintaining one lane of travel in each direction. Driveways to properties would also be closed for construction of the elevated guideway; however, access would be maintained throughout construction, which may require access through the construction site or neighboring properties.

Construction of the station adjacent to 200th Street SW could require nighttime closures and intermittent one-lane closures on the south side of the street. Most of the construction activity would occur south of the street. Construction of the guideway where it is adjacent to 200th Street SW, west of 48th Avenue West, could require nighttime closures of 48th Avenue West.

Transit Impacts

Community Transit Route 130 travels on 52nd Avenue West to 200th Street SW. This route does not operate past 10:00 pm and would therefore not be affected during nighttime closures after 10:00 pm.

Construction of the station on the south side of 200th Street SW could cause an increase in traffic congestion and delays to Community Transit Routes 115, 116, 130, 201, and 202. Approximately 200 to 250 parking stalls would be displaced along the north side of the existing transit center during construction of the parking garage. The existing park-and-ride is 100 percent utilized. Temporary replacement parking in the vicinity will be investigated. Otherwise, park-and-ride users would be required to change their mode of access to the park-and-ride or use other park-and-rides, such as the Swamp Creek or Mountlake Terrace Park-and-Ride.

Nonmotorized Impacts

The Interurban Trail is an on-street facility adjacent to 52nd Avenue West between 208th Street SW and the power line segments. Pedestrians and bicyclists using the trail in this section would need to detour to other surface streets, such as 54th Avenue West and 206th Street SW, during Alternative C1 construction.

Sidewalks could be closed along the east side of 52nd Avenue West and the south side of 200th Street SW during construction. Pedestrians could use the sidewalk on the opposite side of the street, and bicycles could either use the traffic lane or detour to the Interurban Trail.

6.4.2 Alternative C2: 52nd Avenue West to Lynnwood Transit Center

General Purpose Traffic Impacts

Construction impacts with Alternative C2 on the east side of 52th Avenue West would be the same as with Alternative C1. Access to and through the Lynnwood Park-and-Ride would be maintained throughout construction of the transit center station and parking garage.

Transit Impacts

46th Avenue West, which carries the I-5 bus routes to the direct access ramps, would be closed in the short term for guideway construction. Fifteen bus routes (12 Community Transit, 3 Sound Transit) travel between the Lynnwood Transit Center and I-5 using the direct access ramps. 46th Avenue West would be temporarily closed for construction of the guideway during nights and weekends. Community Transit routes operate from 6:00 am to 7:00 pm, and Sound Transit routes operate from 4:30 am to 12:15 am.

Construction of the parking garage would result in a loss of approximately 660 parking spaces during construction. Temporary replacement parking in the vicinity will be investigated. Otherwise, park-and-ride users would be required to change their mode of access to the park-and-ride or use other park-and-rides, such as

Swamp Creek or Mountlake Terrace. Alternatively, leasing parking spaces from nearby local private lots may also be considered.

Nonmotorized Impacts

Nonmotorized impacts would be the same as Alternative C1, except for the addition of Scriber Creek Trail closures.

6.4.3 Alternative C3: Along I-5 to Lynnwood Park-and-Ride

General Purpose Traffic Impacts

Construction of the elevated guideway over 52nd Avenue West will require nighttime closures of this roadway. The elevated guideway west of I-5 approaching the Lynnwood Park-and-Ride would cross over 208th Street SW and private properties, which would require access during construction. The project would include reconstruction of 208th Street SW and possibly some access roads. The alignment would cross the Interurban Trail at its intersection with 208th Street SW. Trail and roadway access would be maintained.

The guideway would then cross the 46th Avenue West direct access ramps to I-5. Nighttime closures would be needed to complete the guideway across the ramp facility. The guideway/tail track would extend east of 44th Avenue West, and construction would require nighttime closures of 44th Avenue West to install the guideway structure. Detours for north-south traffic could include 52nd Avenue West. A detour for the I-5 ramp traffic may include using 204th Street SW east of 44th Avenue West to connect to the 196th Street SW interchange.

The guideway would require reconstructing 208th Street SW at the east end, where it functions as a minor road providing access to industrial uses and a substation. Nighttime closures would be required to construct the guideway over 208th Street SW.

Traffic access to the transit center and parking garage would be maintained during construction of the Lynnwood Park-and-Ride Station.

Transit Impacts

Fifteen bus routes (12 Community Transit, 3 Sound Transit) travel to and from the Lynnwood Transit Center via I-5 using the direct access ramps. Constructing the guideway over the ramps would temporarily close the direct access ramps on nights and weekends. Community Transit routes operate from 6:00 am to 7:00 pm, and Sound Transit routes operate from 4:30 am to 12:15 am.

52nd Avenue West would be closed temporarily while the light rail is constructed in the I-5 median over this roadway. Community Transit Route 130 travels on 52nd Avenue West to 200th Street SW; this route does not operate past 10:00 pm.

Construction of the parking garage would result in a loss of up to 560 park-and-ride stalls during construction. Approximately 150 parking stalls could remain along 48th Avenue NE if the garage is constructed first, followed by the light rail station and trail tracks. Temporary replacement parking in the vicinity will be investigated. Otherwise, park-and-ride users would be required to change their mode of access to the park-and-ride or use other park-and-rides, such as Swamp Creek or Mountlake Terrace.

The construction of the tail track beyond the station would extend over 44th Avenue West, on which Community Transit Route 112 travels. The construction over this roadway would cause temporary lane closures and some nighttime full closures. Community Transit Route 112 does not operate past 10:00 pm.

Approximately 1,100 stalls would be lost altogether during construction of the station and associated park-and-ride garage in both Options 1 and 2 of Alternative C3. The approximately 1,600-stall parking garage could be constructed early to reduce this impact.

Option 1 would utilize the existing transit center, while Option 2 would rebuild the transit center adjacent to the light rail station. The new transit center in Option 2 would be built before the existing transit center is removed to maintain transit connections at this location.

Nonmotorized Impacts

Light rail would be constructed across the Interurban Trail in two locations: approximately 500 feet east of where the alignment leaves I-5, and over the Interurban Trail bridge at 44th Avenue West. The Interurban Trail would be closed during Alternative C3 construction. Detour planning could use streets such as Alderwood Mall Boulevard/200th Street SW to Cedar Valley Road, where there are bicycle lanes and sidewalks. Pedestrian and bicycle routes through the park-and-ride facility could be considered that connect to the Scriber Creek Trail. However, use of this latter option could require significant safety improvements.

Lynnwood Park-and-Ride Station, Options 1 and 2

The tail track east of the light rail station would be constructed over 44th Avenue West and the Interurban Trail. The construction would result in temporary lane closures and some nighttime full closures. Construction activity over the Interurban Trail would require the same detour as discussed above.

7 INDIRECT AND SECONDARY IMPACTS

This chapter discusses potential indirect and secondary transportation mobility impacts that would be caused by the Lynnwood Link Extension. Key observations and findings include the following:

- The Lynnwood Link Extension could help facilitate potential increases in residential and employment uses around project stations.
- These potential increases in land use density around stations could lead to changes in regional and local travel patterns, as trips both to and from these areas may increase for all modes, affecting transit, freeway and local traffic volumes, parking demand, and nonmotorized users.
- The light rail extension could also affect ridership on other transit service in the project corridor, particularly parallel bus rapid transit service in the SR 99 corridor, where longer distance trips could decrease as some riders shift to the light rail lines, and shorter trips could increase as more riders use other transit service to access light rail.
- Other changes in transit service in the corridor in response to the light rail extension that are not yet planned or anticipated could also result in shifts in ridership. These could include the potential for Community Transit, Sound Transit, and King County Metro to redeploy and/or reinvest bus service that is replaced by light rail service. Also, ridership on Sounder North commuter rail service could be affected by the light rail extension.

7.1 Regional Context and Travel Patterns

The completion of the Lynnwood Link Extension would provide fast and reliable light rail service. Light rail service could help to facilitate potential increases in residential and employment uses around project stations, although the potential for increased land use development is expected to be low to moderate for all stations except for the Lynnwood Transit Center Station, based on the station area development potential ratings included in Chapter 4, Section 4.2, Land Use, of the Lynnwood Link Extension Draft EIS. However, these potential increases in land use development, regardless of level, could lead to corresponding changes in regional travel patterns as trips to and from these areas potentially increase for all modes.

7.2 Transit

The Lynnwood Link Extension could affect ridership levels on parallel transit service, particularly bus rapid transit service in the SR 99 corridor. Ridership on the RapidRide E line could decrease as riders making longer commute trips shift to the light rail network. However, ridership could increase on the *Swift* bus rapid transit line with the route extended south and east to terminate at the NE 185th Street light rail station and more riders use it to access light rail.

In addition to the planned changes to local and commuter bus service assumed for the light rail alternatives in forecast year 2035, King County Metro and Community Transit could make additional changes in response to the project. These could include the potential for Community Transit, Sound Transit, and King County Metro to redeploy and/or reinvest in bus service that is replaced by light rail service. Such changes are dependent on transit funding and would result in a net benefit for transit riders. Also, ridership on the Sounder North commuter rail service could be affected by the extension.

7.3 Freeway Operations

As discussed in Section 7.1, the potential for increased land use development around light rail stations in the project corridor could lead to an increase in trips to and from these stations. While the potentially higher-density residential and commercial development could generate additional light rail trips, it could also increase general purpose traffic to and from these station areas. This increase in traffic could cause some additional impacts on freeway mainline and ramp operations.

7.4 Arterials and Local Streets

The potential for increased land use development around light rail stations in the corridor could lead to increases in automobile and bus trips to and from these station areas. This increase in traffic could cause additional impacts on the arterials and local streets. Conversely, increased development along the light rail corridor could also result in shifts from automobile trips to other travel modes such as transit, bicycle, and pedestrian trips.

7.5 Nonmotorized Facilities

A potential increase in higher-density residential and commercial development and the associated potential for increased light rail ridership would generate additional pedestrian and bicycle trips to the stations. These trips could be added to older streets that have narrower sidewalks and lack ADA accessibility, but could also accelerate improvements to these facilities as local jurisdictions observe the increase in usage.

7.6 Parking

The potential for increased land use development around station areas in the corridor could lead to a potential increase in the demand for parking in these areas as well. This could take the form of increased demand for on-street parking for street-level retail businesses, as well as for off-street parking for both residential and commercial uses. In addition, the demand for park-and-ride spaces in areas beyond 0.25 mile from light rail stations could increase as some riders could park along feeder bus routes and then take the bus to the light rail station. Additionally, a loss in park-and-ride demand could occur in other parallel corridors, particularly the SR 99 corridor, where park-and-ride facilities such as the Shoreline Park-and-Ride and Aurora Village Transit Center could experience lower demand as riders shift to the light rail line.

7.7 Safety

No indirect effects on traffic safety are anticipated as a result of the Lynnwood Link Extension project.

8 CUMULATIVE IMPACTS

This chapter discusses potential cumulative transportation mobility impacts that would be caused by the Lynnwood Link Extension. The analysis of the No Build Alternative and the light rail alternatives is inherently cumulative because it is based on regional forecasts that assume future funded projects and future growth in population and employment, located in designated growth centers, consistent with adopted land use plans. However, there could be differences in effects based on the details of other individual transportation or development projects, and the actual rate and timing of population or employment growth in a given community. Key observations and findings include the following:

- Land use changes, future population and employment growth, or future transportation projects that are not assumed as part of the No Build Alternative and light rail alternatives in forecast year 2035 could potentially influence travel patterns to, from, and within the Lynnwood Link Extension corridor. These potential changes or projects could affect traffic operations on freeways, arterials, and local streets.
- Future extensions of the regional mass transit network that currently are not funded would improve transit accessibility for communities in the Lynnwood Link Extension corridor. In addition, new bus rapid transit such as a route serving 196th Street SW would provide increased connectivity for the Lynnwood area.
- Potential projects involving new managed or tolled lanes on I-5 or new direct access facilities to managed lanes could alter freeway and interchange operations.
- Construction of other projects could increase cumulative short-term impacts such as increased congestion, truck trips and detours if they are constructed at the same time as the Lynnwood Link Extension.
- Future developments or local transportation projects or trails improvements could add more pedestrian and bicycle trips to the street network surrounding the light rail stations.
- Future developments could generate increased parking demand within the corridor, but increases in regional transit connectivity could help offset parking demand.
- Transportation infrastructure improvements to current standards could result in improved traffic safety along roadways surrounding future light rail stations.

8.1 Regional Context and Travel Patterns

In addition to the land use changes that could occur as a result of this project (indirect and secondary impacts), additional unanticipated land use changes throughout the region could influence the nature of travel patterns within and through the Lynnwood Link Extension corridor. For example, to the north, changes in employment levels at Boeing could cause an increase or decrease in traffic volumes and transit demand in the corridor.

Additional future transportation projects in the region that were not assumed as part of the No Build Alternative and light rail alternatives in 2035 could also potentially influence travel patterns to, from, and within the Lynnwood Link Extension corridor. As discussed below under Transit and Freeway Operations, future extensions of the mass transit network and changes to the operation of I-5 would provide enhanced regional connectivity within and through the corridor.

8.2 Transit

Future extensions of the regional mass transit network are depicted in Sound Transit's Long-Range Vision, and include an extension north from Lynnwood to Everett. If voters approve funding for construction of additional extensions, transit accessibility for the communities in the Lynnwood Link Extension corridor would be increased through connections to additional regional destinations. Moreover, Community Transit has studied the feasibility of new bus rapid transit corridors in its service area, including a potential new line serving 196th Street SW. This new transit service, which is not currently funded, would combine with the Lynnwood Link Extension to provide increased connectivity for the Lynnwood area.

8.3 Freeway Operations

In addition to the Lynnwood Link Extension, the implementation of other projects that is not reflected in this transportation analysis could affect freeway operations. The current WSDOT I-5 Express Lanes study could result in new managed or tolled lanes in the I-5 corridor, providing more efficient person throughput and reduced freeway congestion in the corridor, including at freeway interchanges near light rail stations. Other projects that could affect freeway operations include any changes to interchanges, such as the introduction of new direct access facilities to future managed lanes.

8.4 Arterials and Local Streets

The cumulative analysis of future transportation impacts in Chapter 5 was based on the results of traffic and ridership modeling that incorporated past, funded, and approved future actions, as well as projected growth that would generate development in the region.

In a separate project, Sound Transit is evaluating potential sites for a Link Operations and Maintenance Satellite Facility. One of the sites under consideration is located north of I-5 and east of 52nd Avenue West/Cedar Valley Road in Lynnwood. The transportation effects of this maintenance facility would be limited. The light rail trains would enter and leave the station via a dedicated light rail guideway. While employees, service vehicles, and shipments would arrive using local streets, the traffic would not be likely to change conditions because the maintenance facility would occupy an area that is already largely developed with office and light industrial uses, and trips related to the displaced facilities would no longer occur. There would be no notable difference in the transportation effects of this maintenance facility related to any Segment C alternative—all of which have stations and park-and-ride facilities that would largely be accessed using different streets than 52nd Avenue West, the street access point for the facility.

The Edmonds School District owns a property that it plans to develop for an operations base that includes school bus storage. This development could increase traffic volumes along 52nd Avenue West, including during the morning peak period and in afternoons when the school buses are deployed.

Other unfunded regional and local transportation projects and development projects could result in additional effects on traffic operations and local circulation near the proposed stations. New development projects may increase vehicle trips around stations and change travel patterns on local streets, which could contribute to cumulative traffic delays on roadways within the Lynnwood Link Extension corridor. On the other hand, future transit and roadway capacity projects could improve person throughput, traffic flow, and circulation on local streets along the corridor and reduce the impacts of proposed light rail stations on local traffic operations. Also, if the implementation of these projects overlaps, construction activities could have cumulative short-term impacts.

8.5 Nonmotorized Facilities

Future unfunded projects or accelerated growth could add more pedestrian and bicycle trips to the street network surrounding the light rail stations. These projects would also improve nonmotorized facilities associated with the project.

8.6 Parking

Similar to the previous discussion of regional travel patterns, parking within the corridor could also be affected by land use and transportation infrastructure changes that are not reflected in this analysis. In particular, transportation projects that would increase roadway throughput capacity could increase parking demand within the corridor. Conversely, increases in regional transit connectivity could decrease parking demand as travelers shift their modes of travel.

8.7 Safety

The cumulative effects of future development and transportation improvements could improve traffic safety along roadways surrounding the proposed light rail stations.

9 POTENTIAL MITIGATION MEASURES

This chapter discusses potential mitigation measures for transportation mobility impacts caused by the Lynnwood Link Extension. Key observations and findings include the following:

- Regional Travel—No mitigation is required to maintain regional travel.
- Transit—The transit integration plans developed by King County Metro and Community Transit would provide coordinated bus service with the light rail system. In addition, major park-and-ride lots in the study area would be expanded to accommodate the increase in transit ridership with the project. No additional transit mitigation is required.
- Freeway—No mitigation would be necessary along the I-5 mainline. However, congestion on local streets near the proposed NE 130th Street and NE 145th Street Stations could cause long queues and congestion on the off-ramps affecting the freeway mainline. Improvements in these interchange areas, such as the addition of new signals and channelization at ramp terminal intersections as well as the addition of ramp meters, would help meter traffic flow and reduce or eliminate the effects of queuing on the I-5 mainline.
- Arterials and Local Street Operations—For impacts on arterials and local streets, mitigation would be required at intersections located near proposed light rail stations that would degrade below LOS standards and/or worsen compared to the No Build Alternative. In particular, intersection and/or arterial improvements would be needed near light rail stations in Segments A and C. Sound Transit has identified potential measures to improve conditions to meet LOS standards where No Build conditions would otherwise meet standards. Sound Transit would provide these improvements or other improvements as agreed to by the local jurisdiction or Sound Transit could contribute a proportionate share of costs to improve intersection performance where the No Build Alternative would be below standards. This share could be determined by the project's ratio of trips at the intersection or another equitable method. Advanced signal system infrastructure may be appropriate to implement for signal coordination for multiple travel modes, plus transit signal priority and transit queue jumps may be identified to facilitate local transit access to the station areas. Sound Transit will coordinate closely with impacted agencies and jurisdictions to determine final mitigation.
- Property Access and Circulation—Access and circulation could be affected near the NE 130th Street interchange due to station placement, and/or proposed modifications to the interchange configuration, as well as I-5 overcrossings. These impacts could require a break in the continuous median on 5th Avenue NE north of NE 130th Street (with Alternatives A1, A5, A7, A10, and A11) and/or the addition of a U-turn location south of NE 130th Street (with Alternatives A1, A5, and A10).

- Nonmotorized Facilities—Sound Transit would provide pedestrian and bicycle improvements at the proposed stations and would work with local agencies to provide for safe and effective pedestrian crossings and access.
- Freight Mobility and Access—No mitigation would be required to maintain freight mobility and access.
- Parking—Mitigation may be required where there are potential impacts on parking around stations. In addition, Sound Transit will evaluate the need to mitigate for potential hide-and-ride activities near stations.
- Construction—All potential mitigation measures would comply with local regulations governing construction traffic control and construction truck routing. Sound Transit would finalize detailed construction mitigation plans in close coordination with local jurisdictions, WSDOT, King County Metro, Community Transit, and other affected agencies and organizations.

9.1 Regional Travel

Mitigation for regional travel would not be required because highways and arterials are not expected to experience adverse changes in operations. The v/c ratios and mode share would generally remain similar to the No Build Alternative or improve with the Lynnwood Link Extension.

9.2 Transit

Mitigation for transit would likely not be required for the Lynnwood Link Extension because the project would improve the regional transit system and, by freeing up existing bus service resources, may allow King County Metro's and Community Transit's integration plans to provide coordinated bus service with the light rail system. In addition, major park-and-rides in the study area would be expanded to better accommodate the increase in transit ridership with the project.

9.3 Freeway

No mitigation improvements would be necessary along the I-5 mainline during project operations because the project would have either similar or improved vehicle travel times and increased corridor person throughput in both the AM and PM peak periods compared with the No Build Alternative.

Congestion on local streets, particularly at intersections near the proposed NE 130th Street and NE 145th Street Stations, could result in long queues and congestion on the off-ramps which could in turn affect operations ofthe freeway mainline. While the northbound I-5 off-ramp intersections at both the NE 130th Street and NE 145th Street interchanges operate at LOS F under the No Build Alternative, they may be affected further with some of the light rail alternatives. Improvements to the arterial streets and intersections in these interchange areas could help meter traffic flow and reduce or eliminate their effects on the I-5 mainline. With the NE 130th Street Station options that do not include a reconfigured NE 130th Street northbound off-ramp (Alternatives A7 and A11), a signal could be provided at the 5th Avenue NE/I-5 northbound off-ramp intersection to mitigate potential impacts on freeway operations. With the NE 145th Street Station options (Alternatives A1, A3, A10, and A11), a signal could be provided at the 5th Avenue NE/I-5 northbound on-ramp intersection to mitigate potential impacts on freeway operations. Other mitigation measures could include additional channelization at ramp termini intersections, and ramp meters on project area on-ramps.

9.4 Arterials and Local Streets

9.4.1 Traffic Operations

For impacts on arterials and local streets, mitigation is potentially required at intersections where the intersection LOS with the light rail alternatives, compared with the No Build Alternative, would degrade to levels that do not meet the LOS jurisdiction standards. For locations that would operate below LOS standards with the No Build Alternative in forecast year 2035, improvements were assumed to be needed if the light rail alternatives result in further delay increases of over 5 seconds per vehicle at signalized and unsignalized intersections compared to the No Build Alternative. Potential mitigation measures for improvements at intersections in each segment based on these criteria are described below.

These intersection improvements would improve the AM and PM peak hour intersection delay to the same level or better than that reflected by the No Build Alternative. Sound Transit would likely be responsible for contributing a proportionate share of costs to improve intersections affected by the project, which could be determined by the project’s proportionate ratio of trips at the intersection or another equitable method.

There is some potential for increased cut-through traffic in neighborhoods to access the light rail stations via local streets. To reduce the potential for this, Sound Transit could work with local jurisdictions to consider measures such as signage, access or turn restrictions, or other traffic control measures. Final mitigation for all traffic impacts, including the potential for intersection degradation and cut-through traffic impacts, would be determined in conjunction with local jurisdictions.

Segment A Intersections

In Segment A, several intersections in Seattle and Shoreline could potentially require improvements to adjust for additional trips and changes in travel patterns to and from the proposed light rail stations. Tables 9-1 and 9-2 summarize the potential improvements required to improve intersection operations to acceptable levels in the

PM and AM peak hours, respectively. Intersection LOS results without the potential mitigation improvements are summarized in Tables 5-25 and 5-26.

Table -9-1. Forecast Year 2035 PM Peak Hour Intersection LOS with Potential Mitigation Improvements—Segment A

Nearest Station/ Intersection	LOS Standard	Alternative: No Build	A1	A3	A5	A7	A10	A11	Potential Improvements
NE 130th Street Station					**Opt.1**	**Opt.2**	**Opt.1 (no park-and-ride)**	**Opt.2**	
5th Avenue NE and I-5 northbound off-ramp	D	F				B		B	Opt. 2 – signalize intersection
NE 145th/NE 155th Street Station			**Opt.1**	**Opt.2**	**155th**	**155th**	**Opt.1 (650-space park-and-ride)**	**Opt.2**	
5th Avenue NE and I-5 northbound on-ramp	D	B	A	B			A	B	Opt. 1 – signalize intersection
NE 145th Street and 5th Avenue NE	E	E	E	E			E	E	All Opts. – add a protected northbound right phase
5th Avenue NE and I-5 northbound off-ramp	D	F	C	C			C	C	All Opts. – signalize intersection
NE 145th Street and 12th Avenue NE	E	F	D	D			D	D	All Opts. – add two-way left-turn lane or short refuge area on NE 145th Street
North 155th Street and Aurora Avenue North	D	D			D	D			Change eastbound right-turn lane to a shared through-right-turn lane
North 155th Street and Meridian Avenue North	D	D			C	C			Add left-turn pockets to the northbound and southbound approaches
North 155th Street and 1st Avenue NE	D	E			D	D			Add a right-turn pocket to the northbound approach
NE 155th Street and 8th Avenue NE	D	F			C	C			Add a two-way left-turn lane or refuge area on NE 165th Street
NE 165th Street and 5th Avenue NE	D	E			B	B			Add a second northbound through lane

Table -9-1. Forecast Year 2035 PM Peak Hour Intersection LOS with Potential Mitigation Improvements—Segment A

Nearest Station/ Intersection	LOS Standard	No Build	A1	A3	A5	A7	A10	A11	Potential Improvements
NE 185th Street Station			**Opt.1**	**Opt.2**	**Opt.3**	**Opt.2**	**Opt.3**	**Opt.2**	
North 185th Street and Meridian Avenue North	D	F	F	F	F	F	F	F	All Opts. – add protected-permissive phasing to the northbound and southbound left turns; improves delay to No Build Alternative conditions
NE 185th Street and 2nd Avenue NE	D	D	C	C	C	C	C	C	All Opts. – add a two-way left-turn lane or refuge area on NE 185th Street
NE 185th Street and 5th Avenue NE (north)	D	D	C	C	C	C	C	C	Opt. 3 – add a two-way left-turn lane or refuge area on NE 185th Street
NE 185th Street and 5th Avenue NE (south)	D	F	D	D	C	D	C	D	Opt. 3 – add a two-way left-turn lane or refuge area on NE 185th Street
NE 185th Street and 8th Avenue NE	D	D	D	C	C	C	C	C	Opts. 2 and 3 – add a two-way left-turn lane or refuge area on NE 185th Street
NE 185th Street and 10th Avenue NE	D	C	D	D	C	D	C	D	Opt. 3 – add a right-turn pocket to the eastbound approach

Notes:
Gray = No mitigation required.
Red = Intersection does not meet LOS standard.
Yellow = Intersection operates at acceptable LOS but is approaching LOS standard.
Green = Intersection operates at acceptable LOS.

Table 9-2. Forecast Year 2035 AM Peak Hour Intersection LOS with Potential Mitigation Improvements—Segment A

Nearest Station/ Intersection	LOS Standard	Alternative: No Build	Alternative: A1	Alternative: A3	Alternative: A5	Alternative: A7	Alternative: A10	Alternative: A11	Potential Improvements
NE 130th Street Station					**Opt.1**	**Opt.2**	**Opt.1 (no park-and-ride)**	**Opt.2**	
5th Avenue NE and I-5 northbound off-ramp	D	F				A		A	Opt. 2 – signalize intersection
NE 145th/NE 155th Street Station			**Opt.1**	**Opt.2**	**155th**	**155th**	**Opt.1 (650-space park-and-ride)**	**Opt.2**	
5th Avenue NE and I-5 northbound on-ramp	D	C	C	D			C	D	Opt. 1 – signalize intersection
NE 145th Street and 5th Avenue NE	E	E	E	E			E	E	All Opts. – add a protected northbound right phase
5th Avenue NE and I-5 northbound off-ramp	D	F	B	B			B	B	All Opts. – signalize intersection
NE 185th Street Station			**Opt.1**	**Opt.2**	**Opt.3**	**Opt.2**	**Opt.3**	**Opt.2**	
North 185th Street and Meridian Avenue North	D	D	D	D	D	D	D	D	All Opts.– add protected-permissive phasing to the northbound and southbound left turns

Gray = No mitigation required.
Red = Intersection does not meet LOS standard.
Yellow = Intersection operates at acceptable LOS but is approaching LOS standard.
Green = Intersection operates at acceptable LOS.

In addition to the intersection improvements described above, capacity improvements, such as the addition of a two-way left-turn lane, may be needed by 2035 on NE 185th Street between Meridian Avenue NE and 5th Avenue NE to meet the City of Shoreline's concurrency standards during the PM peak hour. Sound Transit may also be responsible for contributing a proportionate share of costs to improve this roadway segment.

Segment B Intersections

In Segment B, no intersections in Mountlake Terrace would require improvements to adjust for additional trips and changes in travel patterns to and from the proposed stations.

Segment C Intersections

In Segment C, two intersections in Lynnwood could potentially require improvements to adjust for additional trips and changes in travel patterns to and from the proposed light rail stations. Tables 9-3 and 9-4 summarize the potential improvements required to improve intersection operations to acceptable levels in the PM and AM peak hours, respectively. Intersection LOS results for Segment C without the potential mitigation improvements are summarized in Tables 5-29 and 5-30.

Table 9-3. Forecast Year 2035 PM Peak Hour Intersection LOS with Potential Mitigation Improvements—Segment C

Nearest Station/ Intersection	LOS Standard	Alternative					Potential Improvements
		No Build	C1	C2	C3a	C3b	
Lynnwood Station			**200th**	**Transit Center**	**Park-and-Ride Opt. 1**	**Park-and-Ride Opt. 2**	
196th Street SW and 50th Avenue West	E	F	C	C	C	C	Change from two-way stop control to signal control.[Change would clearly be needed for No Build Alternative also]
200th Street SW and 44th Avenue West	E	F	F	F	F	F	Restripe northbound approach to two left turns, one through lane, and one shared through-right lane. Delays would be improved over No Build Alternative with this change.

Red = Intersection does not meet LOS standard.
Green = Intersection operates at acceptable LOS.

Table 9-4. Forecast Year 2035 AM Peak Hour Intersection LOS with Potential Mitigation Improvements—Segment C

Nearest Station / Intersection	LOS Standard	Alternative					Potential Improvements
		No Build	C1	C2	C3a	C3b	
Lynnwood Station			**200th**	**Transit Center**	**P&R Opt. 1**	**P&R Opt. 2**	
200th Street SW and 44th Avenue West	E	E	E	E	E	E	Restripe northbound approach to two left turns, one through lane, and one shared through-right lane

Yellow = Intersection operates at acceptable LOS but is approaching LOS standard

9.4.2 Property Access and Local Circulation

With Alternatives A1, A5, A7, A10, and A11, the potential for access and circulation impacts exists near the NE 130th Street interchange due to station placement and/or proposed modifications to the interchange configuration and I-5 overcrossings, as described in Section 5.4.3. With these alternatives, a gap in the raised median on 5th Avenue NE is needed to maintain access to NE 131st Place and the North Seattle Church of the Nazarene.

For Alternatives A1, A5, and A10, the reconstruction of southbound 5th Avenue NE under the I-5 northbound off-ramp limits access to properties south of NE 130th Street. A potential U-turn location should be identified south of this location to improve access to these properties.

For all Segment A alternatives, 1st Avenue NE would be reconstructed between NE 170th Street and NE 174th Street adjacent to the guideway and local streets would be reconnected after construction. For all Segment A alternatives, 5th Avenue NE would be reconstructed between NE 180th Street and NE 185th Street (with variations by alternative) where property access and local connections would be restored after construction. For Alternative A1, the reconstruction of 5th Avenue NE north of NE 185th Street would provide a new access to the adjacent property.

9.5 Nonmotorized Facilities

No adverse impacts have been identified for nonmotorized facilities due to light rail operations; therefore, no mitigation is proposed. Sound Transit would provide pedestrian and bicycle improvements at Lynnwood Link Extension stations consistent with its current System Access Policy and FTA's New Starts criteria, to safely accommodate projected increases in pedestrian and bicycle travel associated with the project. Sound Transit would also work with local agencies to determine which pedestrian and bicycle improvements would be most appropriate to support station access and safety. New or reconstructed facilities would be designed and constructed to meet or exceed agency and local jurisdictional standards for pedestrian and bicycle mobility.

With the NE 145th Street Station options (all Segment A alternatives), a signalized crossing should be provided at the 5th Avenue NE/I-5 northbound on-ramp intersection to improve safety for pedestrians accessing the station.

9.6 Freight Mobility and Access

The Lynnwood Link Extension is not expected to require mitigation during operation to improve freight mobility and access because truck routes would be maintained and mobility would be maintained or improved with the project.

9.7 Parking

Mitigation may be required where there are potential impacts on parking around stations. The potential exists for hide-and-ride activities near stations, and the best ways to mitigate such activities are specific to each station area.

Sound Transit would work with local jurisdictions to develop a plan to evaluate and, if necessary, implement hide-and-ride mitigation. With this approach, Sound Transit would inventory on-street parking around each station before the start of light rail revenue service. These inventories would document the current on-street parking supply within a 0.25-mile radius of the stations. Based on the inventories, Sound Transit and the local jurisdiction would work with the affected stakeholders to identify and implement appropriate mitigation measures, if necessary. Parking control measures could consist of parking meters, restricted parking signage, passenger and truck load zones, and residential parking zone programs and associated signage. Other parking mitigation strategies could include promotion of alternative transportation services (for example, encouraging use of buses, vanpool or carpool services, walking, or bicycling).

For parking controls agreed to with the local jurisdiction and community, Sound Transit would be responsible for the cost of installing the signage or other parking controls, including any expansion of the parking controls for 1 year after the project's opening. The local jurisdictions would be responsible for monitoring the parking controls and providing all enforcement and maintenance of the parking controls. The local residents would be responsible for any costs related to the residential parking zones imposed by the local jurisdictions.

9.8 Construction

9.8.1 Transit

During construction, the existing South Jackson Park, North Jackson Park, Mountlake Terrace Transit Center, and Lynnwood Transit Center park-and-ride lots could either be partially or fully closed. Measures to mitigate the loss of parking at these locations could include the following:

- Consider service increases or other measures to encourage transit trips that do not require automobile access.
- Route transit riders that use these locations to available spaces at nearby park-and-ride lots.
- Lease parking lots and/or new parking areas within the vicinity of the closed park-and-ride lots.

During construction, transit service mitigation measures for partial or full closures of the Mountlake Terrace Transit Center and Lynnwood Transit Center could include the following:

- Relocate transit stops to adjacent streets.
- Provide a temporary transit center at a nearby off-street location.
- Revise transit services.

During construction of alternatives within street rights-of-way, buses would be rerouted to nearby arterials, where appropriate, to maintain transit service. Transit service modifications would be coordinated with King County Metro, Community Transit, and private transit service providers to minimize construction impacts and disruptions to bus facilities and service. These measures could include posting informative signage before construction at existing transit stops that would be affected by construction activities.

9.8.2 Freeway Operations

During Lynnwood Link Extension construction, Sound Transit would work with WSDOT to develop a written plan to coordinate construction with incident management, construction staging, and traffic control where the light rail construction might affect freeway traffic. Sound Transit would also coordinate with WSDOT to disseminate construction closure information to the public as needed.

9.8.3 Arterials and Local Streets

All mitigation measures associated with constructing the Lynnwood Link Extension would comply with local regulations governing construction traffic control and construction truck routing. Sound Transit would finalize detailed construction mitigation plans in close coordination with local jurisdictions and WSDOT during the final design and permitting phases of the project. Mitigation measures for traffic impacts due to light rail construction could include the following practices:

- Conform to the *Manual on Uniform Traffic Control Devices* and jurisdictional agency requirements for all traffic plan maintenance.
- Use lighted or reflective signage to direct drivers to truck haul routes to ensure visibility during nighttime work hours.
- Use temporary reflective truck prohibition signs on streets with a high likelihood of cut-through truck traffic.
- Prepare a written plan to communicate public information through tools such as print, radio, posted signs, Web sites, and email to provide information regarding street closures, hours of construction, business access, and parking impacts. Sound Transit would provide this plan.
- Obtain written permission to close access to affected businesses and residents. The contractor will be required to perform this task in coordination with Sound Transit staff. If access closures are required, property access to residences and businesses would be maintained to the extent possible. If access to the property cannot be maintained, the specific construction activity would be reviewed to determine if it could occur during non-business hours, or if the parking spaces and users of this access (for example, deliveries) could be provided at an alternative location.
- Provide parking areas for construction workers, where necessary, which could be the responsibility of the contractor. This may include providing remote parking with shuttle service to and from the construction site if sufficient on-site parking cannot be provided.
- Post advance notice signs prior to construction in areas where surface construction activities would affect access to surrounding businesses.
- Provide regular, written updates to schools, emergency service providers, local agencies, solid waste utilities, and postal services, and assist public school officials in providing advance and ongoing notice to students and parents concerning construction activity near schools.
- Schedule traffic lane closures and high volumes of construction truck traffic during off-peak hours to minimize delays during periods of higher traffic volumes as much as possible.
- Cover potholes and open trenches, where possible, and use protective barriers to protect drivers from trenches remaining open.
- Provide temporary parking to mitigate loss due to construction staging or work activities, as appropriate.
- Provide signed detour routes for pedestrians and bicycles through construction areas. If required, use skid-resistant steel plates.

The adverse transportation impacts that would occur during construction include temporary lane or roadway closures during peak hours, temporary increase in truck traffic, and temporary loss of parking in some construction staging areas. This assessment is based on current designs and construction assumptions. As the design process continues, Sound Transit would refine construction approaches and attempt to further reduce potential construction-related traffic impacts.

9.8.4 Nonmotorized Facilities

During construction, Sound Transit would minimize potential impacts on pedestrian and bicycle facilities by providing detours within construction areas, such as protected walkways, and notify the public as determined appropriate by the project team. Multiuse trails that might be affected by construction would generally be kept open for use, but detours would be provided when trails are closed, unless they are closed for short durations or in areas where a detour option is not feasible. Public notification efforts would be conducted for temporary trail closures during construction.

9.8.5 Freight Mobility and Access

During Lynnwood Link Extension construction, adverse truck impacts would likely be associated with delays and restricted access for business deliveries on arterials and local streets near surface construction activities. To minimize potential impacts, Sound Transit would work specifically with affected businesses throughout the construction period to maintain business access as much as possible.

For construction associated with I-5, Sound Transit would coordinate with freight stakeholder groups by providing construction information to WSDOT for use in the state's freight notification system. Sound Transit would provide information in a format required by WSDOT.

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APPENDIX A

Transportation Technical Analysis Methodology

Introduction

This technical analysis methodology memorandum describes the methods that will be used to analyze the impacts on transportation for the Lynnwood Link Extension Project Environmental Impact Statement (EIS). The transportation section of the EIS identifies and evaluates the short- and long-term impacts of project alternatives on the following:

- Regional transit system, including ridership and mode share;
- Regional traffic, including vehicle miles of travel, vehicle hours of travel, and vehicle hours of delay;
- Project corridor traffic;
- Road-based transit service;
- Intersection level of service;
- Freeway level of service;
- Property access and local traffic circulation;
- Parking near stations and at park-and-ride lots;
- Bicycle and pedestrian circulation;
- Freight movement within the corridor including trucking and freight rail;
- Construction impacts; and
- Safety.

In addition to the impacts analysis related to the topics listed above, the memorandum also describes the transportation analysis that will be conducted to:

- Describe cumulative transportation effects; and
- Develop data for use by other disciplines, including air quality, noise, energy, and environmental justice.

These methods are being provided for review and comment by participating and cooperating agencies for the Lynnwood Link Extension Project EIS. The review of methods at the start of the EIS process is consistent with the National Environmental Policy Act (NEPA) environmental review procedures established by Section 6002 of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), codified as 23 United States Code (USC) §139. Sound Transit and the Federal Transit Administration (FTA) initiated the EIS process for the project in September 2011, and they invited potential cooperating and participating agencies to take part in the EIS process.

Lynnwood Link Extension Project Area

The proposed Lynnwood Link Extension Project would begin at Northgate in north Seattle and end at the Lynnwood Transit Center, and would be about 8.5 miles long, as shown in Figure A-1. The transportation corridor it serves is bounded by Puget Sound to the west and Lake Washington to the east, and is within the cities of Seattle and Shoreline in King County, and Mountlake Terrace and Lynnwood in Snohomish County. The corridor generally follows Interstate 5 (I-5), the major north-south route through Washington, and serves a large commuter market that travels toward Seattle or north to Everett, where many of the region's jobs are located.

The Lynnwood Link Extension project alternatives would extend light rail from the planned north terminus of the North Link light rail system at Northgate, and extend north along I-5 to Lynnwood. A separate preface for this methodology memorandum describes the range of alternatives being analyzed in the EIS.

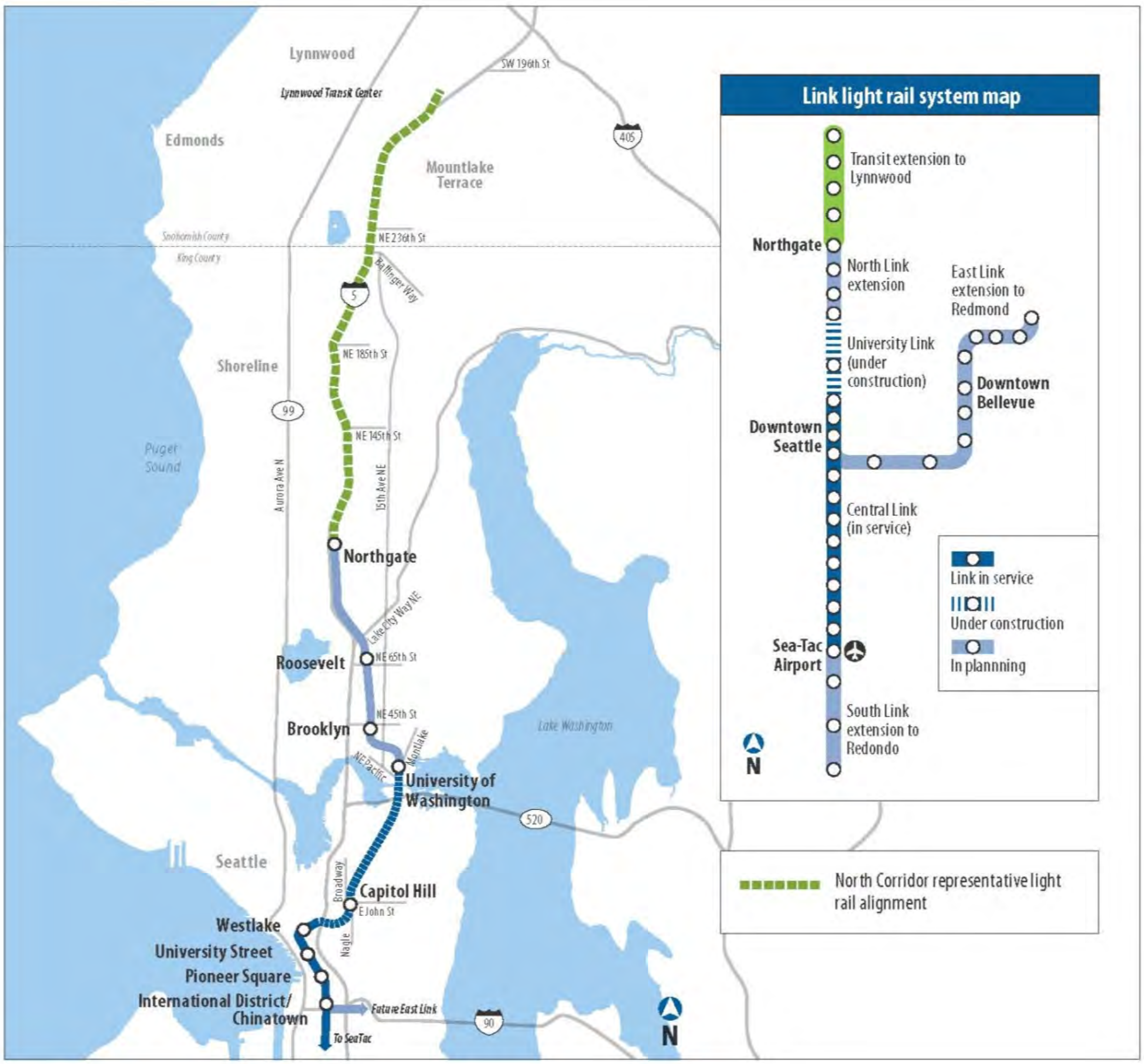


Figure A-1 – Study Area for Transportation Analysis

Guiding Regulations, Plans, and/or Policies

The transportation analysis will guided by the following laws and regulations:

- NEPA
- State Environmental Policy Act (SEPA)
- SAFETEA-LU, Public Law 109-59
- Code of Federal Regulations (CFR) 23 Part 450 (implementing USC 23 Section 111, which requires the U.S. Secretary of Transportation to approve access revisions to the Interstate System)
- CFR 23 Part 771 (Environmental Impact and Related Procedures)
- Washington State Growth Management Act (Revised Code of Washington [RCW] 36,70A.070)

In addition to the laws and regulations identified above, analysis of local transportation impacts will be guided by the policy direction established in the numerous plans or policy documents adopted within the project corridor. These include, but are not limited to:

- Sound Transit 2 (ST2), approved November 4, 2008
- Strategic Plan for Public Transportation 2011–2021 (King County Department of Transportation Metro Transit Division, 2011)
- 2012–2017 Transit Development Plan (Community Transit, November 15, 2011 Draft)
- Community Transit Long-Range Transit Plan (Community Transit, February 4, 2011)
- Washington Transportation Plan 2007–2026 (Washington State Department of Transportation [WSDOT], November 14, 2006)
- WSDOT Design Manual
- WSDOT Development Service Manual (M.3007.00)
- Puget Sound Regional Council (PSRC) Transportation 2040: Toward a Sustainable Transportation System
- Comprehensive and/or Transportation Plans for the Cities of Seattle, Shoreline, Mountlake Terrace, and Lynnwood, as well as King County and Snohomish County
- 6-Year Capital Improvement Program for the Cities of Seattle, Shoreline, Mountlake Terrace, and Lynnwood, as well as King County and Snohomish County

Agency Coordination

The transportation planning and analysis process will involve local jurisdictions, state agencies, federal agencies, transit agencies, PSRC, and other interested parties.

NEPA Lead Agency

FTA will be the lead agency for development of the EIS in accordance with NEPA regulations.

Cooperating and Participating Agencies

For the development of the transportation technical report, Sound Transit staff and consultants will meet with and/or provide opportunity for coordination with staff planners and engineers from the cooperating and participating agencies for this project:

- WSDOT
- Federal Highway Administration (FHWA)
- PSRC
- Community Transit
- King County
- City of Lynnwood
- City of Mountlake Terrace
- City of Shoreline
- City of Seattle
- Snohomish County
- King County

Data Needs and Sources

A variety of data will be collected and assembled to analyze the transportation-related effects of project alternatives. These data sets will include the following:

- Existing peak-hour turning-movement counts at the intersections identified below under "Intersections to be Studied." These counts will be collected from the local and state agencies (Cities of Seattle, Shoreline, Mountlake Terrace, and Lynnwood; and WSDOT) for the PM peak hour for all locations, and for the AM peak hour for selected locations where AM peak hour operations is determined to be as, or more critical, than PM peak hour operations. For I-5, volume data from WSDOT's loop counters will be used to generate existing mainline and ramp volumes. New counts will be taken for a 2-hour period during the PM peak hour, if year 2010 or more recent turning-movement counts are not available from the agencies listed above. The new counts will include automobiles; trucks classified by light, medium, and heavy types; buses; pedestrians; and bicyclists. AM peak hour turning-movement counts will also be collected where AM peak hour volumes are the highest or the existing/future traffic issues are considered critical during the AM time period (i.e., if an intersection provides access to a regional facility). These locations will be chosen based on area knowledge, a comparison of available AM versus PM peak hour traffic volumes, and/or if identified by Sound Transit, and local or state agency staff. All peak-hour turning-movement counts will be factored to a common base analysis year (2012) based on available historical data trends.

- Daily traffic counts in the study area, as available from local jurisdictions. These counts will be factored to a common base analysis year (2012).
- Physical characteristics of the existing street system, including functional use, lane geometry, traffic signal timing and phasing patterns, and other parameters necessary to conduct traffic operations analysis (such as the proximity of bus stops, speed limits, presence of on-street parking, etc.). Where available, these data will be obtained from local agencies (such as paint line sketches developed by the City of Seattle) and will be field checked as appropriate.
- On- and off-street parking supply and peak weekday parking utilization survey data will be collected within a 0.25-mile walking distance of each station and for all at-grade or elevated alignments that are within the road right-of-way. Data will be obtained from the Cities of Lynnwood, Mountlake Terrace, Shoreline, and Seattle, and augmented by field visits where appropriate.
- Park-and-ride supply and demand data will be collected at either proposed stations or locations within a 0.25-mile walking distance of each station. Existing park-and-ride information and utilization rates will be collected from King County Metro, Community Transit, and WSDOT, where available, and supplemented by field visits as appropriate.
- Pedestrian volumes will be collected in areas with high pedestrian activity (including station areas, activity centers, and major nonmotorized facilities), and where existing counts have been conducted by local jurisdictions. The data collection effort will be limited to the intersections identified below under "Intersections to be Studied." Pedestrian and bicycle volume data will also be collected for major nonmotorized facilities near proposed station areas.
- Existing and planned pedestrian and bicycle facilities within an approximate 0.50-mile of each station area (1.0 mile for bicycle facilities) will be inventoried by either field visits or available information from agencies (such as geographic information system [GIS] data). This inventory will include identification of school walk routes and any barriers to pedestrian or bicycle travel within each station area. The general sidewalk condition immediately surrounding station areas will be qualitatively assessed.
- Existing transit route information along the proposed build alternatives will be obtained from local transit agencies and compiled. This task will include information on selected routes that serve the project corridor. The bus route

information will include service areas, hours of service (including schedule/frequency), reliability, and passenger load. Passenger load information will be collected at selected screenline locations. Transit reliability information will be collected for selected routes that serve the project corridor.

- Accident data for the most recent 3-year period will be obtained for the study area intersections (signalized and unsignalized) and on I-5 between the 44th Avenue West and NE Northgate Way interchanges. Accident data for roadway segments (between intersections) will be collected only where at-grade or elevated light rail alternatives are running within or immediately adjacent to a roadway. Existing truck corridors/routes and any truck weight or height restrictions will be identified; truck volume data for the I-5 corridor also will be collected.
- Local, regional, and state agency Six-Year Transportation Improvement Plans/Capital Improvement Programs or Transportation Facilities Plans, as well as other planned improvements in proximity to a light rail alignment or station area will be reviewed and summarized. This effort will include identification of all "committed" improvements assumed for the No Build Alternative.

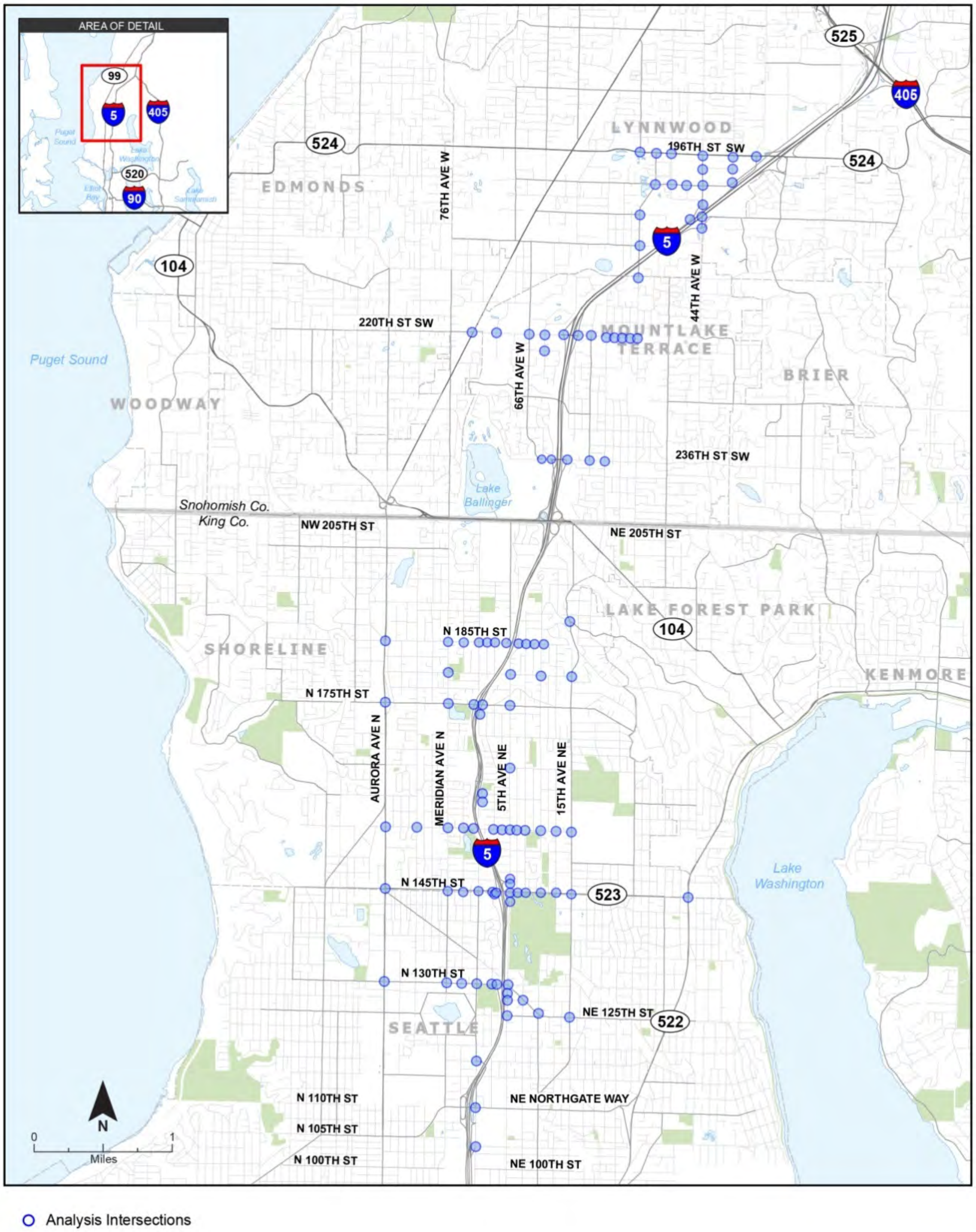
Study Area and Area of Effect

Geographic Coverage

The transportation analysis will include evaluation measures that consider systemwide as well as more localized impacts. Analysis of systemwide traffic impacts will address the effects of project alternatives on travel movements within the light rail corridor study area. Figure 1 shows the study area within the context of the Puget Sound region. The arterial and local street analysis will focus on locations assumed to be most likely affected by the light rail alternatives. The intersections that will be analyzed are those directly affected, such as by a change in channelization or signal control, as well as those indirectly affected by changes in volume due to trips accessing the system. These latter locations will include intersections surrounding transit stations with proposed increases in park-and-ride lot capacity and passenger pick-up and drop-off activity.

Intersections to be Studied

A preliminary list of intersection locations has been identified for analysis based on the components of the I-5 alignment alternative identified in the Phase 1 Alternatives Analysis. This list, provided below by jurisdiction and station area, will be reviewed and modified as necessary with Sound Transit and local jurisdiction staff, as appropriate, to reflect the final selection of alternatives to be evaluated in the EIS. Final confirmation of intersections to be studied will be documented in a separate memorandum. Figure A-2 shows the locations of these intersections.



Source: North Corridor transit Project Transportatin Analysis Methodology Report

Figure A-2. Analysis Intersections

City of Lynnwood (20 intersections)

Lynnwood Transit Center Station

- 200th Street SW/50th Avenue West
- 200th Street SW/48th Avenue West
- 200th Street SW/46th Avenue West
- 200th Street SW/44th Avenue West
- 204th Street SW/52nd Avenue West
- 208th Street SW/52nd Avenue West
- 212th Street SW/52nd Avenue SW
- I-5 Direct Access/46th Avenue NE on and off HOV ramp
- I-5 Southbound on-ramp/44th Avenue West
- 204th Street SW/44th Avenue West
- I-5 Northbound off-ramp/44th Avenue West
- Alderwood Mall Boulevard/40th Avenue West
- 196th Street SW/52nd Avenue West
- 196th Street SW/50th Avenue West
- 196th Street SW/48th Avenue West
- 196th Street SW/44th Avenue West
- 196th Street SW/40th Avenue West
- 196th Street SW/36th Avenue West
- 198th Street SW/44th Avenue West (future analysis only)
- 198th Street SW/40th Avenue West (future analysis only)

City of Mountlake Terrace (18 intersections)

220th Street Station SW

- 222nd Street SW/64th Avenue West
- 220th Street SW/State Route (SR) 99
- 220th Street SW/70th Avenue West
- 220th Street SW/66th Avenue West
- 220th Street SW /64th Avenue West
- 220th Street SW/I-5 southbound ramps
- 220th Street SW/I-5 northbound ramps
- 220th Street SW/58th Avenue West
- 220th Street SW/56th Avenue West
- 220th Street SW/55th Avenue West
- 220th Street SW/54th Avenue West
- 220th Street SW/53rd Avenue West

- 220th Street SW/52nd Avenue West

Mountlake Terrace Station

- 236th Street SW (Lakeview Drive)/64th Avenue West
- 236th Street SW (Lakeview Drive)/I-5 southbound on-ramp
- 236th Street SW/I-5 northbound off-ramp/Mountlake Terrace Park-and-Ride driveway
- 236th Street SW/58th Avenue West
- 236th Street SW/56th Avenue West

City of Shoreline (38 intersections)

NE 185th Street Station

- North 185th Street/Aurora Avenue North
- NE 185th Street/Meridian Avenue North
- NE 185th Street/Corliss Avenue North
- NE 185th Street/1st Avenue NE
- NE 185th Street/2nd Avenue NE
- NE 185th Street/3rd Avenue NE
- NE 185th Street/5th Avenue NE
- NE 185th Street/7th Avenue NE
- NE 185th Street/8th Avenue NE
- NE 185th Street/9th Avenue NE
- NE 185th Street/10th Avenue NE
- NE Perkins Way/15th Avenue NE
- North 180th Street/Meridian Avenue North
- NE 180th Street/5th Avenue NE
- NE 180th Street/10th Avenue NE
- NE 180th Street/15th Avenue NE
- North 175th Street/Aurora Avenue North
- North 175th Street/Meridian Avenue North
- NE 175th Street/southbound I-5 ramps
- NE 175th Street/northbound I-5 ramps
- NE 175th Street/5th Avenue NE
- NE 174th St/1st Avenue NE

NE 155th Street Station

- North 155th Street/Aurora Avenue North
- North 155th Street/Ashworth Avenue North
- North 155th Street/Meridian Avenue North
- North 155th Street/Corliss Avenue North

- NE 155th Street/1st Avenue NE
- NE 155th Street/3rd Avenue NE
- NE 155th Street/4th Avenue NE
- NE 155th Street/5th Avenue NE
- NE 155th Street/6th Avenue NE
- NE 155th Street/8th Avenue NE
- NE 155th Street/10th Avenue NE
- NE 155th Street/12th Avenue NE
- NE 155th Street/15th Avenue NE
- NE 161st Avenue/1st Avenue NE
- NE 165th Street and 5th Avenue NE
- NE 159th Avenue NE/1st Avenue NE

The following intersections, counted under the City of Seattle, will be evaluated for both the NE 155th Street Station and NE 145th Street Station:

- North 145th Street (SR 523)/Meridian Avenue North
- NE 145th Street (SR 523)/1st Avenue NE
- NE 145th Street (SR 523)/5th Avenue NE
- NE 145th Street (SR 523)/15th Avenue NE

City of Seattle (33 intersections)

NE 145th Street Station

- North 145th Street (SR 523)/Aurora Avenue North
- NE 145th Street (SR 523)/Meridian Avenue North
- NE 145th Street (SR 523)/Corliss Avenue North
- NE 145th Street (SR 523)/1st Avenue NE
- NE 145th Street (SR 523)/3rd Avenue NE
- NE 145th Street (SR 523)/4th Avenue NE
- NE 145th Street (SR 523)/I-5 Southbound Ramps
- NE 145th Street (SR 523)/5th Avenue NE
- 5th Avenue NE/I-5 northbound off-ramp
- 5th Avenue NE/I-5 northbound transit only off-ramp/I-5 northbound on-ramp
- 5th Avenue NE/North Jackson Park-and-Ride driveway
- NE 145th Street (SR 523)/6th Avenue NE
- NE 145th Street (SR 523)/8th Avenue NE
- NE 145th Street (SR 523)/10th Avenue NE
- NE 145th Street (SR 523)/12th Avenue NE

- NE 145th Street (SR 523)/15th Avenue NE
- NE 145th Street (SR 523)/Bothell Way NE

NE 130th Street Station

- NE 130th Street/Aurora Avenue North
- NE 130th Street/Meridian Avenue North
- NE 130th Street/Corliss Avenue North
- NE 130th Street/1st Avenue NE
- NE 130th Street/3rd Avenue NE
- NE 130th Street/I-5 southbound on-ramp
- NE 130th Street/5th Avenue NE/Roosevelt Way NE
- 5th Avenue NE/I-5 northbound off-ramp
- 5th Avenue NE/NE 127th Street
- 5th Avenue NE/NE 125th Street
- Roosevelt Way NE/10th Avenue NE
- NE 127th Street/8th Avenue NE/Roosevelt Way NE
- NE 125th Street/15th Avenue NE

Northgate Station Area

- North Northgate Way/1st Avenue NE
- 1st Avenue NE/I-5 Express on- and off-ramps
- 1st Avenue NE/North 117th Street

Approach for Finalizing List of Intersections to be Studied

The existing conditions at all study area intersections identified above will be evaluated using traffic data collected at the outset of the project. Additionally, the design year 2035 PM peak hour analysis for the No Build Alternative will be developed for the same study area intersections. For the light rail alternatives, a screening process will be applied to each of the study area intersections, using threshold values, to pinpoint conditions that could result in a change in the level of service (LOS) at the intersection. Additional intersections or revision of the study area will be reviewed once design year 2035 forecasts have been developed. At that time, it will be determined where changes in vehicle and/or pedestrian/bicycle volume demand and patterns occur within the build alternative to warrant a change in the study area limits. No further analysis beyond the no-build conditions will be conducted at study area intersections where changes in traffic volumes or other conditions in the build alternatives are expected to be below the threshold values identified in Table A-1.

The methodology is to conduct the light rail alternatives intersection analysis for only the worst-case traffic impact condition. Any light rail alignment that has direct (physical) geometry impacts on an intersection will also be analyzed.

Table A-1. Intersection Analysis Screening Process

Parameter	Threshold Value	Description
Critical Volumes	5%	Forecasts indicate that a critical volume comparison between a light rail alternative and the No Build Alternative would exceed the threshold value.
Change in Intersection Geometry	Changes in the number of lanes in any approach	Changes in intersection geometry resulting in the addition or deletion of a lane in any approach would change the capacity of the intersection and could affect LOS.
Change in Intersection Control	Traffic signal installation	The addition of a traffic control device such as a signal would affect the capacity for some traffic movements, and could change the overall LOS.
Crosswalk Lengths Across Major Streets	Increased crossing distance	Green traffic signal time for side streets would be extended and pedestrian clearances would be longer.
Intersection LOS	If the intersection operates with a delay value within 10% of the agency's LOS threshold	Locations meeting the threshold criterion with the No Build Alternative would likely require further analysis. For example, if an intersection operates at LOS E (75 seconds) in No Build and the LOS threshold is LOS E (80 seconds), the intersection is then included in the light rail analysis.

Individual Roadway Segments to be Studied

For the EIS, segments of I-5 between the 196th Street SW ramps in Lynnwood and the vicinity of NE Northgate Way in Seattle may be analyzed if the geometry of the mainline or interchanges in the segment have changed due to the project, or if the project is estimated to add substantial traffic volumes to the mainline and/or interchanges. For any locations determined to be affected, the analysis will include the I-5 mainline and merge/diverge areas adjacent to the affected interchanges. Potential locations of analysis could include segments upstream and downstream of the following interchanges:

- 196th Street SW (Exit 181B)
- SR 524 Cedar Way Spur/44th Avenue West (Exit 181A)
- 220th Street SW (Exit 179)
- 236th Street SW (Exit 178)
- SR 104/NE 205th Street (Exit 177)
- NE 175th Street (Exit 176)
- Metro North Operating Base (Exit 175B)
- SR 523/NE 145th Street (Exit 175)
- NE 130th Street/Roosevelt Way NE (Exit 174)
- NE Northgate Way (Exit 173)

In Shoreline, the following arterials will be evaluated for volume-to-capacity (v/c) ratios to ensure consistency with city concurrency standards. The following arterial segments have been identified for v/c analysis:

- NE 155th Street—Aurora Avenue N to 15th Avenue NE
- NE 185th Street—Aurora Avenue N to 10th Avenue NE
- 5th Avenue NE/7th Avenue NE—NE 145th Street to NE 185th Street
- Meridian Avenue North—North 145th Street to North 185th Street
- 15th Avenue NE—NE 145th Street to NE 185th Street
- NE 175th Street—Aurora Avenue North to 5th Avenue NE

Affected Environment

The affected environment for transportation includes all components of the transportation system within the affected area. These components include traffic-related operations and performance on all roadway facilities; transit, both road-based and rail; freight; bicycles; and pedestrians. The anticipated effect on parking facilities will also be assessed. Particular focus for these modes will be on transportation facilities in the vicinity of proposed transit stations and park-and-ride lots because these will be the primary site-specific traffic attractors and generators. However, effects on the regional transportation system will also be considered. Measures for assessing impacts on these transportation elements, discussed in the following sections, will be both quantitative and qualitative and will be displayed both graphically and in a tabular format as appropriate. Primary issues of concern include impacts on overall mobility for these various modes (e.g., travel times, speeds, and accessibility) as well as reliability and safety. These issues need to be assessed for the construction stages of the proposed project as well as for when the project is fully operational.

Environmental Impacts Analysis

This section discusses the potential impacts of the No Build Alternative and the light rail alternatives (including all alignment options and station locations). It also describes the methodology used to determine direct and indirect (long term/operational and construction) as well as cumulative impacts on transportation.

Direct Impacts

Transportation Analysis Years

Based on the project's schedule and available traffic forecasting data, the transportation analysis will focus on three distinct periods:

- Existing Year—2012.

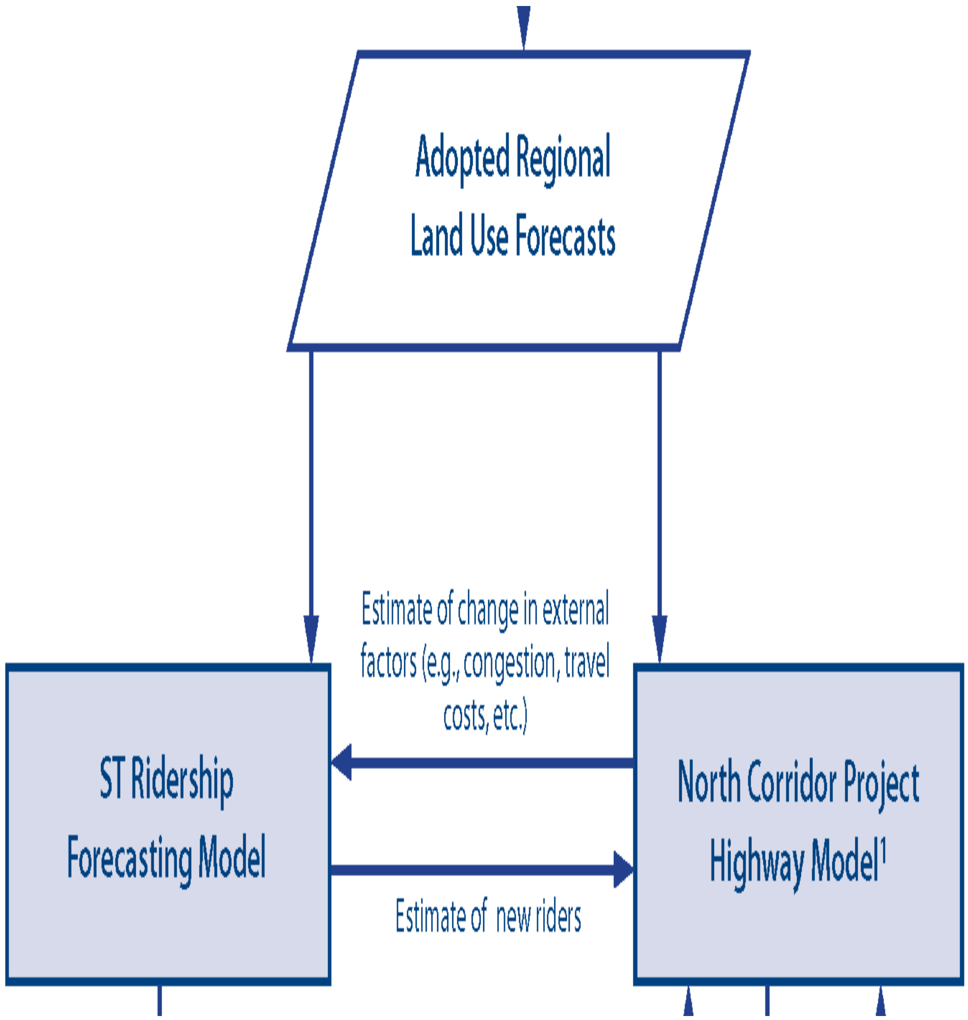
- Design Year—2035. This is the proposed design analysis year. This design year needs to be confirmed based on further coordination with local agencies, FTA, WSDOT, FHWA, and others.
- Construction Period. If construction impacts are determined to need more than a qualitative assessment for any particular location, the existing year 2012 volumes will be used for assessing construction impacts on transportation, or extrapolated to the year of construction.

Analysis Tools

This section describes the tools that will be used to conduct the transportation analysis for the EIS.

Travel Demand Forecasting

The transportation team will use two regional travel demand models to support assessment of future conditions, including development of transit ridership forecasts and future roadway traffic volumes. The Sound Transit Ridership Model will be used to produce ridership forecasts, while the PSRC Regional Model: WSDOT Project Version will be used to calculate growth in vehicular traffic volumes to support traffic operations analysis, as well as data required for a variety of environmental analyses. Figure A-3 illustrates the relationship between the demand models.



[1] The NCTP Highway Model is based on the version of the PSRC regional model used for major WSDOT project (e.g., SR 520 FEIS), with additional network refinements.

Source: North Corridor transit Project Transportatin Analysis Methodology Report

Figure A-3. Ridership and Highway Demand Models Relationship

Sound Transit Ridership Model

The current version of the Sound Transit Ridership Model was developed using analytical ridership forecasting procedures developed over two decades of incremental methods applications. During this period, the methods have been subjected to substantial external review, including two independent Expert Review Panels, and two cycles of review by the FTA over the course of New Starts grant applications for Link light rail projects. For more detailed information about the Sound Transit Ridership Model, see the *North Corridor Transit Project Transit Ridership Forecasting Technical Report* (December 2010).

One of the key tasks for the transportation team will be to update the Sound Transit model, in conjunction with Sound Transit and FTA, to reflect the latest information available. The updated model will be 2011-based, using new surveys and counts data within the general incremental modeling framework. The updated Sound Transit model will be used to produce ridership forecasts for use in the EIS and in support of the New Starts application of the Lynnwood Link Extension project to FTA for entry into Preliminary Engineering.

PSRC Regional Model

The PSRC Regional Model: WSDOT Project Version was developed for the SR 520 EIS, I-405 expansion, and WSDOT Express Lanes Pre-Design Studies (including I-5 HOT-lane assessment). As part of this task, the PSRC model will be refined to reflect necessary network modification specific to the project corridor, as well as the latest PSRC land use forecasts. Transit ridership forecast results from the Sound Transit Ridership Model are incorporated into the PSRC model to reflect effects from changes in transit ridership on traffic levels at the screenline and/or regional systemwide level. Traffic forecast results from the PSRC model form the basis upon which traffic impacts of the project are assessed. Growth rates derived from the PSRC model output will be applied to observed traffic volume counts to develop estimated peak-hour and daily traffic forecasts for detailed traffic operations analysis. The model will also be used to provide required input for other environmental disciplines including air quality modeling, noise analysis, greenhouse gas assessment, environmental justice analysis, and community equity evaluation.

Traffic Operations Analysis

VISSIM

The transportation team will assess freeway traffic operations at specific locations where the build alternative(s) are expected to affect freeway operations. An analysis would be conducted using a traffic simulation model developed in the VISSIM modeling environment (version 5.0 or later). The VISSIM model can include mainline freeway segments, ramps, and ramp terminal intersections, as well as selected adjacent arterial intersections and street segments where appropriate. The model replicates traffic flow by simulating discrete vehicle movements to produce estimates of travel speeds and traffic density, which can be used to assess highway LOS consistent with the *Highway Capacity Manual* (HCM) definitions.

Synchro/SimTraffic

The transportation team will assess intersection traffic operations for key locations on the arterial network using models developed with Trafficware Corporation's Synchro software (version 7.0 or later). Synchro is a traffic modeling program designed for analysis of intersection traffic operations and the optimization of traffic signal timings. Synchro reports average vehicle delay, allowing calculation of LOS consistent with HCM definitions. Synchro also estimates average and maximum queue lengths.

Other Tools

Other tools that may be used include Highway Capacity Software (HCS), which may also be used as necessary to estimate LOS impacts for both arterial and freeway traffic operations at isolated locations where use of Synchro or Vissim is not warranted, generalized LOS calculations based on v/c ratios by facility and/or screenline, and a spreadsheet-based sketch-planning method[13] for estimating park-and-ride lot demand to supplement forecasts from the Sound Transit Ridership Model. Additionally, mode of access tools including GIS-based determination of 15-minute walk, bicycle, and automobile "access sheds" will be used to refine the mode of access estimates.

Assessment Methods and Analysis Thresholds

Transportation System

Regional Transit

<u>Evaluation Criteria</u>

The following evaluation criteria will be considered for assessing effects of the project on regional transit for the proposed design year of 2035:

- Project corridor ridership—Daily boardings (inbound boardings and outbound alightings) by alternative and study year will be produced for the project, defined as Lynnwood to Northgate. For the No Build Alternative, corridor daily bus ridership will be estimated for the bus routes that are assumed to be truncated and/or otherwise replaced by the light rail alternative(s).
- Mode share—Change in systemwide mode split between transit and automobile by alternative and study year.
- Transit quality of service—This will be measured by assessing changes in transit service frequency, hours of service, passenger load, and effects on transfers. The analysis will reflect anticipated changes in bus service by King County Metro, Community Transit, and Sound Transit.
- Transit user benefit—This will be measured in annual minutes of weighted transit travel time saved, consistent with FTA New Starts methodology.

[13] Spillar, Robert J. 1997. Park-and-Ride Planning and Design Guidelines. 1995 William Barclay Parsons Fellowship Monograph #11. Parsons Brinckerhoff, New York, NY.

Evaluation Approach

As described earlier, the Sound Transit Ridership Model will be used to produce data related to changes in regional transit associated with the study alternatives. After the model is updated to reflect the most recent regional travel data, the model will be coded to reflect the build scenarios and then run to produce summary data tables. Daily ridership data for the study area will be provided by direct outputs from the ridership model. Outputs from the combined modeling system (which includes both the ridership model and the PSRC model) will include mode-split information and transit travel times.

Transit travel reliability will be qualitatively assessed for specific trips based on the proportion of the travel route for which transit has exclusive right-of-way versus when it uses right-of-way shared with other vehicles (e.g., exclusive rail line versus roadway lanes shared with either high-occupancy vehicle [HOV] or general purpose traffic), taking into account the projected levels of congestion on the shared facilities.

Specific trips for which transit travel times and reliability will be assessed will be identified in coordination with Sound Transit staff and/or cooperating agency staff. Possible trips may include the following routes, which incorporate the peak directions for both AM and PM peak periods, as well as the reverse peak direction for the PM peak period:

- AM Peak Period – Peak Direction (southbound) Trips

  From Lynnwood and Shoreline to:
  - Northgate
  - University of Washington
  - Capitol Hill
  - Downtown Seattle
  - Sea-Tac Airport
  - Bellevue
- PM Peak Period – Peak Direction (northbound) Trips

  To Lynnwood and Shoreline from:
  - Northgate
  - University of Washington
  - Capitol Hill
  - Downtown Seattle
  - Sea-Tac Airport
  - Bellevue
- PM Peak Period – Reverse Peak Direction (southbound) Trips

  From Lynnwood and Shoreline to:
  - Northgate

  - University of Washington
  - Capitol Hill
  - Downtown Seattle
  - Sea-Tac Airport
  - Bellevue

Regional Traffic

Evaluation Criteria

As described earlier, output from the PSRC Regional Model: WSDOT Project Version will be the key data source for this analysis. The following types of data will be produced for design year 2035 to gauge the effect of the study alternatives on regional or systemwide traffic characteristics:

- Vehicle Miles of Travel (VMT)—Total average daily vehicle miles traveled on the regional highway system.
- Vehicle Hours of Travel (VHT)—Total average daily vehicle hours traveled on the regional highway system.
- Vehicle Hours of Delay (VHD)—Total average daily vehicle hours of delay on the regional highway system, which indicates the total level of congestion on the highway system.

Evaluation Approach

Information from the PSRC model will be used to generate the No Build Alternative and light rail alternative(s) VMT/VHT/VHD data. The PSRC model will be run in an iterative process with the Sound Transit Ridership Model, with highway traffic volumes reflecting changes in transit ridership and the ridership model reflecting changes in highway travel times. Matrices of vehicle trips and travel time per trip will be used to quantify estimated VHT, and matrices of vehicle trips and hours of delay per trip will be used to quantify the impact of project alternatives on VHD.

Surface Streets and Freeways

The methodology proposed for the surface street and freeway analysis is intended to be applied as consistently as possible throughout the corridor. The surface street system focuses on intersection operations and safety analysis while the freeway analysis will include measures such as density, travel time, and person-throughput.

Impacts on property access/circulation, parking, nonmotorized facilities, freight movement, construction, and safety will be addressed. The methodologies proposed to analyze the surface street system and freeway impacts are described in this section.

Corridor Traffic

Evaluation Criteria

Criteria used to evaluate effects at the broader corridor level will be based on a screenline-level analysis, which will include assessing the projected change in the following for proposed design year 2035:

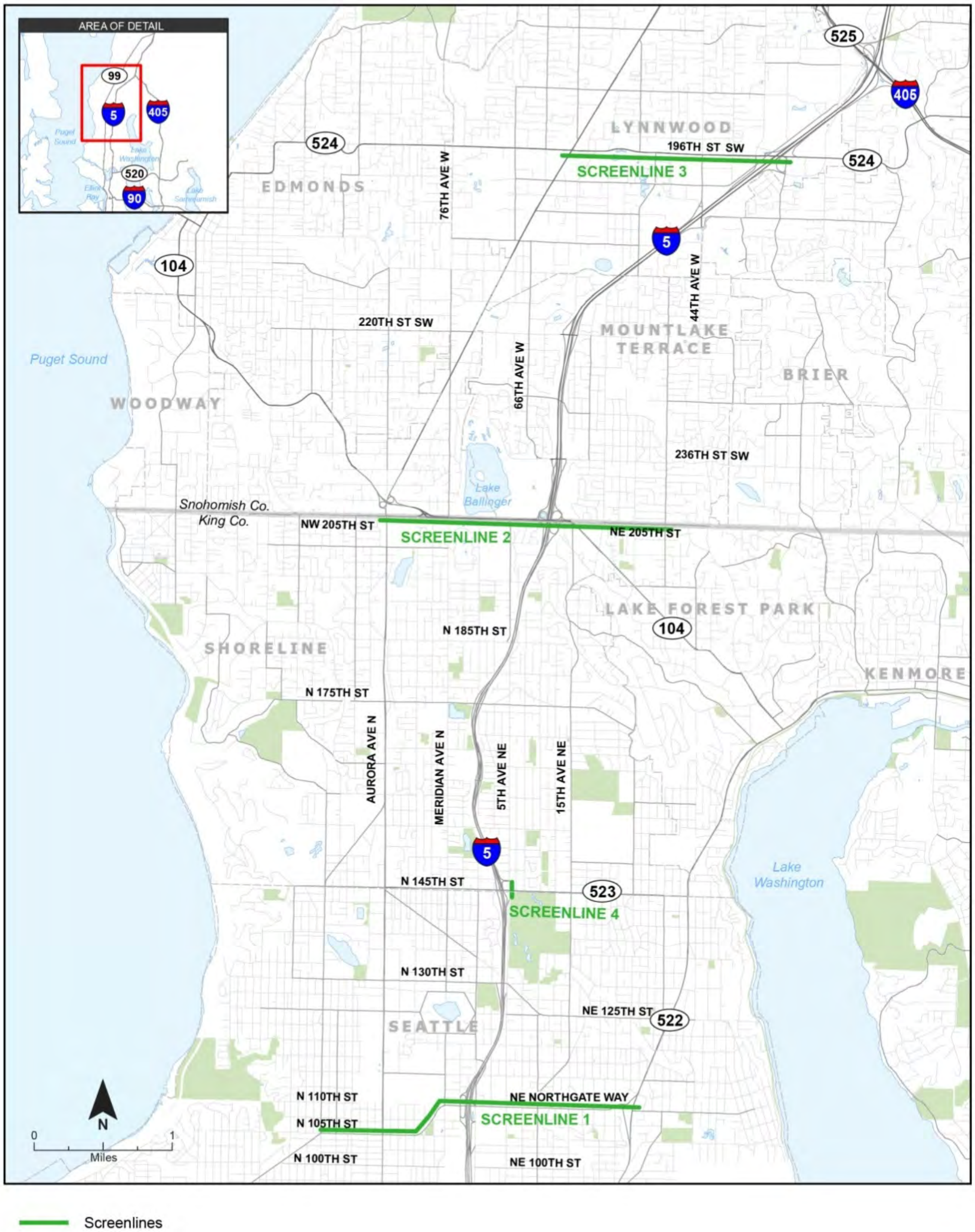
- Screenline peak hour and daily vehicle volumes;
- Screenline vehicle v/c ratios (converted to a generalized LOS); and
- Plots of congestion over time (for existing conditions only).

Evaluation Approach

The analysis of traffic impacts in various segments of the corridor will involve comparing projected traffic volumes on the highway and local street system at selected screenlines for each alternative. Screenlines are imaginary lines drawn across one or more roadways to compare aggregate changes in traffic volumes and person-moving capacities, etc. across all the facilities crossed by the line. A map and table will be used to present daily vehicle trips, AM peak hour trips, and PM peak hour trips at the four identified screenline locations.

The preliminary screenlines, shown in Figure A-4, are:

- Screenline 1—north of North Northgate Way/NE 110th Street
- Screenline 2—south of North 205th Street
- Screenline 3—south of 196th Street SW
- Screenline 4—on NE 145th Street east of 5th Avenue NE



Source: North Corridor transit Project Transportatin Analysis Methodology Report

Figure A-4. Analysis Screenlines

The screenline comparisons will provide a snapshot of traffic operations along each corridor. Information from the PSRC and Sound Transit models that will be presented for each screenline will include AM peak hour, PM peak hour, and daily values.

In addition to the screenline totals, the v/c ratios may also be shown separately by key arterials and highways.

Local and Sub-Regional Bus Service

This section describes the analyses that will evaluate projected changes to local and sub-regional (e.g., *Swift*, RapidRide) bus service that would be affected by the study alternatives.

<u>Evaluation Criteria</u>

The following evaluation criteria will be considered for changes in local and sub-regional bus service for design year 2035:

- Ridership—Daily and peak period boardings by alternative and study year will be produced for selected local and sub-regional bus routes.
- Transit quality of service—This will be measured by assessing changes in transit service frequency, hours of service, passenger load, and effects on transfers consistent with the *Transit Capacity and Quality of Service Manual* standards and guidelines.

<u>Evaluation Approach</u>

The transportation team will assess the expected effects on existing local and sub-regional bus service using both qualitative and quantitative information. Expected changes in transit routing under the build alternatives will be identified and compared to routing under baseline conditions. The comparison will focus on changes in coverage area (including consideration of walk and bicycle distance to bus stops) and potential effects on speed and reliability (based on traffic operations results and/or other traffic analysis data). Traffic analysis results will be used to gauge potential travel time effects on routes operating on I-5. Modeled changes in ridership will be reported as well.

Intersection Operations (including Station Area/Park-and-Ride Traffic Analysis)

<u>Evaluation Criteria</u>

Effects on intersection operations will be evaluated based on the calculated design year 2035 peak hour intersection LOS. LOS measures the quality of traffic operations at an intersection in terms of both operational conditions and their perception by motorists. As described in Table A-2, LOS ratings range from A to F. LOS A represents the best operation and LOS F the poorest operation.

Table A-2. Level of Service Definitions for Signalized and Unsignalized Intersections

	Average Control Delay (seconds per vehicle)		
LOS	**Signalized Intersection**	**Unsignalized Intersection**	**Traffic Flow Characteristics**
A	≤ 10	≤ 10	Virtually free flow; completely unimpeded.
B	> 10 and ≤ 20	> 10 and ≤ 15	Stable flow with slight delays; less freedom to maneuver.
C	> 20 and ≤ 35	> 15 and ≤ 25	Stable flow with delays; less freedom to maneuver.
D	> 35 and ≤ 55	> 25 and ≤ 35	High density but stable flow.
E	> 55 and ≤ 80	> 35 and ≤ 50	Operating conditions at or near capacity; unstable flow.
F	> 80	> 50	Forced flow; breakdown conditions.

Source: *2010 Highway Capacity Manual,* Transportation Research Board.

Agency Thresholds

As part of each agency's comprehensive planning efforts, agency transportation goals and LOS standards are developed. While each agency accepts different levels of congestion, a delay-based intersection LOS analysis has been preliminarily accepted by each agency. Delay is expressed in terms of average delay per vehicle, in seconds, experienced due to the intersection operations. LOS definitions for signalized and unsignalized intersections are included in Table 2. Overall, if a given intersection's operations are better than the LOS standard for each agency with the light rail alternative, then that intersection is considered to meet the agency's standard and does not require mitigation. In situations where the intersection operates worse than the agency's LOS standard without the light rail alternative, then mitigation is only required if the intersection delay and/or LOS degrades further with the build alternative. Further definition of this approach and the LOS standard(s) for each agency is summarized in Table A-2a and described below.

Table A-2a. LOS Standards for Affected Agencies

Agency	LOS Standard
Washington State Department of Transportation	LOS D for highways of statewide significance (HSS) LOS E/mitigated for regionally significant state highways (non-HSS)
City of Lynnwood	LOS E for City Center arterials LOS D for non-City Center arterials LOS C for local streets
City of Mountlake Terrace	LOS D for signalized intersections with the following exceptions (LOS E): • 212th Street SW • 244th Street SW • 220th Street SW between SR 99 and I-5 LOS E for unsignalized intersections

Table A-2a. LOS Standards for Affected Agencies

Agency	LOS Standard
City of Shoreline	LOS D for signalized intersections LOS D for unsignalized intersecting arterials Volume-to-capacity ratio of 0.90 or lower for principal and minor arterials
City of Seattle	LOS D (goal)

Washington State Department of Transportation

For state highways of statewide significance (HSS), such as I-5 and portions of SR 99 (King County) and SR 104 (NE 205th Street), the operating threshold in urban areas is LOS D. For regionally significant state highways (non-HSS), such as SR 99 (in Snohomish County), SR 524, SR 104 (Ballinger Way NE), and SR 523 (North/NE 145th Street), the operating threshold is LOS E/mitigated, meaning that congestion should be mitigated when the PM peak hour LOS falls below LOS E (i.e., LOS F).

City of Lynnwood

The operating threshold for signalized intersections is LOS E for City Center arterials and LOS D for non-City Center arterials. The operating threshold for local streets is LOS C. Only signalized intersections are considered as part of the Lynnwood Transportation Concurrency system. LOS failures at unsignalized intersections are separately addressed under the SEPA review of new developments.

City of Mountlake Terrace

Signalized intersection operations within Mountlake Terrace are to meet LOS D at a minimum, with exceptions along the following corridors, for which a minimum LOS E is acceptable: 212th Street SW, 244th Street SW, and 220th Street SW between SR 99 and I-5. The operating threshold for unsignalized intersections is LOS E.

City of Shoreline

To assess intersection operations, the operating threshold is LOS D for signalized intersections on arterial streets and at unsignalized intersecting arterials in Shoreline. The v/c ratio on one leg of an intersection may exceed 0.90 when the intersection operates at LOS D or better. For principal and minor arterials, a v/c ratio of 0.90 or lower is considered acceptable.

City of Seattle

The City of Seattle’s goal is to maintain intersection operations at LOS D or better. However, within the Seattle metropolitan area, arterial LOS standards are defined based on the PM peak hour directional v/c ratio at designated screenlines. For the

City of Seattle's concurrency management system, v/c ratios are averaged across a series of parallel arterials to determine if the LOS threshold has been exceeded. At the northern city limit, where there are limited or no options to increase capacity and/or where growth is expected, a v/c ratio of up to 1.2 (LOS F) is considered to be acceptable (at a v/c ratio of 1.20 or greater, significant traffic congestion and vehicle queuing at intersections would be expected). When the calculated LOS for a screenline approaches the LOS standards, strategies would be pursued to reduce vehicular travel demand and/or increase the operating capacity across the screenline.

Evaluation Approach

Trip Generation

Information on transit station trip generation for 2035 will be developed from the Sound Transit model and will be assigned to various modes of travel based on data from the *2008 BART Station Profile Study* (BART and Corey, Canapary & Galanis Research 2008), and recent data collected from the Tukwila park-and-ride station. The BART study is a mode of access and egress survey of BART rail users in the San Francisco Bay area. This survey characterized the different modes people choose to access and depart from the stations such as walking, bicycling, driving alone, driving with others, being dropped off, using a transit transfer, or other modes. This information is presented by each station type, which is based on the type of station facilities provided and the surrounding land uses.

The vehicle and pedestrian trips associated with the light rail station ridership forecasts for the highest ridership full length alternative will be used for evaluating station area effects. Exceptions will be made at locations where there are substantial differences between alternatives (e.g., one has a park-and-ride, and one does not); in these cases, two different scenarios may be evaluated at affected locations. For park-and-ride stations, the analysis will assume that the park-and-ride lot is full for the purposes of providing a conservatively high estimate of automobile trips to and from each station. The automobile traffic volumes will be added to the future No Build Alternative automobile traffic volumes as the basis to analyze the light rail alternatives. This approach yields a conservatively high forecast of automobile trips for the light rail alternatives because it does not reflect the shift to transit as people replace their vehicle trip and use light rail. Trips will be assigned to the pedestrian and vehicular networks around the station locations based on existing and anticipated future traffic circulation patterns.

Level of Service Analysis

Synchro (version 7.0) software will be used to determine the projected 2035 AM and PM peak hour LOS at signalized and unsignalized intersections identified above, under "Intersections to be Studied." The HCM report from the Synchro software will be used to summarize average intersection delay, LOS, and critical queue lengths. The signalized intersections LOS will be defined in terms of average intersection delay. Delay is dependent on two factors: (1) the capacity of the intersection as defined by the number of lanes, lane widths, pedestrian volumes, and other features; and (2) signal timing. Capacity, delay, and LOS are calculated for each traffic movement or group of traffic movements at an intersection. The weighted average delay across all traffic movements determines the overall LOS for a signalized intersection.

The LOS at an unsignalized intersection is also defined in terms of delay, but only for the approach that is stop-controlled, which is typically the minor street. For unsignalized intersections that are stop-controlled on each approach, the average intersection delay is reported. LOS definitions for signalized and unsignalized intersections are provided in Table 2.

Default values for the analysis will be developed for intersections where actual values are not available. These will include assumptions with respect to saturation flow rates, geometry, traffic, and signalization conditions. Table A-3 provides preliminary assumptions for existing input values where data have not been collected. For future input values, also listed in Table 3, assumptions are also typically made in terms of how traffic patterns change and traffic signals operate.

Table A-3. Default Synchro Parameters and Assumptions

Arterial Intersection Parameters	Condition	
	Existing Year 2012	**Design Year 2035**
Peak Hour Factor	From count and by each approach, default provided 0.90	Use 0.95 for all intersections except where existing Peak Hour Factor (PHF) is greater than 0.95 or less than 0.70. Use existing PHF in cases where the PHF is greater than 0.95. If existing PHF is less than 0.70, then increase factor by 0.20.
Conflicting Cyclists and Pedestrians per Hour	From traffic count, otherwise assume 10 pedestrians/cyclists in both AM and PM periods	For the No Build Alternative, apply growth rate from adjacent street to existing volumes. For the light rail alternatives, add the number of pedestrians based on the station ridership and mode of access forecasts.
Area Type	“Other” for all areas	Same as existing
Ideal Saturation Flow (for all movements)	1,900 vehicles per hour	Same as existing
Lane Utilization	Default software assumptions unless data/ engineering judgment suggests otherwise	Same as existing
Lane Width	From field sheets, agency in-house Synchro files or paint Line drawings (i.e., WSDOT)	Same as existing, unless improvements proposed, then use agency standards/plans.

Table A-3. Default Synchro Parameters and Assumptions

Arterial Intersection Parameters	Condition	
	Existing Year 2012	Design Year 2035
Percent Heavy Vehicles	From count, otherwise 2%	Same as existing
Percent Grade[a]	From as-built drawings, agency in-house Synchro file, or field sheets	Same as existing
Parking Maneuvers per Hour	Based on parking regulations. For less than 15-minute parking, assume 4 maneuvers per hour; otherwise, assume 1 maneuver per hour, unless data/information gathered or provided from agencies suggest otherwise.	Same as existing. For new parking, assume existing assumptions for maneuvers based on parking durations.
Bus Blockages	Headway information provided by transit agencies	Use future service assumptions developed by Community Transit, King County Metro, and Sound Transit as part of the Transit Service Integration Plan.
Intersection Signal Phasing and Coordination	From agency signal phasing sheets or their existing analysis files	Same as existing. For timing adjustments: Left turns, if permissive in existing, will be examined for a protected phase based on LOS, access/geometry, safety, and agency guidance. For build: Any left-turn conflict with at-grade light rail will include a separate lane and have protected phasing. Left turns will be restricted (or protected with a gate or similar treatment) at unsignalized intersections. For elevated light rail, mid-block left turns will be restricted.
Intersection Signal Timing Optimization Limits	Not applicable	Between 60 to 120 seconds
Minimum Green Time	Not applicable	Based on pedestrian times (minimum of 4 seconds walk time and 4 feet per second for flashing don't walk [FDW] clearance). If no crosswalk: 10 seconds
Yellow and All Red Time	Not applicable	New signals: (Y) = 4 seconds and (R) = 1 second
Right Turn on Red	Allow	Same as existing
Right Turn Overlaps	Signal timing plans	Identify if used
50th and 95th Percentile Vehicle Queues	Based on 25 feet per vehicle	Same as existing

[a] Percent grade assumed for at-grade intersections only.

Note: Delay-based LOS results will be reported from Synchro's HCM Reports.

Freeway and Ramp Operations

Evaluation Criteria

Locations where freeway access will be modified will be identified. Where appropriate, selected freeway segments at those locations will be analyzed where freeway traffic operations are anticipated to be affected by the proposed interchange modifications. For those segments, the Transportation Technical Report will describe and analyze the following types of data related to freeway traffic operations for design year 2035:

- AM and PM peak hour LOS for selected freeway mainline segments and ramps. Notable areas of congestion will be noted and described.
- AM and PM peak hour travel times will be reported for selected freeway segments (e.g., Lynnwood Transit Center to Northgate Transit Center).
- AM and PM peak hour travel speeds for selected freeway segments.

LOS is a measure that characterizes the operating conditions, as perceived by a driver or facility user, of a highway, street, or other transportation facility. Although LOS is a qualitative measure, it is based on quantitative measures, such as traffic density, average speed, or average vehicle delay depending on the facility type and function. A range of six LOS designations, ranging from A to F, is defined in the HCM for limited access facilities. LOS A represents ideal, uncongested operating conditions, while LOS F designates extremely congested, breakdown conditions. LOS B through LOS D designate intermediate operating conditions, while LOS E denotes congested conditions at the point of maximum service rate. LOS for either freeway segments or multi-lane highway segments is derived from traffic density and classified according to the ranges shown in Table A-4. Note that intersection LOS at ramp termini will also be categorized using intersection-based LOS measurements.

Table A-4. Level of Service Designations for Freeways or Multi-lane Highways

LOS (Freeway/Highway Segments)	Density Range (pcpmpl)
A	0–11
B	> 11–18
C	> 18–26
D	> 26–35
E	> 35–45
F	> 45

pcpmpl = passenger car equivalents per mile per lane.

Source: Transportation Research Board Highway Capacity Manual (2000).

Evaluation Approach

VISSIM traffic micro-simulation software will be used to assess design year 2035 AM and PM peak hour freeway operations for specific locations where the build alternatives are expected to affect freeway operations. The network coding within the VISSIM software will be built based on as-built plan sheets or aerial photographs. Any design changes associated with the light rail alternatives will be coded into the network to satisfy the design requirements of the state and will be consistent with the latest WSDOT Design Manual. Table A-5 identifies some of VISSIM's additional inputs and assumptions that will be incorporated into the analysis. VISSIM outputs will produce mainline and ramp junction LOS and selected travel times and speeds.

Table A-5. VISSIM Freeway Parameter Methods and Assumptions

Freeway Parameter	Existing Year 2012	Design Year 2035
Deceleration Lane Length	From as-built drawings or aerial photographs	Same as existing or from design plans
Acceleration Lane Length	From as-built drawings or aerial photographs	Same as existing or from design plans
Grade	From as-built drawings, if not, assume 0%	Same as existing
Superelevation[a]	Assume 0%	Same as existing
Pavement Type	Assume dry concrete	Assume dry concrete
Desired Free-Flow Speed	60 mph	Same as existing
Car Following Sensitivity Factor (CFSF)	Variable	Same as existing
Truck %	From traffic data	Same as existing
Carpool/HOV %	From field data	From demand modeling information
Mainline and Ramp Link Traffic Volumes	From traffic data	Estimated using growth rates from highway demand model
Lane Distribution (for entering links)	Assume even distribution over all entering lanes	Assume even distribution over all entering lanes
Vehicle Type Specifications	Assume default vehicle type specifications	Same as existing
Warning Sign Distance (for on-ramps)	From as-built drawings, variable depending on freeway conditions and geometry	Same as existing
Warning Sign Distance (for off-ramps)	From as-built drawings, variable depending on freeway conditions and geometry	Same as existing
Ramp Metering	Will be coded as fixed-time	Will be coded as fixed-time
VISSIM Output *(pcphpl = per car; per hour; per lane)*	Segment density (in terms of pcphpl) and corridor travel time	Segment density (in terms of pcphpl) and corridor travel time
Number of Simulations	Results will be taken as an average of up to five simulations	Same as existing

[a] Driver behavior parameters and lane change distances are key inputs and will be used as a calibration technique to match field conditions.

Property Access and Local Circulation

This area of evaluation will assess local area traffic impacts including access to properties. The focus will be on impacts during both construction and full build out of the project.

Evaluation Criteria

The evaluation criteria will include any physical change in access to properties.

Evaluation Approach

In addition to the analysis of intersection LOS and delay impacts, traffic impacts on local circulation will be assessed qualitatively. This assessment will include such factors as:

- Effect of potential street closures on localized traffic movement
- Potential for neighborhood traffic intrusion associated with either light rail stations or trackway
- Loss of left-turn access to and from driveways for at-grade and elevated light rail alternatives
- Changes in property access

Parking

Parking supply varies throughout the project corridor. Large supplies of free private parking are available in Lynnwood, Mountlake Terrace, Shoreline, and Northgate. Demand for parking spaces varies depending upon location throughout the corridor, with relatively high demand at existing park-and-ride facilities in Lynnwood, Mountlake Terrace, Shoreline, and Northgate; moderate demand at business districts and activity centers in Lynnwood, Mountlake Terrace, Shoreline, and Northgate; and relatively low on-street demand in residential neighborhoods surrounding the I-5 corridor.

Evaluation Criteria

Analysis of the impacts of light rail on existing on-street and off-street public parking will focus on the loss or reconfiguration of existing on-street and off-street parking supply due to light rail station and trackway development.

Evaluation Approach

The evaluation of parking impacts will include an inventory of parking supply and utilization in locations where parking is anticipated to be affected by the project; in addition, changes to the parking supply and utilization due to the project will be assessed.

Inventory of Parking Supply and Utilization

The analysis of light rail impacts on existing patterns of on-street parking supply and demand will generally be limited to one block on either side of the proposed light rail alignments. A parking inventory and utilization survey will be conducted for all potential rail alignments that are within the road right-of-way.

At station areas, parking inventory and utilization surveys will be conducted within 0.25 mile of each station. Within this area, an inventory of existing on-street and off-street parking spaces will be developed. Inventory data will be stratified by type of parking (i.e., time-limited parking, free parking, loading zone, private, etc.) and location (i.e., block face, business name, or other distinguishing feature). Where available, data from local agencies will be used to initiate the inventories near the station locations. The analysis will focus on locations that may be specifically affected by light rail alignments, including both available parking and internal site circulation. Where data are not available from local agencies, data will be collected through field surveys. Data will include a space occupancy count by block face or lot taken once during weekday mid-morning or mid-afternoon hours. This time period represents typical conditions for parking demand.

Assessment of Parking Impacts

The assessment of parking loss will be based on review of the inventory of parking supply and demand coupled with an evaluation of the conceptual drawings for each build alternative. These concepts should identify specific locations where changes would be made to the existing parking supply. Comparison between existing demand and the supply remaining after construction of each light rail alternative will form the basis for identification of parking loss associated with each alternative. This comparison will also address the potential significance of that loss in relation to parking utilization and will facilitate the identification of possible mitigation strategies. The loss of existing parking spaces will be stratified by both location and type.

Park-and-ride lot demand will be estimated at an aggregate level for the project corridor area and then allocated to individual stations based on an assessment of the GIS-based calculated 15-minute automobile "access shed" (an access shed of 25 minutes will be used for Lynnwood Transit Center Station because it will be the terminus of the line). This estimate will be combined with an assessment of the physical and policy-related potential for parking at a given location. The estimated park-and-ride demand will then be compared to the proposed supply to determine the potential for spillover parking impacts on the surrounding area. Park-and-ride demand will be forecasted for day of opening and horizon year conditions. A combination of approaches will be used including results from the Sound Transit Ridership Model and an empirically based sketch-planning park-and-ride demand estimation technique developed using data from the Puget Sound region[14]. Results from each of these methods will be reviewed by the transportation team and Sound Transit and a final range of park-and-ride demand estimates will be determined.

Nonmotorized Facilities and Modes

The light rail alternatives will be qualitatively assessed regarding existing and future pedestrian and bicycle facilities. Specific issues to be discussed and assessed include the following:

- Pedestrian access and circulation in the vicinity of the proposed station in relation to the forecasted ridership.
- Direct (physical) effects on pedestrian and bicycle facilities along the alignment of each alternative.
- Barriers to nonmotorized (pedestrian and bicycle) traffic movement introduced by the light rail alternative.
- Intersection crossing issues associated with station layout and connections to major pedestrian routes and destinations.
- Missing sidewalk sections for city arterials within 0.50 mile of proposed station locations.
- Impacts on recommended school walk routes.
- Existing and funded regional bicycle paths, routes, and deficiencies within 1.0 mile of proposed station locations, and a general quantification of how major multi-use trails/paths are used (i.e., by commuters or recreational users).

A pedestrian LOS analysis will also be conducted for sidewalks at intersections within one block or approximately 300 feet of each proposed station entrance (the study area may exceed one block or 300 feet from the station depending on the location of transfer points or nearby pedestrian generators). The *Transit Capacity and Quality of Service Manual* and HCM methodology for determining sidewalk LOS will be used for this analysis. This methodology produces a score that indicates the pedestrian's perception of the travel experience, and is based on the average pedestrian space and average flow rate. Additional factors such as station layout, adjacent land uses, connections to nearby pedestrian routes and destinations, and potential queue locations will be considered and qualitatively discussed as part of the sidewalk analysis.

[14] Spillar, Robert J. 1997. Park-and-Ride Planning and Design Guidelines. 1995 William Barclay Parsons Fellowship Monograph #11. Parsons Brinckerhoff, New York, NY.

Freight

Evaluation Criteria

Evaluation criteria may include the following:

- Change in congestion levels and/or travel speeds along major freight facilities
- Physical impacts on truck loading zones or access to local businesses

Evaluation Approach

Impacts of the light rail alternatives on freight movements will be qualitatively assessed. This assessment will focus on truck movement and truck routing impacts because freight rail corridors do not exist in the study area. The assessment of truck issues will focus on impacts on major truck routes (including I-5) and truck service areas, access to truck depots or intermodal yards, and loss of on-street loading zones and/or modifications of truck access to local businesses.

Construction

Evaluation Criteria

Two primary sources of construction impacts on local traffic will be considered from a generally qualitative standpoint:

- Impacts on traffic operations, property access, and parking supply related to potential road, sidewalk, bicycle, or other transportation facility closures during construction
- Impacts of construction-related traffic on traffic operations

Evaluation Approach

The assessment of construction-related traffic impacts will focus primarily on I-5 mainline and ramps, principal and minor arterials, or on streets that could be significantly affected by construction of one or more of the light rail alternatives. For the purposes of impact assessment, the construction stage considered to be most disruptive to traffic operations in the corridor will be the one analyzed in the most detail. The transportation team will identify this stage in coordination with Sound Transit staff and staff from local jurisdictions as appropriate.

Construction traffic analysis will consider the following:

- Identification of changes in roadway capacity including potential lane closure requirements, parking restrictions, pedestrian or bicycle facility impacts, alignment shifts, areas of construction activity adjacent to travel lanes, or other reductions to capacity due to transit facility construction activity;
- Impacts on transit and emergency services

- Impacts on school transportation services during construction
- Impacts of construction-related activity on on-street parking supply
- Identification of potential construction staging areas, including access and impact on roadway operations
- Identification of potential construction access and truck routes and the impact of construction-related traffic on these routes
- Assessment of potential for neighborhood traffic intrusion related to road closure and options for traffic detour
- Estimation of construction truck traffic
- Identification of areas that would require construction coordination between Sound Transit and other governmental agencies
- Development of mitigation measures

The analysis will be summarized in a tabular format to identify the following:

- Impact location(s)
- Street characteristics
- Type of construction activity including likely duration of impact (short term versus long term)
- Level of construction traffic (characterized as high, moderate, or low). High truck traffic is associated with major fill, excavation, and concrete work such as with tunneling. Moderate truck traffic generally refers to activities not associated with major fill or excavation work. Low truck traffic occurs when none of the construction activities associated with moderate or high truck traffic occurs.
- Full or partial road closures
- Availability of detour routes
- Potential for detoured traffic to affect a residential neighborhood. (This is characterized as high, medium, or low and is related to both potential for road closure and options for traffic detour.)
- Loss of on-street parking. (This may be characterized as "yes" for parking loss and "no" for no parking loss. Additionally, there may be some temporary loss of off-street parking due to the location and operation of construction staging, as well as construction worker parking.)
- General comments highlighting key issues for each location related to construction traffic activity that do not fall into one of the above categories. This may include the following:
    a. Identify capacity issues, impact on parking/access
    b. Identify construction routes and staging areas

Safety

Potential effects of the project on safety will be assessed qualitatively for all modes within the study area including general traffic, transit, freight, bicycle, and pedestrian modes.

Evaluation Criteria

Evaluation criteria could include the following:

- Effect on general purpose traffic safety
- Effect on transit operations safety
- Effect on freight travel safety
- Effect on nonmotorized travel safety

Evaluation Approach

A safety (accident/crash) analysis will be used to assess accidents currently occurring within the project limits in terms of the following:

- Type
- Cause
- Frequency

Accident data from the latest 3 years will be compiled and summarized to identify any current safety deficiencies. Unique accident patterns (e.g., high frequency of a specific pattern) will be noted. The accident data will be collected for any directly affected local intersections, roadways, and I-5 mainline and ramps. An intersection and roadway safety analysis will be conducted only where the light rail alternatives are proposed to be either at-grade in semi-exclusive right-of-way, elevated within or immediately adjacent to the road right-of-way, or results in a physical change to a roadway. Along the local streets, a qualitative discussion of how the project may affect accident type and frequency will be developed and presented.

No accident analysis or safety conclusions for alternatives proposed to operate outside the roadway right-of-way (exclusive right-of-way) will be conducted other than where (if) the alternative physically changes the geometry of a roadway facility (e.g., park-and-ride entrances).

Safety effects on freight and road-based transit travel will be assessed based on projected changes in traffic volumes and/or modal conflicts along key routes. Safety effects on bicycle and pedestrian travel will be assessed based on change in conflicts with motorized modes, as well as change in facilities provided for their travel. This assessment will include consideration of children walking and bicycling to school and drop-off, pick-up, and school bus zones.

Development of Detailed Traffic Volumes by Analysis Scenario

In many instances, the methodology for analyzing a particular measure is the same across all time periods, analysis years, and given alternative. However, in the development of detailed traffic volumes for use in traffic impact assessments, some differences exist between different types of analysis scenarios. This section describes the differences in methodology that will be employed depending on the scenario to be analyzed.

Existing Conditions

Peak hour freeway, arterial roadway, and intersection-turning movement volumes will be compiled from traffic volume counts. These will form the basis upon which traffic volumes for other analysis scenarios will be developed.

Future Baseline (No Build)

For future baseline conditions, growth rates produced by the PSRC Regional Model will be applied to existing traffic volumes to develop future forecasted arterial and freeway traffic volumes.

Light Rail Alternative(s) and Construction Scenario(s)

Similar to the future baseline conditions, traffic volumes for the light rail alternatives will be developed based on proportionate change in volumes from the regional model between the future baseline volumes and the alternative in question. Note that the regional model will reflect the effects of transit ridership derived from the Sound Transit Ridership Model. Changes in traffic volumes will generally be assessed at an aggregate level (e.g., screenlines) and as implied by system measures such as VMT. For localized impacts such as in the vicinity of park-and-ride lots, the No Build Alternative volumes will be used as a base, with additional volumes added to reflect traffic anticipated to be generated by the given facility.

The effect of selected construction scenarios on traffic operations will be evaluated in a qualitative manner, although some analysis at spot locations may be conducted using volumes for the opening year of the No Build Alternative.

Indirect Effects

Indirect effects are those project effects that occur later in time or some distance from the project. Typical indirect effects are those associated with changes in land use development patterns, typically consistent with adopted plans and zoning, and associated with changes in transportation accessibility over time. These effects are described in the land use and specific resource reports, but the potential changes in transportation access that could lead to these effects will be discussed qualitatively in the Transportation Technical Report.

Cumulative Effects

The analysis of future traffic and transit impacts of the project will be cumulatively assessed based on the results of traffic modeling and ridership modeling that incorporates past, funded, and approved future actions, as well as projected growth that would result from development in the region.

The assessment of additional cumulative transportation effects will include qualitative evaluation and discussion of past, present, and reasonably foreseeable future actions that could interact with the project alternatives, and that were not included in the traffic modeling. These may include, but are not limited to, consideration of effects from actions such as the following:

- Extension of light rail from Lynnwood to Everett
- Highway/lane management, such as from the implementation of tolls on state and/or local facilities, that could further alter travel behavior in the corridor
- Construction activities from other transportation projects that could affect or be influenced by the project construction activities
- Local developments and public infrastructure projects that could contribute to cumulative traffic delays on local arterial streets over the construction period

Transportation Data Developed for Use by Other Disciplines

Air Quality Effect Analysis Data

To support the air quality effect analysis, the following types of data will be produced for the study alternatives:

- AM and PM peak hour traffic volumes, speeds, and vehicular class for all roadway intersections that will be affected by changes in travel and traffic patterns caused by study alternatives.
- Daily VMT estimates by speeds for two areas: Lynnwood Link Extension study area and the regional system. These estimates will be provided in a tabular format for mobile source and greenhouse gas analyses.
- Level of service at affected intersections.
- The above information will be provided for existing conditions and the design year (2035), and the design year information will be extrapolated to 2040 for air quality conformity analyses.

Noise Effect Analysis Data

To support the noise effect analysis, the following types of data will be produced by the transportation team:

- AM and PM peak hour Synchro model files and general systemwide vehicle classification information.
- Maximum AM and PM peak hour free-flow volumes. These will be estimated by calculating 80 percent of the roadway capacity as indicated in the PSRC Regional Model. This will be for all links associated with the intersections analyzed in the Synchro traffic simulation analysis.
- The above information will be provided for existing conditions and the design year (2035).

Energy Effect Analysis Data

Energy effects will be calculated for operational and construction phases of the project. To determine operational energy effects, the following types of data for year 2035 will be produced by the transportation team:

- Daily regional VMT and VHT
- Daily light rail transit/bus rapid transit and/or HOV VMT

Environmental Justice and Social Impact Analysis Data

To support the environmental justice and social impact analysis, a variety of data will be produced by the transportation team, including the following:

- Estimated travel sheds as determined by using the travel demand model to identify transportation analysis zones relevant to environmental justice and social impact analysis
- Estimated travel times to selected destinations (e.g., Seattle central business district, Capitol Hill, First Hill, University of Washington) for use in the analysis of access to employment centers, education, and medical services for environmental justice populations
- Analysis of temporary or permanent impacts on Americans with Disabilities Act (ADA) parking or designated parking at social services, as well as percentage of parking spaces temporarily or permanently lost in designated commercial shopping districts
- Change in level of service on corridor roadways

Mitigation Measures

Project Design Measures and Best Management Practices

As long-term impacts are identified and mitigation options developed, these options will be forwarded to Sound Transit staff and the design team for engineering design/refinement and development of approximate cost estimates. The analysis of mitigation options will be coordinated with the relevant local/state jurisdictions to identify strategies that may be under consideration to address other regional transportation challenges, but which could benefit the light rail project.

Mitigation

Direct Impacts

Potential mitigation measures will be described to address potential transportation impacts associated with the build alternatives.

- Local Traffic Impacts: Based on the 2035 traffic analysis, opportunities for mitigation of long-term impacts will be identified for the intersections that do not meet the established LOS standards previously discussed. These measures might include operational changes such as signal phasing, timing, or physical modification such as added travel or turning lanes. For intersections that do not meet the established LOS standards in the no build condition, the build alternatives are only obligated to bring the operating conditions back to the no build condition. Determining if an intersection meets the agency LOS standards will be based on the conditions at each individual intersection.
- Parking: Areas for potential parking mitigation will be identified by considering the potential for hide-and-ride parking activity in the neighborhoods surrounding transit stations. Areas with a high potential for hide-and-ride activity will be identified with potential mitigation strategies to reduce the likelihood of this activity.
- Construction: Mitigation measures aimed at addressing the construction traffic impacts identified above will be developed and reviewed. As appropriate, this will include a review of measures proposed and/or used for Initial Segment, Airport, and University Link light rail construction. Mitigation measures identified to address local construction traffic impacts will also be reviewed for their relevancy in addressing regional and/or corridor level construction traffic issues.
- Potential improvements will also be identified to mitigate light rail project impacts on nonmotorized facilities, freight, and access restrictions to businesses.

Cumulative Effects

Sound Transit will coordinate with proponents of reasonably foreseeable future projects that are likely to be under construction at the same time as the Lynnwood Link Extension, as necessary, to minimize the potential cumulative impacts of overlapping construction periods and project operation.

Summary of Technical Activity by Analysis Year

Table A-6 shows the technical activities to be undertaken for each of the analysis years identified.

Table A-6. Summary of Technical Activities by Analysis Year

Activity	Existing (2012)	Design Year (2035)	Construction Period[a]
Regional traffic forecast measures	X	X	
Ridership forecasts		X	
Corridor traffic	X	X	X
Road-based transit	X	X	X
Intersection operations	X	X	X
Freeway and ramp operations	X	X	X
Property access and circulation	X	X	X
Parking demand	X	X	X
Nonmotorized modes	X	X	X
Freight	X	X	X
Construction impacts			X
Indirect effects		X	
Cumulative effects		X	
Transportation data for other disciplines:			
Air quality	X	X[b]	X
Noise	X	X	
Energy	X	X	
Environmental justice and social impact	X	X	

[a] Construction period analysis will be qualitative.

[b] Year 2035 forecasts will be extrapolated to year 2040 for conformity analyses.

Documentation

For this resource, the following documentation will be developed:

- EIS section
- Transportation Technical Report

APPENDIX B

Future Transportation Improvement Assumptions for the No Build Alternative

Key highway and transit projects included in the Lynnwood Link Extension project are same as those assumed in the SR 520 Final EIS model. These are listed below.

Highway Network

- SR 520—West Lake Sammamish Parkway to SR 202
- SR 520—Floating bridge replacement and associated improvements
- I-90—R8A: Phases I, II, and III
- SR 99—Alaskan Way Viaduct Seawall Replacement Program
- I-405—South Bellevue Widening Project
- I-405—NE 8th Street to SR 520 Braided Ramps
- SR 519—Intermodal Project: Phase 2
- SR 518—SeaTac Airport to I-5/I-405 Interchange: third eastbound lane

Transit Network

- The transit definition reflects transit services in Seattle, North King County, East King County, and South Snohomish County that affect the travel demand across Lake Washington.
- The Downtown Seattle Transit Tunnel (DSTT) will be used exclusively by light rail—buses will no longer utilize the DSTT.
- Transit priority on 3rd Avenue in downtown Seattle includes mid-day operations, in addition to the existing priority during morning and evening peak periods.
- Sound Transit (ST) Central Link light rail will operate from Lynnwood to Redondo/Star Lake.
- ST East Link light rail will operate between Lynnwood and Overlake Transit Center (OTC) during peak hours and between Northgate and OTC during off-peak periods.
- ST East Link light rail will include a tunnel alignment through downtown Bellevue.
- ST Sounder Commuter Rail service will operate south to Lakewood.
- First Hill Streetcar will use the two-way Broadway alternative.
- *RapidRide* bus service will operate along five bus rapid transit (BRT) corridors identified in King County's *Transit Now* measure.

Local Street Network

The following local street improvements were also included in the 2035 No Build Alternative for traffic operations analysis. These projects were included in each city's transportation improvement program and/or identified by each jurisdiction to be included in the 2035 No Build Alternative roadway network.

City of Shoreline

- Aurora Corridor Improvement Project

City of Mountlake Terrace

- 212th Street SW and 48th Avenue West - install a signal and reconfigure northbound leg to a right turn lane and a left turn lane
- 220th Street SW and 58th Avenue West - install a signal or one-lane roundabout
- 230th Street SW and 56th Avenue West - install a one-lane roundabout or all-way stop control
- 236th Street SW and 56th Avenue West - reconfigure intersection so that left turn lanes become left/through lanes. Restrict parking access in peak direction to allow for two receiving lanes during peak (westbound in AM, eastbound in PM)
- Gateway Boulevard - complete from 244th Street SW to 236th Street SW with pedestrian facilities and bicycle accommodations
- 236th Street SW and Gateway Boulevard - install a signal
- 236th Street between I-5 and 56th Avenue West - coordinate signals at 236th Street SW and northbound I-5 ramp, 236th Street SW and Gateway Boulevard, 236th Street SW and 58th Avenue W, 236th Street SW and 56th Avenue West
- 244th Street SW and 48th Avenue West - add an eastbound left turn lane
- 244th Street SW and Cedar Way - add turn lane and reconfigure intersection
- 220th Street SW and SR 99 - install a westbound right turn pocket

City of Lynnwood

New/Expanded Roads:

- 204th Street SW from 68th Ave West to SR 99
- 36th Avenue W from Maple Road to SR 99
- Poplar Extension Bridge
- Maple Road Extension
- 33rd Avenue West Extension
- 52nd Avenue West from 168th Street SW to 176th Street SW

- Beech Road Extension
- 200th Street SW from 64th Avenue W to 48th Avenue West – widen from 3 to 5 lanes

Intersection Improvements:

- Scriber Lake Road and 196th Street SW Traffic Signal Reconstruction
- 52nd Avenue W and 176th Street SW Roundabout/Traffic Signal
- Sears Driveway and Alderwood Mall Parkway Traffic Signal/Turn Lane
- 28th Avenue W and Alderwood Mall Boulevard Traffic Signal
- 48th Avenue W and 188th Street SW Roundabout/Traffic Signal
- 66th Avenue and 212th Street Traffic Signal
- 196th Street SW and Alderwood Mall Parkway Traffic Signal/Turn Lane
- 198th Street SW and 44th Avenue West Traffic Signal

City Center Improvements:

- 196th Street SW from 37th Avenue West to 48th Avenue W – Add BAT lanes
- 42nd Avenue W from 200th Street SW to 194th Street SW
- 44th Avenue W from I-5 to 194th Street SW – widen roadway
- 194th Street SW from 33rd Avenue West to 40th Avenue West
- 200th Street SW from 40th Avenue West to 48th Avenue West – widen from 3 to 5 lanes
- Right-in, right-out stop control at all new City Center streets bounded by 44th, 40th, 196th and 200th.