



CHAPTER 7: TRANSPORTATION

7.1 Introduction

This chapter describes the potential effects of the BGT Missing Link project on the transportation system in the study area. Topics addressed include the roadway network, traffic volumes and operations, motorized freight corridors, nonmotorized users (bicyclists and pedestrians), public transportation, freight rail, and safety.

The primary sources of information used to prepare this analysis include the following:

- **Roadway Characteristics:** Lane configuration, intersection control, and industrial and residential driveway information as collected during fieldwork; previous technical analyses in the study area; and data provided by SDOT.
- **General-Purpose Traffic:** Traffic counts and turning movement data provided by SDOT and collected in the field.
- **Freight Truck:** Freight truck volumes, turning movement data, and truck route information provided by SDOT and collected from field counts and previous technical analyses in the study area.
- **Nonmotorized Users:** Pedestrian and bicycle volumes and circulation data provided by SDOT and collected in the field within the study area, as well as BGT user volumes in other areas of the city.
- **Public Transportation:** Public transportation service operating in the study area and travel route information provided by King County Metro.
- **Freight Rail:** Train volumes and routes that traverse the study area, as reported by the Federal Railroad Administration and the Ballard Terminal Railroad (BTR).
- **Safety:** Accident data and incident response data in the project vicinity provided by SDOT and the Seattle Fire Department.

The quantitative traffic analysis is based on traffic conditions during the PM peak hour—the hour during which traffic volumes are at their highest. For additional details on study methods, see the Transportation Discipline Report (Parametrix, 2017).

Changes from the DEIS

Chapter 7 was updated to reflect comments received on the DEIS and to include analysis of the Preferred Alternative. Additional intersection and driveway data were collected to provide more information on potential transportation and freight impacts. Interviews were conducted with a sample of driveway owners to better understand driveway operations; vehicle types; driveway usage by time of day, week, and year; frequency of driveway users; number of driveways; and estimated vehicle volumes. Other edits were made to correct errors and improve clarity.

7.2 Affected Environment

7.2.1 Study Area

The transportation study area was defined as the area bounded by 32nd Ave NW to the west, NW 56th St/20th Ave NW/Leary Ave NW to the north, 11th Ave NW to the east, and Shilshole Ave NW/NW 45th St to the south (Figure 7-1). The study area boundaries encompass the areas where the function of transportation modes could be affected by project construction or operation. Analysts used estimated traffic volumes and construction phasing to identify potentially affected areas.

In response to comments on the DEIS, additional data were collected in 2016 and 2017; however, 2015 still serves as the baseline year. The traffic data and transportation facilities are approximately the same in 2016 and 2017 as in 2015.

Figure 7-1 also shows the 19 intersections and 44 driveways evaluated as part of the affected environment analysis. Seven of the intersections (Intersections A, B, and D through H) have full signals and are referred to as signalized intersections. Intersection C has a pedestrian-activated signal, which remains green for traffic on the major street until activated by a pedestrian. This intersection is described as having a pedestrian half signal. The remaining intersections (Intersections I through S) are controlled by stop signs and are referred to as unsignalized intersections.

Driveways (identified in Figure 7-1 as numbers 1 through 44) provide access to businesses in the study area and are unsignalized. The driveways chosen for this analysis are a sample of representative driveways in the study area with a range of traffic volumes and represent industrial and commercial driveways.

In addition, 16 driveway owners were interviewed to provide information on operations and driveway uses. Analysts asked driveway owners a set of questions to collect information on the following:

- General description of the types of vehicles that use a driveway;
- Driveway operations based on time of day, week, and year;
- Direction of travel on each driveway;
- Whether vehicles back in or out of each driveway;
- Frequency of driveway users (occasional customers, frequent customers, employees);
- Number of driveways serving the business and if there are shared driveways with other businesses; and
- An estimate of vehicle volumes using the driveway.

This provided analysts with information on how driveways in the study area are currently being used. Interview notes are included in Appendix A of the Transportation Discipline Report (Parametrix, 2017).

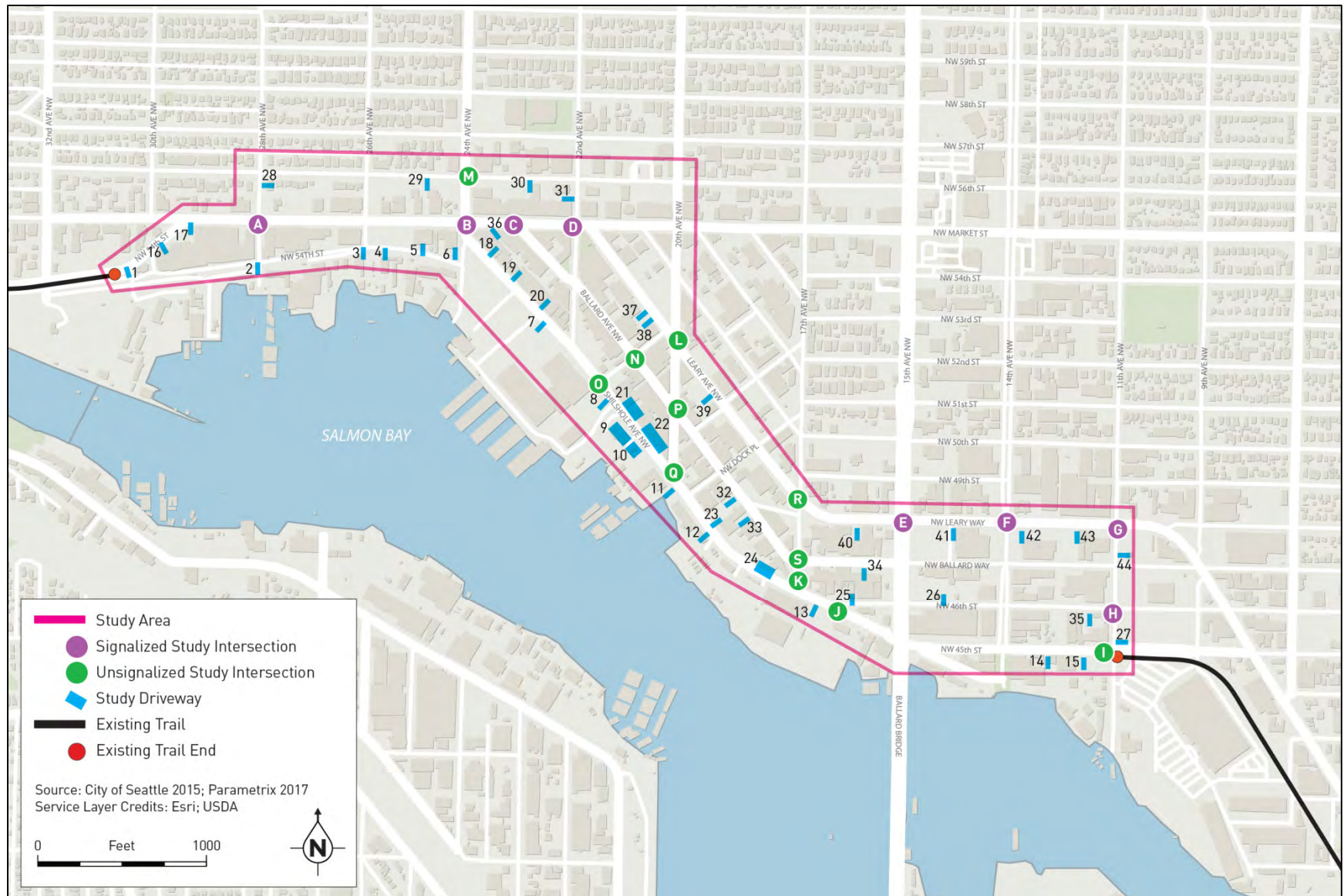


Figure 7-1. Transportation Discipline Study Area and Study Intersections and Driveways

7.2.2 Roadway Network

The roadway network within the study area consists of principal, minor, and collector arterial streets, as well as local access streets (Figure 7-2). Most roads in the study area are classified as local access streets.

Principal arterial roadways are the foundation of the city's transportation network, designated as the major thoroughfares for trucks, motor vehicles, and transit vehicles. In the study area, NW Leary Way, a portion of NW Market St, and 15th Ave NW are defined as principal arterials, meaning that they serve as primary routes for vehicle trips between urban centers and as connections to the regional transportation network.

Minor arterials distribute traffic from the principal arterials to collector arterials and local access streets, and provide connections to community destinations. In the study area, NW 46th St, Shilshole Ave NW, a portion of NW Market St, and 24th Ave NW are minor arterials.

Collector arterials collect and distribute traffic from principal and minor arterials to local access streets or directly to local destinations. Collector arterials are typically located within neighborhood boundaries and serve small groups of stores, schools, small apartment complexes, and residential land uses. In the study area, 14th Ave NW and 20th Ave NW are considered collector arterials.

All other streets are local residential or commercial access streets. SDOT does not consider local access streets as part of the arterial network. Local access streets provide direct access from the arterial network to local land uses.

There are also Major and Minor Truck Streets within the study area, also shown on Figure 7-2. Major Truck Streets are arterial streets that provide connections between and through industrial land uses, commercial districts, and urban centers (SDOT, 2016). Minor Truck Streets provide connections to and from urban villages and commercial districts, and secondary connections to Major Truck Streets (SDOT, 2016). Major Truck Streets in the study area include:

- Shilshole Ave NW;
- NW Leary Way;
- 15th Ave NW; and
- NW Market St between 24th Ave NW and the eastern boundary of the study area.

Minor Truck Streets in the study area include 24th Ave NW between Shilshole Ave NW and the northern boundary of the study area.

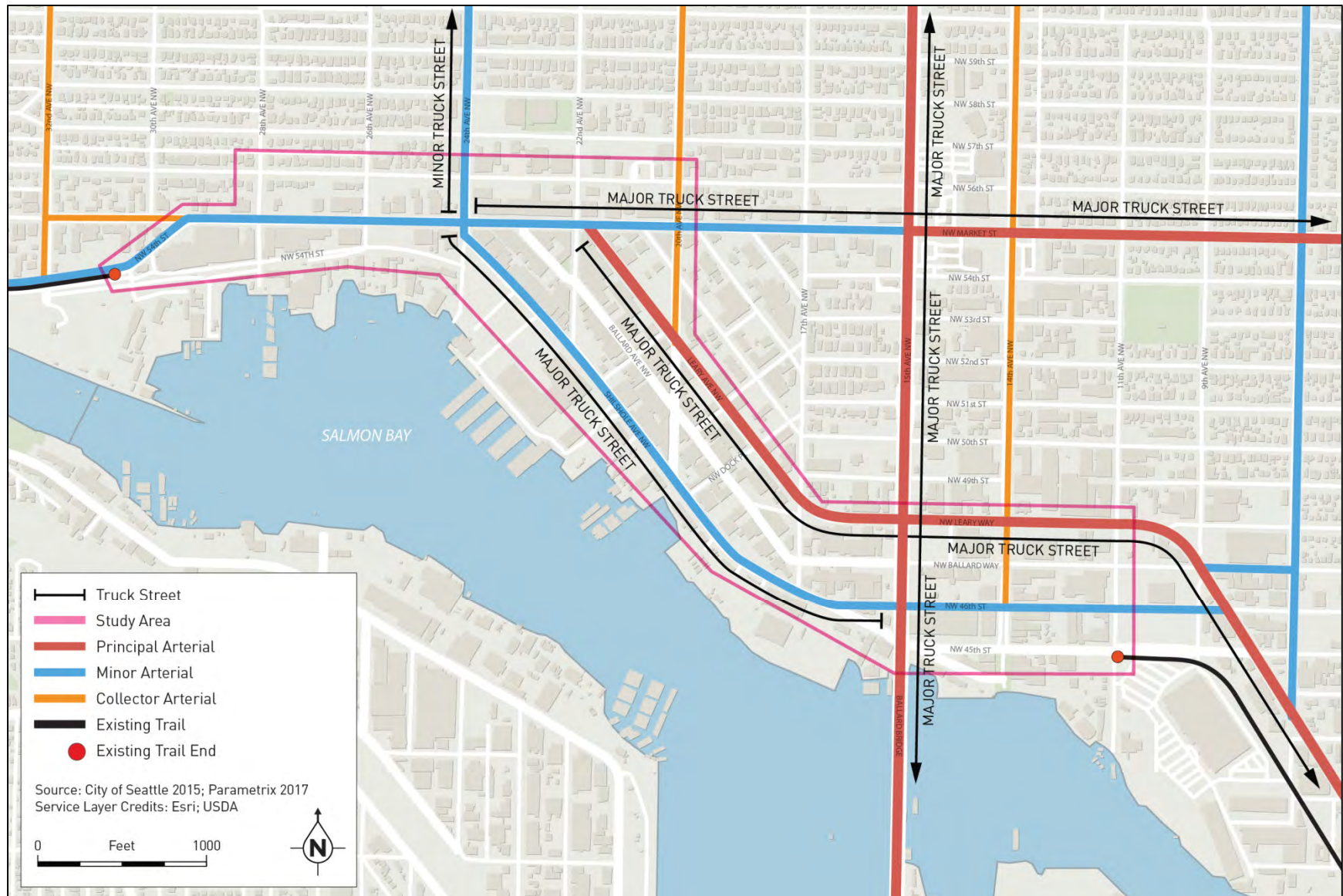


Figure 7-2. Transportation Discipline Study Area Roadway Hierarchy

7.2.3 Intersection Operations and Driveway Delay

Intersection operations were measured using the level of service (LOS) scale ranging from A to F, depending on the delay conditions at the intersection. LOS A represents the best conditions with minimal delay and LOS F represents the worst conditions with severe congestion. LOS ratings are based on the control delay of the intersection or roadway. Table 7-1 lists the intersection LOS delay thresholds for signalized and stop-controlled intersections. There are variations in the ranges of delay associated with the LOS ratings for signalized and unsignalized (stop-controlled) intersections.

Table 7-1. Level of Service Thresholds

<i>Level of Service</i>	<i>Average Control Delay per Vehicle (seconds)</i>	
	<i>Signalized Intersections</i>	<i>Stop-Controlled Intersections</i>
A	≤ 10	≤ 10
B	> 10 and ≤ 20	> 10 and ≤ 15
C	> 20 and ≤ 35	> 15 and ≤ 25
D	> 35 and ≤ 55	> 25 and ≤ 35
E	> 55 and ≤ 80	> 35 and ≤ 50
F	> 80	> 50

Note: The LOS criteria are based on control delay, which includes initial deceleration delay, queue move-up time, stopped delay, and final deceleration delay.

For this analysis, intersections that operate at LOS E or F were evaluated in more detail to determine the reasons for the higher level of congestion. As shown in Figure 7-3 and Table 7-2, the following five intersections currently operate at LOS E or F during the PM peak hour:

- Intersection E2: 15th Ave NW/NW Leary Way northbound off-ramp;
- Intersection K: Shilshole Ave NW/NW 17th St (southbound approach from NW 17th St);
- Intersection L: Leary Ave NW/20th Ave NW (southbound approach on 20th Ave NW);
- Intersection M: NW 56th St/24th Ave NW (westbound approach on NW 56th St); and
- Intersection R: NW Leary Way/17th Ave NW (southbound approach on 17th Ave NW).

All other intersections in the study area currently operate at LOS D or better.

The average delay in seconds at driveways during the PM peak hour is shown in Table 7-3. Existing delay at driveways in the study area ranges between approximately 0 and 40 seconds during the PM peak hour. Driveways that had no exiting volume during the PM peak hour had no delay as shown in Table 7-3.



Figure 7-3. Existing Conditions PM Peak Hour Study Intersection Level of Service

Table 7-2. 2015 PM Peak Hour Study Intersection Level of Service

<i>ID¹</i>	<i>Intersection</i>	<i>Traffic Control</i>	<i>2015 Existing Conditions PM Peak Hour²</i>	
			<i>LOS</i>	<i>Delay (sec)</i>
A	NW Market St/28 th Ave NW	Signal	A	6
B	NM Market St/24 th Ave NW	Signal	D	42
C	NM Market St/Ballard Ave NW	Pedestrian Half Signal	A	8
D	NW Market St/22 nd Ave NW/ Leary Ave NW	Signal	D	54
E1	15 th Ave NW/NW Leary Way Southbound Off-Ramp	Signal	B	15
E2	15 th Ave NW/NW Leary Way Northbound Off-Ramp	Signal	E	61
F	NW Leary Way/14 th Ave NW	Signal	A	8
G	NW Leary Way/11 th Ave NW	Signal	B	14
H	11 th Ave NW/NW 46 th St	Signal	B	18
I	11 th Ave NW/NW 45 th St	Unsignalized	A	10
J	NW 46 th St/Shilshole Ave NW	Unsignalized	A	8
K	Shilshole Ave NW/NW 17 th St	Unsignalized	E	46
L	Leary Ave NW/20 th Ave NW	Unsignalized	F	260
M	NW 56 th St/24 th Ave NW	Unsignalized	F	54
N	NW Vernon Pl/Ballard Ave NW	Unsignalized	C	18
O	NW Vernon Pl/Shilshole Ave NW	Unsignalized	C	19
P	Ballard Ave NW/20 th Ave NW	Unsignalized	B	14
Q	Shilshole Ave NW/20 th Ave NW	Unsignalized	C	18
R	NW Leary Way/17 th Ave NW	Unsignalized	F	50
S	NW Ballard Way/17 th Ave NW	Unsignalized	A	9

¹ ID number matches ID number on Figure 7-1 and Figure 7-3.

² Existing conditions delay is based on volume data collected in 2015, 2016, and 2017; however, 2015 still serves as the baseline year.

Table 7-3. 2015 PM Peak Hour Study Driveway Delay

<i>ID¹</i>	<i>Driveway</i>	<i>2015 Existing Conditions PM Peak Hour Delay (sec)²</i>
1	NW 54 th St/Ballard Locks	14
2	NW 54 th St/McGinnis Marine	0
3	NW 54 th St/Ballard Oil	9
4	NW 54 th St/Snow and Co	9
5	NW 54 th St/Ballard Transfer	9
6	NW 54 th St/Lieb Marine Services	0
7	Shilshole Ave NW/Stimson Marina	19
8	Shilshole Ave NW/Salmon Bay Center	20
9	Ballard Ave NW/Salmon Bay Sand and Gravel South	15
10	Shilshole Ave NW/Covich Williams	31
11	Shilshole Ave NW/Salmon Bay Café	17
12	Shilshole Ave NW/Hatton Marine/Ballard Mill Marina	13
13	Shilshole Ave NW/CSR Marine/Ballard Mill Marina	19
14	NW 45 th St/Ballard Insulation	10
15	NE 45 th /Dovetail General Contractors	9
16	NW 54 th St/Triad Ballard Development	14
17	NW 54 th St/Trident Seafood Retail	14
18	Shilshole Ave NW/Shilshole West Building	21
19	Shilshole Ave NW/Wilson Bros Automotive/Rathburn Automotive	15
20	Shilshole Ave NW/Magnum Self Storage	0
21	Shilshole Ave NW/Salmon Bay Sand and Gravel Retail North	13
22	Shilshole Ave NW/Salmon Bay Sand and Gravel Loading Zones North	21
23	Shilshole Ave NW/Ballard Hardware	21

Table 7-3. 2015 PM Peak Hour Study Driveway Delay (continued)

<i>ID¹</i>	<i>Driveway</i>	<i>2015 Existing Conditions PM Peak Hour Delay (sec)²</i>
24	Shilshole Ave NW/Salmon Bay Sand and Gravel Maintenance	22
25	NW 46 th St/Ballard Marine	19
26	NW 46 th St/Ballard Blocks Development	38
27	11 th Ave NW/U.S. Post Office	0
28	28 th Ave NW/Townhomes	9
29	NW 56 th St/Mark24	9
30	NW 56 th St/Ballard Square Parking	12
31	22 nd Ave NW/Chase Bank	14
32	Ballard Ave NW/Ballard Sheet Metal Works	10
33	Ballard Ave NW/Ballard Hardware Loading Zone	0
34	NW Ballard Way/Warden Fluid Dynamics	11
35	NW 46 th St/Radtke Marine	10
36	NW Market St/Alley	12
37	Leary Ave NW/Ballard Landmark	11
38	Leary Ave NW/Public Parking/Caffè Fiore	12
39	Leary Ave NW/Carter Subaru Ballard	9
40	NW Leary Way/BOLT Modern Storage	18
41	NW Leary Way/Quest Church	14
42	NW Leary Way/Office Max	10
43	NW Leary Way/U-Haul	19
44	11 th Ave NW/7-Eleven	10

¹ ID number matches ID number on Figure 7-1.

² Existing conditions delay is based on driveway volume data collected in 2015, 2016, and 2017; however, 2015 still serves as the baseline year.

7.2.4 Freight

As documented in the Freight Master Plan, SDOT has designated several streets in the study area as Major and Minor Truck Streets. Major Truck Streets are arterial streets that provide connections between and through industrial land uses (Manufacturing Industrial Centers and intermodal terminals), commercial districts, and urban centers (SDOT, 2016). Minor Truck Streets provide connections to and from urban villages and commercial districts, and secondary connections to Major Truck Streets (SDOT, 2016). Major Truck Streets in the study area include:

- Shilshole Ave NW;
- NW Leary Way;
- 15th Ave NW; and
- NW Market St between 24th Ave NW and the eastern boundary of the study area.

Minor Truck Streets in the study area include 24th Ave NW between Shilshole Ave NW and the northern boundary of the study area.

The Industrial Areas Freight Access Project (SDOT and Port of Seattle, 2015) describes all arterial streets in the city as freight routes, although arterials are not subject to the same criteria for street design, traffic management, and pavement design and repair as Major Truck Streets. In addition to Shilshole Ave NW, NW Market St, 24th Ave NW, NW Leary Way, and 15th Ave NW, the following streets are considered arterial streets and are expected to accommodate some freight traffic:

- NW 46th St;
- 14th Ave NW; and
- 20th Ave NW.

Daily freight truck volumes (medium and heavy trucks) are highest on NW Leary Way/Leary Ave NW, NW Market St, NW 54th St, Ballard Ave NW, NW 46th St, and Shilshole Ave NW based on daily volume counts. During the PM peak hour, freight truck volumes in the study area are also highest on NW Leary Way/Leary Ave NW, NW 46th St, NW Market St, and Ballard Ave near 22nd Ave NW.

Interviews with driveway owners provided information on operations and driveway uses. The following characteristics and activities occur at driveways in the study area:

- There are a range of vehicle types at driveways, including small class vehicles (motorcycles, passenger cars, and light trucks), medium and large class trucks, vehicles with tractor-trailers, and other special vehicle types, such as boat transporters, lowboys, or tankers, and forklift activity.
- Vehicle activity at many driveways was busiest throughout normal business hours (8:00 AM to 5:00 PM) and on weekdays. As described in Section 7.2.5 below, nonmotorized volumes on the trail are also high during these times of the day and weekdays because many BGT users are commuters.
- Many of the driveways allow two-way travel; however, several driveway owners reported that their driveway only provides one-way access. In some cases, this was because there is insufficient driveway width to allow two vehicles to pass each other in the driveway. These driveways are primarily on the unimproved NW 54th St right-of-way.
- There are a number of driveways where vehicles back into or out of the driveway as summarized on Table 7-4, which could be a hazardous maneuver when this occurs in areas with nonmotorized traffic. Vehicles backing into or out of driveways, particularly large vehicles, could have difficulty

seeing other users in the area, including nonmotorized users crossing the driveway. These maneuvers currently occur at driveways on NW 54th St, Shilshole Ave NW, and Ballard Ave NW.

- Many of the driveway owners reported that drivers accessing their driveways are frequent customers or employees who would be familiar with the characteristics of the driveway and nearby roadway system. Driveway owners also provided information on the uses of specific driveways providing access to their business, which was used to determine the needed driveway widths along the trail alignment.

Table 7-4. 2015 Representative Driveway Movements and Operations¹

<i>Driveway</i>	<i>Vehicles Back In</i>	<i>Vehicles Back Out</i>	<i>Busiest Time of Year</i>	<i>Busiest Time of Week</i>	<i>Busiest Time of Day</i>
Ballard Oil	Yes	No	All Year	Varies	Varies
Snow and Co	Yes	No	All Year, Near Fishing Seasons	Monday-Friday	Varies
Ballard Transfer	Yes	No	All Year	Monday-Friday	Mornings, Evenings
Lieb Marine	Yes	No	Summer	Monday-Friday	Varies
Shilshole West Building	No	No	All Year	Monday-Friday	All Day
Wilson Bros Automotive	No	Yes	All Year	Monday-Friday	Commute Periods
Magnum Self Storage	No	No	All Year	Saturday-Sunday	Varies
Stimson Marina	No	No	All Year	Monday-Friday	Commute Periods
Trident Seafoods	No	No	January-February, June-July	Monday-Saturday	Commute Periods
Salmon Bay Sand and Gravel	Yes	No	Summer, Winter	Monday-Friday	Business Hours
Covich Williams	Yes, Occasionally	No	Summer, Winter	Monday-Saturday	Commute Periods
Sagstad Marina	No	No	Spring, Summer, Fall	All Week	All Day
Ballard Industrial	Yes, at Loading Zone	No	Fall, Winter, Spring	Monday-Friday	Loading Zone—Mid-AM/PM
Ballard Marine	Yes	No	Summer	Monday-Friday	Business Hours
Ballard Mill Marina	No	No	Nearing Fishing Seasons	All Week	Business Hours
Ballard Insulation	No	No	October-June	Monday-Friday	Business Hours

¹Data shown in the table were collected from interviews with property owners.

7.2.5 Nonmotorized Users

Nonmotorized Facilities

The existing BGT ends just east and west of the study area. The eastern end of the BGT is at the intersection of 11th Ave NW and NW 45th St. The western end is 300 feet east of the intersection of 32nd Ave NW and NW 54th St.

The BGT is a multi-use trail that provides local and regional access connecting Seattle, Lake Forest Park, and Kenmore. Near the study area, the BGT provides connections to destinations such as Golden Gardens Park and the Ballard Locks to the west, and Gas Works Park and the University of Washington to the east. Near the study area, the trail has a width of between 12 and 15 feet. Currently, the BGT is used by a variety of nonmotorized users, including walkers, runners, bicyclists, skaters, and commuters.

In addition to the BGT, other bicycle facilities within and near the study area are shown on Figure 7-4. Most streets in the study area have paved sidewalks on both sides of the street with widths varying between 6 and 20 feet (Figure 7-5).

Pedestrian and Bicycle Volumes

Table 7-5 shows daily nonmotorized counts recorded during 2015 on the BGT at two locations: 9th Ave NW and at Seaview Ave NW. Table 7-6 provides nonmotorized volumes during the PM peak hour on the BGT at 9th Ave NW.

Bicycle volumes are higher than pedestrian volumes on the BGT. Counts recorded during 2015 indicated that pedestrian volumes are approximately 30% of bicycle volumes on the trail. The counts at 9th Ave NW, the closest location to the study area, also indicate that bicycle volumes are typically higher on weekdays than on weekends (Table 7-5). This is likely because of the high number of commuters who use the BGT compared to recreational users. Nonmotorized volumes on the BGT are substantially higher on the east side of the study area compared to the west side. It is likely that a large number of users are starting and ending their trips in the higher density residential areas north of the study area.

Turning movement counts collected in April 2014, September 2015, and February 2017 at study area intersections also recorded pedestrian and bicycle movements during the PM peak hour. During the PM peak hour, bicycle volumes were highest at:

- NW 45th St near the eastern end of the BGT;
- Shilshole Ave NW and NW 46th St;
- Shilshole Ave NW and 17th Ave NW;
- NW Market St, Leary Ave NW, and 22nd Ave NW;
- NW Market St and NW 24th St;
- NW Market St and NW 28th St; and
- NW 24th St and 56th Ave NW.

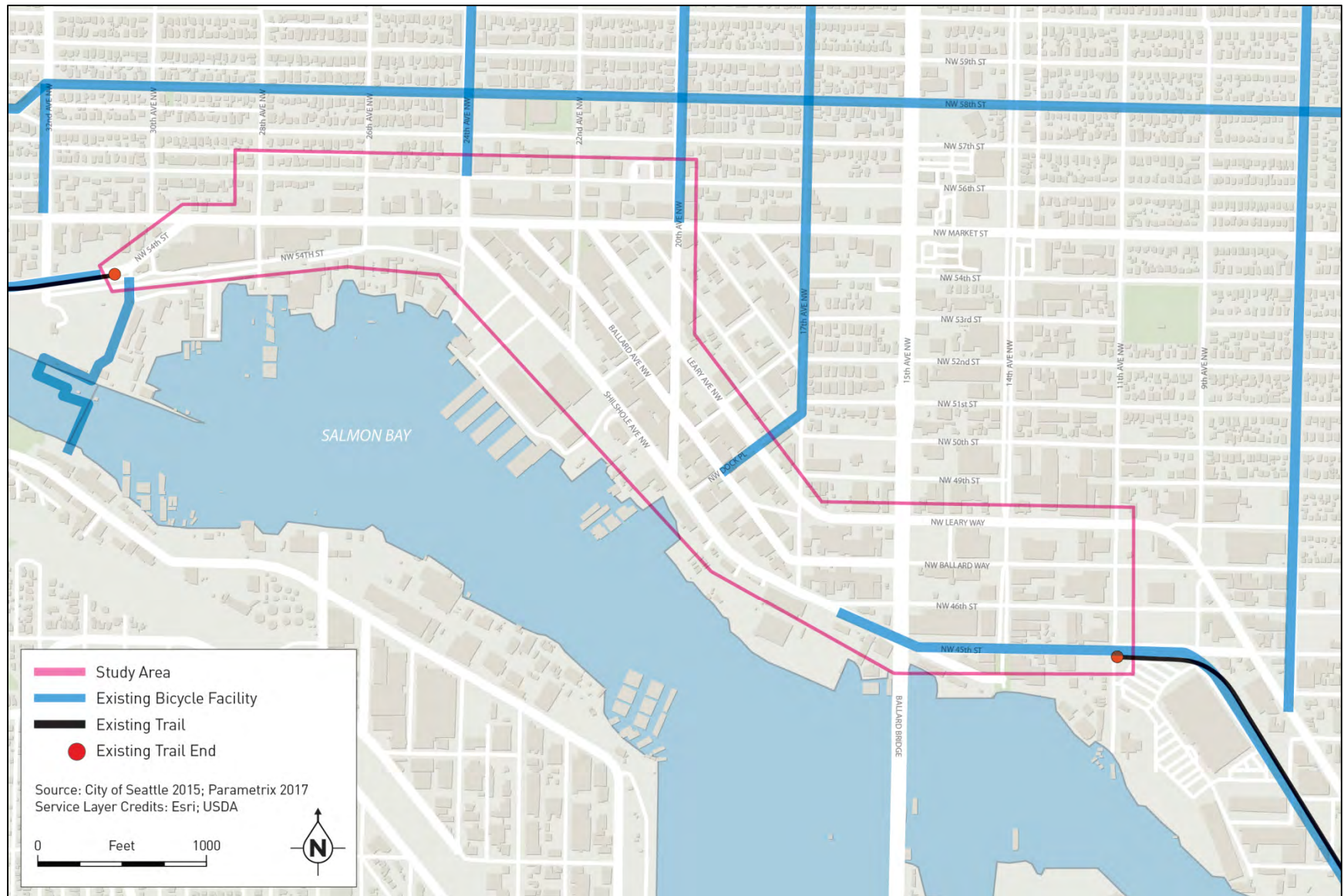


Figure 7-4. Existing Conditions Study Area Bicycle Facilities

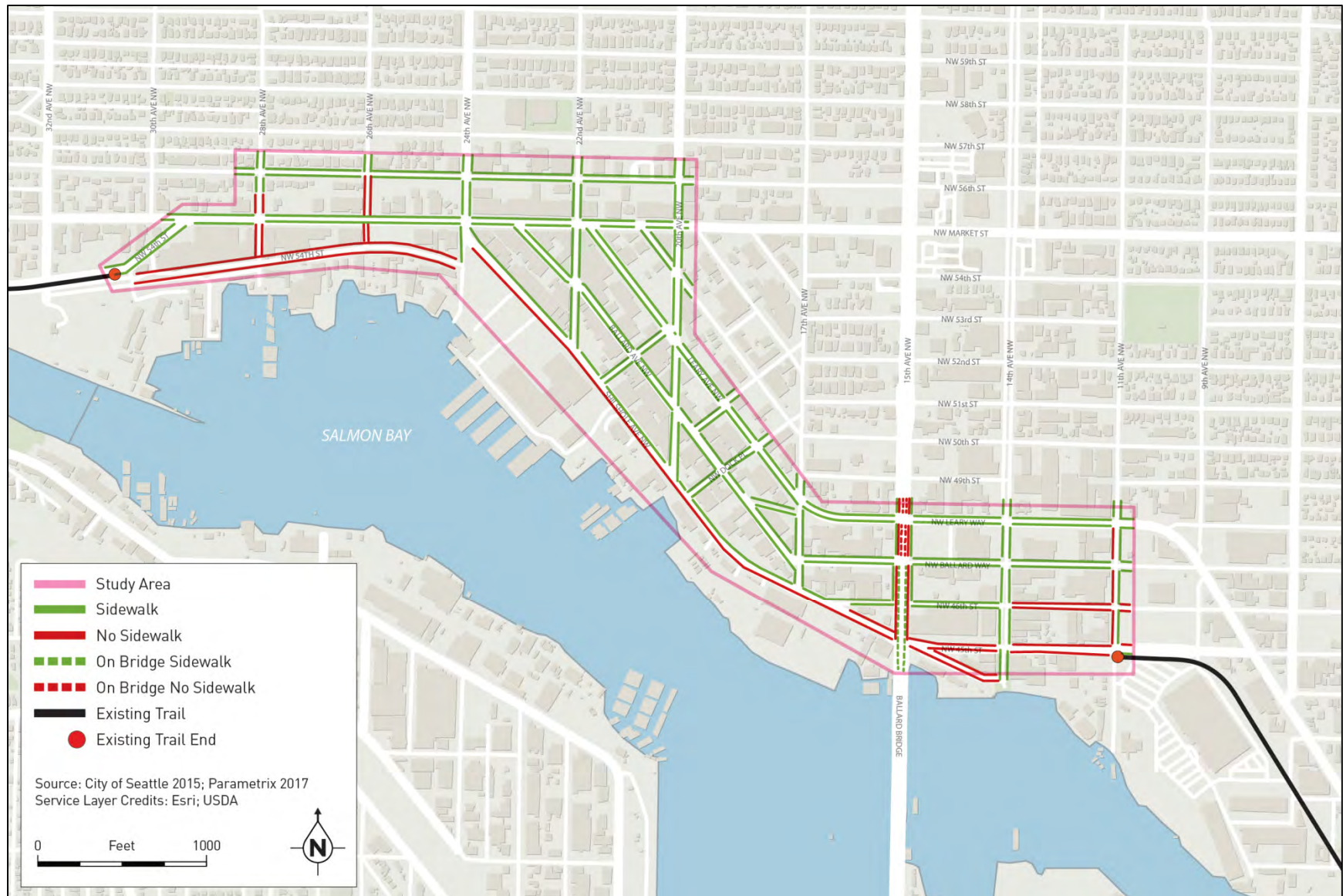


Figure 7-5. Existing Conditions Study Area Sidewalks

Table 7-5. 2015 Daily Bicycle Counts and Estimated Pedestrian Volumes on the BGT

<i>Date</i>	<i>Total Bicycles</i>	<i>Westbound Bicycles</i>	<i>Eastbound Bicycles</i>	<i>Estimated Total Pedestrians¹</i>	<i>Estimated Westbound Pedestrians¹</i>	<i>Estimated Eastbound Pedestrians¹</i>
<i>BGT at 9th Ave NW</i>						
Fri 7/17/15	1,080	670	410	360	230	130
Sat 7/18/15	1,530	760	770	505	260	245
Sun 7/19/15	1,420	715	705	470	245	225
Mon 7/20/15	1,665	845	820	545	285	260
Tues 7/21/15	1,640	815	825	540	275	265
Wed 7/22/15	1,720	850	870	565	290	275
<i>BGT at Seaview Ave NW</i>						
Fri 7/17/15	400	180	220	135	60	75
Sat 7/18/15	635	325	310	210	105	105
Sun 7/19/15	200	80	120	65	25	40
Mon 7/20/15	55	45	10	20	15	5
Tues 7/21/15	75	65	10	25	20	5
Wed 7/22/15	130	75	55	45	25	20
Thurs 7/23/15	95	70	25	30	20	10

¹ Pedestrian volumes estimated based on the bicycle-to-pedestrian ratio developed using counts taken in September 2015.

Note: Counts were rounded to the nearest five users to account for daily fluctuations. For counts that were between one and four users, the number was rounded up to provide a conservative estimate of impacts.

Table 7-6. 2015 PM Peak Hour Nonmotorized Counts on the BGT at 9th Ave NW

<i>PM Peak Hour</i>	<i>Total Bicycles</i>	<i>Westbound Bicycles</i>	<i>Eastbound Bicycles</i>	<i>Total Pedestrians</i>	<i>Westbound Pedestrians</i>	<i>Eastbound Pedestrians</i>
5:00–6:00 PM	190	145	45	50	35	15

Note: Counts were rounded to the nearest five users to account for daily fluctuations. For counts that were between one and four users, the number was rounded up to provide a conservative estimate of impacts.

The bicycle counts indicate that during the PM peak hour, bicyclists are traveling westbound from the eastern end of the BGT along Shilshole Ave NW. Bicyclists likely use various northbound streets, such as 20th Ave NW, 22nd Ave NW, and 24th Ave NW, to connect to residential areas.

During the PM peak hour, pedestrian volumes are highest at:

- NW Market St;
- Ballard Ave NW;
- Leary Ave NW near 20th Ave NW; and
- NW 56th St near 24th Ave NW.

Pedestrian volumes in these locations are likely highest due to the adjacent land uses and proximity of transit stops.

7.2.6 Public Transportation

Major transit corridors in the study area include NW Market St, NW Leary Way, 24th Ave NW, and 15th Ave NW. King County Metro operates six transit routes in the study area (Figure 7-6).

7.2.7 Freight Rail

The Ballard Terminal Railroad Co. (BTR) rail line is a shortline railroad that provides freight goods movement in the study area, primarily to the Salmon Bay Sand and Gravel Company. In the study area, the BTR rail line is on the south side of the unimproved NW 54th St right-of-way and Shilshole Ave NW and continues onto the north side of NW 45th St. There is also a rail spur line that travels north from NW 45th St to NW 46th St directly east of 14th Ave NW. There are nine public at-grade crossings in the study area located at:

- 30th Ave NW and NW 54th St;
- 28th Ave NW and NW 54th St;
- 26th Ave NW and NW 54th St;
- 24th Ave NW and NW 54th St;
- Shilshole Ave NW at 15th Ave NW;
- NW 45th St and 11th Ave NW;
- NW 45th St and 14th Ave NW;
- NW 46th St and 14th Ave NW; and
- NW 46th St near 11th Ave NW.

The rail line also crosses several driveways on the south side of Shilshole Ave NW, including the driveways at the Stimson Marina, Salmon Bay Center, Salmon Bay Sand and Gravel, Covich-Williams Chevron, Salmon Bay Café, and Ballard Mill Marina.



Figure 7-6. Existing Conditions Transit Stops and Corridors

Trains do not regularly travel across all of the crossings. Currently, shipments destined for Salmon Bay Sand and Gravel are transferred from BNSF to BTR near the Seaview Boatyard. From this location, trains travel south and east along the BTR rail line to deliver shipments to Salmon Bay Sand and Gravel. The shipment is unloaded from the train cars, and then empty cars are moved back to the transfer location between BTR and BNSF near the Seaview Boatyard. The train engine used by BTR is stored between NW 45th St and NW 46th St just east of 14th Ave NW. Currently, shipments to Salmon Bay Sand and Gravel occur approximately three times per week (Cole, 2016). Although train movements typically occur when traffic and nonmotorized volumes are lower, such as during the night, BTR can operate trains at any time of the day.

Trains typically travel at speeds of 5 to 10 mph in the study area. Half of the crossings in the study area do not currently have safety enhancements, such as gates, advance warning signs, pavement markings, or crossbucks (signs in a letter “X” formation that indicate grade crossings). At a minimum, federal law requires all public at-grade crossings to have passive warning signs, such as crossbucks (FHWA, 2007). The following five crossings do not provide crossbucks:

- 30th Ave NW and NW 54th St (U.S. Department of Transportation [USDOT] Crossing Number 101212H);
- Shilshole Ave NW at 15th Ave NW (USDOT Crossing Number 101226R);
- NW 46th St and 14th Ave NW (USDOT Crossing Number 101246C);
- NW 46th St near 11th Ave NW (USDOT Crossing Number 101258W); and
- NW 45th St and 11th Ave NW (USDOT Crossing Number 101264A).

7.2.8 Safety

Between January 2012 and December 2014, there were 338 vehicular collisions in the study area. Roadway conditions in 2017 are similar to when collision data were collected between 2012 and 2014; these data were used to establish a baseline condition. The single block segment of Ballard Ave NW between NW Market St and 22nd Ave NW had the highest number of collisions compared to other single block segments in the study area, with 13 collisions over the 3-year period (Figure 7-7). The majority of collisions in the study area were property damage-only collisions with parked vehicles. None of the collisions were fatal.

The intersections with the highest concentrations of collisions—five or more collisions over the 3-year period—included the following (Figure 7-8):

- NW 46th St and 14th Ave NW;
- 15th Ave NW northbound and NW Leary Way;
- NW Market St and Leary Ave NW;
- NW Leary Way and 14th Ave NW; and
- NW Leary Way and 11th Ave NW.



Figure 7-7. Study Area Corridor Collisions



Figure 7-8. Study Area Intersection Collisions

Collisions involving nonmotorized users are shown in Figure 7-9. Collisions involving pedestrians or bicyclists were distributed throughout the study area, with just over half occurring between intersections (on block segments). The majority of the nine collisions with pedestrians occurred when a turning or forward-moving vehicle struck a pedestrian who was crossing the street. The cause of collisions between bicyclists and vehicles in the study area varies, although the majority of collisions occurred when both the vehicle and the bicyclist were moving. For example, many collisions occurred when a vehicle was traveling in an opposite direction to the bicyclist, such as a right-turning vehicle colliding with a forward-moving bicyclist or a turning bicyclist colliding with a forward-moving vehicle. There were no dedicated bicycle facilities in the locations where a collision between a vehicle and a bicyclist occurred, with the exception of one collision that occurred on NW 45th St between 9th Ave NW and 11th Ave NW. The existing BGT runs parallel to this location.

Nonmotorized safety in the study area is also affected by roadway conditions, including the presence of railroad tracks and other obstacles. Incident response data provided by the Seattle Fire Department indicate locations in the study area where roadway conditions could create unsafe passage for bicyclists and pedestrians (Seattle Fire Department, 2015). Between January 2012 and December 2014, there were 45 incidents in the study area. However, it is likely that additional incidents caused by roadway conditions occurred but were not recorded. As shown in Figure 7-10, incident responses have been concentrated along NW 45th St and Shilshole Ave NW, and at the intersections of NW 45th St/14th Ave NW and under the Ballard Bridge. The presence of railroad tracks in these locations presents a safety concern for nonmotorized users, particularly bicyclists, as bicycle tires can become trapped between the railroad tracks and the street. Other conditions unrelated to the railroad tracks could also result in incidents in the study area, such as falls during wet or icy roadway conditions.

In September 2013, safety improvements were made to portions of NW 45th St between Shilshole Ave NW and 11th Ave NW and to Shilshole Ave NW between NW 45th St and NW 46th St. These improvements included installation of bicycle lanes to guide bicyclists over the rail tracks, lowering traffic speeds, and conversion of NW 45th St to one-way traffic.

7.3 Potential Impacts

Potential impacts to transportation facilities and operations are described below, with impacts associated with the No Build Alternative, Impacts Common to All Build Alternatives, and impacts specific to each of the Build Alternatives being considered.

Traffic impacts would occur if a Build Alternative would increase traffic congestion and delays to a LOS E or F condition when the intersection operates at LOS D or better under the No Build Alternative (defined as an acceptable LOS). Impacts would also occur if a Build Alternative would increase the delay at intersections operating at LOS E or F under the No Build Alternative by 5 seconds or more.

Freight delay impacts would be similar to those described for general purpose traffic. Impacts on freight access to businesses were also evaluated; impacts could occur if access could no longer be provided or would be altered.

Impacts on nonmotorized users in the study area would include changes in facilities and delay for both pedestrians and bicyclists. Public transportation impacts would occur if any of the Build Alternatives altered transit stops or increased transit travel times or operations.

Impacts on freight rail would occur if freight rail movement in the study area was removed or relocated. Safety impacts would include changing the risk of motor vehicle/trail user conflicts or motor vehicle/motor vehicle conflicts, and changes in sight distance at driveways and intersections.



Figure 7-9. Study Area Collisions Involving Nonmotorized Users



Figure 7-10. Study Area Nonmotorized Incident Responses

7.3.1 No Build Alternative

Construction

No construction activities would occur under the No Build Alternative for the BGT Missing Link project; therefore, there would be no construction impacts associated with the No Build Alternative.

Operation

Roadway Network

The roadway configuration and the 63 study area intersections and driveways for the No Build Alternative would be the same as the 2015 existing conditions.

Traffic Volumes and Operations

The year 2040 was used as the timeline to analyze the impacts of the project. The project team estimated the 2040 passenger vehicle volumes for the study area intersections under No Build conditions (i.e., without the project) by applying an annual background growth rate of 0.6% to existing traffic counts in the study area (IDAX, 2015, 2017; SDOT, 2015a, 2015b). The 0.6% growth rate is consistent with the two previous transportation studies completed in 2008 and 2011 for the Missing Link (Parsons Brinckerhoff, 2008, 2011).

The projected growth in traffic volumes would result in more congestion and delay under the No Build Alternative compared to 2015 existing conditions. The following intersections are expected to operate at LOS E or F in 2040 under the No Build Alternative:

- Intersection D: NW Market St/22nd Ave NW/Leary Ave NW;
- Intersection E2: 15th Ave NW/NW Leary Way southbound off-ramp;
- Intersection K: Shilshole Ave NW/NW 17th St (southbound approach);
- Intersection L: Leary Ave NW/20th Ave NW (southbound approach on 20th Ave NW);
- Intersection M: NW 56th St/24th Ave NW (westbound approach); and
- Intersection R: NW Leary Way/17th Ave NW (southbound approach on 17th Ave NW).

All other intersections in the study area would operate at LOS D or better (Figure 7-11).

During the PM peak hour, delay at study area driveways could increase by between 0 and 61 seconds compared to existing conditions.

Freight

The primary freight corridors would be the same under the No Build Alternative compared to the 2015 existing conditions. However, increased traffic congestion from background population and employment growth would likely adversely affect freight movement in the study area. Freight vehicles would experience the same delay at study area intersections as general-purpose vehicles. Intersection K (Shilshole Ave NW/NW 17th St) and Intersection D (NW Market St/22nd Ave NW/Leary Ave NW) would operate at LOS F in 2040 and are on a primary freight corridor as designated by SDOT.



Figure 7-11. 2040 No Build Alternative PM Peak Hour Study Intersection Level of Service

Driveway activity and usage would be similar under the No Build Alternative as compared to the existing conditions. There are a number of driveways where vehicles would continue to back into or out of the driveway, which could be a hazardous maneuver when this occurs in areas with nonmotorized traffic. Vehicles backing into or out of driveways, particularly large vehicles, could have difficulty seeing other users in the area, including nonmotorized users crossing the driveway.

Nonmotorized Facilities

Pedestrian and bicycle facilities in and near the study area under the No Build Alternative would be the same as under the 2015 existing conditions. There would continue to be a gap in the BGT within the study area (between 11th Ave NW and NW 45th St and approximately 300 feet east of 32nd Ave NW and NW 54th St). Similar to existing conditions, bicyclists are anticipated to primarily use Shilshole Ave NW to travel through the study area. Also similar to existing conditions, pedestrian volumes would likely be higher on facilities near transit stops and pedestrian-heavy land uses, such as retail and commercial areas.

Pedestrian and Bicycle Volumes

Bicycle volumes in the study area are projected to increase by 5% each year between 2015 and 2040 based on recent studies and counts on the BGT, expected land use changes and growth in the Ballard area, and input from SDOT (SDOT, 2015c, 2015d; Fehr & Peers and SvR Design Company, 2011; PSRC, 2015). Pedestrian volumes are projected to increase by 1% each year between 2015 and 2040 (Sound Transit, 2010; Fehr & Peers and SvR Design Company, 2011; PSRC, 2015). Under the No Build Alternative, increased pedestrian and bicycle volumes in the study area could result in increased conflicts between nonmotorized users and vehicular traffic, particularly for bicyclists. Bicyclists currently travel on study area roadways without designated bicycle facilities, particularly on Shilshole Ave NW. When there are more bicyclists on study area streets in the future, the lack of dedicated facilities could result in more collisions between motor vehicles and bicyclists because of increased volumes.

Public Transportation

Public transportation services under the No Build Alternative would be similar to the 2015 existing conditions. With increased population and employment growth, demand for public transit would likely increase, which could result in the need for service expansion in the study area.

The intersections of NW Market St/22nd Ave NW/Leary Ave NW (Intersection D) and 15th Ave NW/NW Leary Way Northbound Off-Ramp (Intersection E2) are expected to operate at LOS E or F under the No Build Alternative. This could increase transit delay at these intersections. The intersection at NW 56th St and 24th Ave NW would operate at LOS F under the No Build Alternative, but this would not affect transit because the delay would only be experienced by vehicles at the westbound approach. Similarly, the intersections at Leary Ave NW and 20th Ave NW (Intersection L) and NW Leary Way and 17th Ave NW (Intersection R) would also operate at LOS F under the No Build Alternative, but this would not affect transit because the delay would only be experienced by vehicles at the southbound approach on 20th Ave NW and 17th Ave NW.

Freight Rail

Rail operations in the study area under the No Build Alternative are expected to be similar to the 2015 existing conditions. No impacts are anticipated under the No Build Alternative.

Safety

Traffic and nonmotorized volumes in the study area are expected to increase between 2015 and 2040. This could increase collision frequencies for both motor vehicle and nonmotorized users in the study area. Bicycle volumes are expected to grow at a higher rate than vehicles and pedestrians; therefore, the frequency of motor vehicle-bicycle collisions could increase at a greater rate under the No Build Alternative. No new dedicated bicycle facilities would be provided under the No Build Alternative. The majority of collisions between bicyclists and motor vehicles to date have occurred when both the bicyclist and the motor vehicle were moving in areas lacking dedicated bicycle facilities. If this condition persists, there could be an increased likelihood for collisions between motor vehicles and bicyclists because of increased volumes.

Other roadway conditions that influence nonmotorized safety would also remain the same under the No Build Alternative, such as the presence of railroad tracks and other obstacles. If dedicated bicycle facilities are not provided to allow bicyclists to avoid or safely traverse areas with obstacles such as railroad tracks, the number of nonmotorized incidents is expected to increase as nonmotorized volumes increase in the study area.

7.3.2 Impacts Common to All Build Alternatives

Construction

Traffic Volumes and Operations

Construction activities could affect traffic operations in the vicinity of each Build Alternative during the 12- to 18-month construction period. Construction would occur in small segments that could range between three and four street blocks; therefore, isolated portions of the roadway would be affected at any given time.

During construction, traffic delay and congestion impacts are anticipated, particularly in areas where the roadway is reduced to one lane. There could also be traffic diversions to other study area streets during construction, which could increase delay and congestion on other roadways. However, traffic delay from diversion would be minimal because diverted vehicles would likely be distributed among multiple adjacent roadways under each alternative.

Additional sources of potential traffic delay during construction could include the following:

- Visual distraction from construction activities; and
- Construction trucks entering and exiting the work zone and staging areas.

Delays resulting from these sources are likely to be temporary.

Driveway access to properties would likely be maintained during construction. It is possible that driveways could be narrowed during construction, or could be temporarily surfaced with ADA-compliant materials in place of asphalt or concrete. If properties have more than one access point, it is also possible that one driveway could be closed while the other remains open during construction. Impacts are expected to be temporary for driveway access and for traffic accessing individual properties.

Freight

The primary freight corridors are expected to be the same under any of the Build Alternatives compared to the No Build Alternative.

Freight traffic could experience temporary delays and congestion. Access to businesses in the study area would be maintained throughout construction. Because freight traffic peaks during the midday, roadway closures during the day could cause additional delay for freight vehicles. However, this impact is not anticipated to be significant because construction closures would only occur for several hours.

Nonmotorized Facilities

Pedestrian and bicyclist access would be maintained within the construction areas in accordance with City policies for construction. Commercial businesses would remain open, and residential and industrial properties would remain accessible. Sidewalks would be temporarily replaced by ADA-compliant facilities within the construction area and to access other properties. Temporary pedestrian facilities could include asphalt sidewalks, steel plates over unfinished areas, wood sidewalks with railings, or cordoned-off areas of parking lanes. When necessary during construction, nonmotorized users could be rerouted around active construction zones, which could lengthen nonmotorized trips and travel times. However, the impact would not be significant because construction is expected to occur in segments of three to four street blocks, resulting in minimal short-term re-routing.

Public Transportation

Traffic diversion to other study area streets could increase delay and congestion for transit in the study area. However, this impact would not be significant because diverted vehicles would likely be distributed among multiple adjacent roadways under each of the alternatives, reducing the delay on any specific street.

Specific construction impacts on public transportation that would only occur for the Preferred Alternative, Ballard Avenue Alternative, and Leary Alternative are described in Section 7.3.3, Section 7.3.6, and Section 7.3.7, respectively.

Freight Rail

Construction impacts on rail service would occur with the Preferred Alternative (Section 7.3.3) and Shilshole South Alternative (Section 7.3.4). Construction activities for all other Build Alternatives are not expected to affect rail operations in the study area.

Safety

Construction activities for the Build Alternatives could temporarily affect safety in the study area. Temporary changes in roadside characteristics and surfacing could increase accident frequencies in isolated locations in the study area during construction. Changes in roadside characteristics could include the presence of construction equipment and activities, the loss of shoulders, and other alterations with the potential to create distractions for drivers. Changes in roadway surfacing could affect traffic speeds and braking.

Operation

Roadway Network

All Build Alternatives would provide a dedicated nonmotorized facility for the entire length of the study area. This facility would be 10- to 12-foot wide with varying buffers on the side of the trail between the adjacent roadways and properties.

Traffic Volumes and Operations

The same projected increases in traffic, bicycle, and pedestrian volumes for the year 2040 used in the No Build Alternative analysis were also applied to each Build Alternative described below.

Freight

All alternatives would cross driveways used for freight movement. Freight vehicles would be required to stop before the trail to check for pedestrians and bicyclists before advancing to the roadway. For driveways that would be crossed by the BGT Missing Link, this could result in up to 27 seconds of additional delay, on average, above the No Build Alternative during the PM peak hour. With the anticipated volume of trail users, and because trail users would be spread out, this delay would occur sporadically during the PM peak hour and all day. However, along any of the Build Alternatives, driveways that would not cross the Missing Link would experience no increases or reductions in delay because nonmotorized users would shift to the trail.

Driveway activity and usage would be similar under any of the Build Alternatives as compared to the No Build Alternative. Backing into or out of driveways adjacent to the trail could be considered a hazardous maneuver. Vehicles backing into or out of driveways, particularly large vehicles, could have difficulty seeing other users in the area, including nonmotorized users crossing the driveway.

Some businesses that currently use the City right-of-way to access parking or loading zone spaces on their properties might need to relocate their access points to driveways or possibly to the ends of the blocks. The change in access would potentially change how private property owners use the space between their buildings and the City's right-of-way. Some businesses may not be able to access their businesses as they currently do and may have to reorient their business operations to accommodate freight by relocating loading zones or driveways.

Nonmotorized Facilities

The project would provide a dedicated 10- to 12-foot wide multi-use trail for nonmotorized users for the entire length of the study area (except for a small segment for the Shilshole South Alternative, where it narrows to 8 feet). Additional nonmotorized improvements could include curb treatments, pavement markings and treatments, signage, wayfinding, and lighting. The trail would cross driveways and loading zone spaces. These crossings would be clearly delineated, which would improve comfort and safety for nonmotorized users in the study area compared to the No Build Alternative by organizing and delineating potential conflict points between vehicles and nonmotorized users. Vehicles would be required to stop for trail users at all driveway/trail intersections.

Pedestrian and Bicycle Volumes

Between 2015 and 2040, bicycle volumes are anticipated to grow by 5% annually, and pedestrian volumes are expected to grow by 1% annually in the study area. These growth rates are based on recent studies and counts on the BGT, expected land use changes and growth in the Ballard area, and input from

SDOT (SDOT, 2015c; SDOT 2015d; Sound Transit, 2010; Fehr & Peers and SvR Design Company, 2011; PSRC, 2015). Anticipated nonmotorized volumes on the Missing Link in 2040 are summarized in Table 7-7. All nonmotorized counts were rounded to the nearest five users to account for daily fluctuations. For locations where the recorded volumes were between one and four, the count was rounded up to provide a conservative estimate of impacts. In the analysis, it is assumed that bicycle traffic would shift to the trail corridor proposed under each Build Alternative. This assumption provides the most conservative estimate of impacts under each of the Build Alternatives. For all alternatives, pedestrians and bicyclists who have destinations in other parts of the study area may use the trail through the study area for only a short distance. This would result in nonmotorized users continuing to use other roadways in the study area as well, but the majority of users would shift to the trail. For additional details on the analysis, see the Transportation Discipline Report (Parametrix, 2017).

Table 7-7. 2040 PM Peak Hour Nonmotorized Volumes on the BGT

<i>PM Peak Hour</i>	<i>Total Bicycles</i>	<i>Westbound Bicycles</i>	<i>Eastbound Bicycles</i>	<i>Total Pedestrians</i>	<i>Westbound Pedestrians</i>	<i>Eastbound Pedestrians</i>
BGT at the eastern end						
5:00–6:00 PM	430	325	105	65	45	20
BGT at the western end						
5:00–6:00 PM	160	90	70	125	85	40

The BGT Missing Link project would be designed to accommodate a high volume of nonmotorized users; therefore, Missing Link users are not expected to be affected by diversion of nonmotorized users from other parts of the study area. Signal timing for both vehicles and nonmotorized users would be included in the design at study area intersections; timing would be optimized so that delays would be minimized for nonmotorized users and vehicles.

Safety

The Missing Link would improve safety for nonmotorized users and motor vehicles in the study area. A dedicated bicycle facility would improve the predictability at conflict points between motor vehicles and cyclists and reduce the likelihood of collisions because potential conflict points would be clearly identifiable by both motor vehicle drivers and trail users. Potential conflict points would be clearly organized and delineated, which would allow motor vehicle drivers and trail users to be aware of where to travel cautiously. A dedicated facility would also reduce the likelihood of nonmotorized injury incidents by providing a facility that safely traverses or avoids obstacles in the study area such as the railroad tracks. The Missing Link would be designed to clearly delineate trail user space from the roadway, and would include safety features such as buffers, pavement markings, raised crosswalks, curb treatments, signage, and lighting.

Although overall safety would improve under any of the Build Alternatives compared to the No Build Alternative, there is potential for some new impacts depending on final design. Those potential impacts include:

- Sight distance concerns at driveway crossings;
- Conflicts between vehicles and nonmotorized users at trail crossings;
- Conflicts between nonmotorized users and trail design features, such as planter strips and curbing; and

- Conflicts between vehicles and trail design features, such as planter strips and curbing.

These potential new impacts would be minimized through detailed review during the trail design process, such as conducting detailed sight distance reviews at each driveway intersection during final design. However, these impacts may not be eliminated entirely.

Nonmotorized users on the BGT Missing Link would also be traveling in both directions on one side of the street under any of the Build Alternatives. This would require vehicles crossing the trail to look both directions for nonmotorized users before continuing across the trail. For drivers of large vehicles with reduced visibility, it could be difficult to see in both directions of travel. A number of design solutions will be considered in the final design to delineate and provide adequate sight distance for both nonmotorized users and vehicles at trail crossings.

Trail design features, such as vegetated planting areas and curbs, could be obstacles if nonmotorized users lost control of their bicycle, had to dodge other trail users, or if trail users were distracted. Similarly, vehicles could conflict with trail design features if drivers miscalculated a turning movement or veered away from their path of travel. This impact is expected to occur infrequently, as typical for other nonmotorized trails throughout the area. Trail design features would be consistent with applicable Seattle design standards, including NACTO and AASHTO guidelines.

7.3.3 Preferred Alternative

Construction

Under the Preferred Alternative, there could be traffic and freight delays on Shilshole Ave NW during construction. If construction activities require the closure of one lane of the roadway, a flagger could be required to direct travel to other routes within the construction zone. Construction would also occur on NW Market St, a transit corridor, which could temporarily increase delay for public transportation. These impacts are expected to occur for several hours during the midday but only for short segments of roadway (between three and four street blocks) at a time. Construction activities could also require temporary relocations of bus stops in the study area. Any construction activities that could affect public transportation on NW Market St would be coordinated with King County Metro.

Under the Preferred Alternative, a portion of the BTR rail line between the Hatton Marine driveway (approximately 600 feet west of 17th Ave NW) and just east of the Ballard Bridge would be removed and reconstructed in a different location. Also, pavement would be added in portions of the rail line to decrease gaps between the tracks and the roadway to improve safety at driveways in the study area. These construction activities would be coordinated with BTR operations and would occur during times when BTR trains are not operating; construction equipment would also be cleared from the tracks each day. New track could also be laid prior to removal of the old track to reduce the period of time when the tracks are unusable. As necessary, any construction activities near the BTR rail line would be coordinated with the appropriate agencies.

Operation

Roadway Network

The Preferred Alternative would provide a dedicated nonmotorized facility for the entire length of the study area. This facility would be 10- to 12-foot wide with a 1- to 10-foot wide buffer on both sides of the trail between the roadway and adjacent properties. The section of the trail on NW 54th St and NW Market St between the Ballard Locks and 24th Ave NW would have a 6- to 10-foot wide sidewalk between the south side of the trail and adjacent properties. On NW 54th St, the westbound left-turn pocket provided at

the Ballard Locks driveway that is adjacent to the Lockspot Café would be removed and replaced at 32nd Ave NW. The public angled parking lot along NW 54th St would be reoriented to provide eastbound one-way travel with angled parking.

Under the Preferred Alternative, NW 54th St and NW Market St between the Ballard Locks driveway and Shilshole Ave NW would have one lane of travel in each direction; NW Market St would also have a two-way center turn lane. In various locations, driveways would cross the trail to allow access to businesses. The roadway channelization on Shilshole Ave NW would be similar to the No Build Alternative, with one travel lane in each direction for vehicles. There are approximately 39 driveways and loading zone spaces along the alignment. To the extent necessary, driveway access to all businesses would be reconstructed and provided in the same location as the No Build Alternative, but one property on NW 54th St with two driveways could have the driveways consolidated into a single access point in coordination with SDOT and the property owner. On Shilshole Ave NW at 17th Ave NW, a left-turn pocket in the eastbound direction and new signal would be provided.

One travel lane in each direction would be provided on NW 45th St between Shilshole Ave NW and 11th Ave NW under the Preferred Alternative.

All other roadways in the study area would be the same as the No Build Alternative.

Traffic Volumes and Operations

Depending on the traffic volume at a particular driveway, vehicles exiting could experience up to 11 seconds of increased delay at driveways that would cross the Missing Link compared to the No Build Alternative. Many driveways that would not cross the trail would experience no increase or decreases in delay compared to the No Build Alternative because nonmotorized users would shift to the trail.

The Preferred Alternative would cause one intersection, NW 46th St/Shilshole Ave NW (Intersection J), to operate at LOS E that would otherwise operate at LOS D or better under the No Build Alternative. However, this delay would be experienced by a small number of vehicles and would be between the delay threshold for LOS D and E for unsignalized intersections. Mitigation is not required because the City does not have an adopted intersection LOS standard for either signalized or unsignalized intersections.

Seven intersections would operate at a different LOS or have a change in delay of at least 5 seconds when compared to the No Build Alternative (Figure 7-12).

Intersections where LOS would improve include:

- Intersection H: 11th Ave NW/NW 46th St

The intersection at 11th Ave NW and NW 46th St (Intersection H) would operate at LOS B compared to LOS C because traffic would shift from NW 46th St to NW 45th St as NW 45th St is restored to a two-way street.

- Intersection K: Shilshole Ave NW/NW 17th St

The intersection at Shilshole Ave NW and 17th Ave NW (Intersection K) would be signalized under the Preferred Alternative. This would result in improved intersection operations (LOS B compared to LOS F under the No Build Alternative).

- Intersection M: NW 56th St/24th Ave NW; Intersection N: NW Vernon Pl/Ballard Ave NW; Intersection R: NW Leary Way/17th Ave NW; and Intersection S: NW Ballard Way/17th Ave NW



Figure 7-12. Preferred Alternative PM Peak Hour Study Intersection Level of Service

Delay at these intersections would be reduced because nonmotorized users in the study area would shift to the trail. This would reduce the amount of conflicting nonmotorized and vehicle movements at the intersection, which would improve overall delay.

LOS would worsen at the following intersection:

- Intersection A: NW Market St/28th Ave NW

The intersection at NW Market St/28th Ave NW (Intersection A) would operate at LOS B compared to LOS A under the No Build Alternative. Under the Preferred Alternative, NW Market St would be reduced from four lanes to three lanes, which would increase delay during the PM peak hour. However, this intersection would still operate at an acceptable LOS.

Freight

Operations at most study area intersections are expected to have similar impacts on freight mobility under the Preferred Alternative compared to the No Build Alternative. The Preferred Alternative would cause one intersection, NW 46th St/Shilshole Ave NW (Intersection J), to operate at LOS E or F that would otherwise operate at LOS D or better under the No Build Alternative. Mitigation is not required because the City does not have an adopted intersection LOS standard for either signalized or unsignalized intersections.

Freight mobility at the intersections of 11th Ave NW and NW 46th St would be improved under the Preferred Alternative compared to the No Build Alternative. This is because NW 45th St would be restored to a two-way roadway, which would redistribute traffic in this part of the study area. Freight mobility at the intersection of Shilshole Ave NW and 17th Ave NW would also be improved under the Preferred Alternative because a signal would be provided, improving intersection operations from LOS F to LOS B compared to the No Build Alternative.

There are approximately 39 driveways and loading zone spaces along the alignment of the Preferred Alternative. At driveways, freight vehicles could be delayed by an additional 11 seconds on average during the PM peak hour. With the anticipated volume of trail users and because trail users would be spread out, this delay would occur sporadically during the PM peak hour and throughout the day. Although some driveways could experience additional delay compared to the No Build Alternative, this delay would not be considered a significant impact because this additional delay, while inconvenient, would not be expected to become severe enough to substantially affect freight operations. Please see the Economic Considerations Report (ECONorthwest, 2016) for additional detail.

Driveway activity and usage would be similar under the Preferred Alternative as compared to the No Build Alternative. Backing into or out of driveways adjacent to the trail could be considered a hazardous maneuver. Vehicles backing into or out of driveways, particularly large vehicles, could have difficulty seeing other users in the area, including nonmotorized users crossing the driveway.

Two driveways at a private property on NW 54th St could change because the BGT Missing Link would be constructed within the City's right-of-way along the south side of the street in this location. This property is served by a parking lot with two access points that could be consolidated to improve safety and decrease the number of driveway crossings while still providing adequate access to the property.

There could also be some changes in access that would potentially change how private property owners use the space between their buildings and the City's right-of-way. Some businesses may not be able to access their businesses as they currently do and may have to reorient their business operations to accommodate freight by relocating loading areas. Businesses that are currently using the public right-of-

way for loading and unloading activities may have to alter their operations under the Preferred Alternative. All other loading zone spaces and driveways along the Preferred Alternative would remain the same as the No Build Alternative.

Nonmotorized Facilities

The Preferred Alternative would provide a dedicated 10- to 12-foot wide multi-use trail for nonmotorized users for the entire length of the study area. Additional nonmotorized improvements under the Preferred Alternative could include curb treatments, pavement markings and treatments, signage, wayfinding, and lighting.

The trail would cross approximately 39 driveways and loading zone spaces under the Preferred Alternative. Trail crossings with driveways and intersections would be clearly delineated, which would improve comfort and safety for nonmotorized users in the study area compared to the No Build Alternative. The Missing Link would organize and create predictability at potential conflict points between vehicles and nonmotorized users. Vehicles would be required to stop for trail users at all driveway and trail intersections. However, after stopping before the trail, vehicles would continue forward over the trail and stop at the roadway. It is possible that vehicles blocking the trail would occasionally delay trail users during the day. On average, trail users could have to wait 15 to 25 seconds for a vehicle to clear the trail.

Signal timing for both vehicles and nonmotorized users would be included at study area intersections. Signal timing would be optimized for all movements so that delay would be minimized for nonmotorized users and vehicles.

Public Transportation

There would be minimal impacts from the Preferred Alternative on transit. At the intersection of NW Market St and 28th Ave NW, which is on a transit corridor, there could be additional delay compared to the No Build Alternative. This intersection would operate at LOS B under the Preferred Alternative compared to LOS A under the No Build Alternative. This could affect transit travel times and speeds near this intersection. However, this intersection would continue to operate at an acceptable LOS and mitigation would not be required.

Freight Rail

Under the Preferred Alternative, the BTR tracks would be relocated between the Hatton Marine driveway (approximately 600 feet west of 17th Ave NW) and just east of the Ballard Bridge. This could include removing pieces of siding, or passing rail (rail line that allows trains to pass each other) that are no longer used, or relocating track to allow additional right-of-way space for the trail. All track relocation would be coordinated with BTR so that impacts on rail operations would be minimized and so that rail operations could continue as before once construction is complete.

The Preferred Alternative would provide improved separation between nonmotorized users and the rail line, which would improve safety and provide adequate sight distance along Shilshole Ave NW. The BGT Missing Link would cross the rail line near the Ballard Mill Marina. Signage and other design elements would be provided to warn nonmotorized users of train activity.

Safety

The Preferred Alternative would improve safety for nonmotorized users and motor vehicles in the study area. Under the Preferred Alternative, a dedicated bicycle facility would improve predictability at conflict

points between motor vehicles and bicyclists and reduce the likelihood of collisions because potential conflict points would be clearly identifiable by both motor vehicle drivers and trail users. Potential conflict points would be clearly organized and delineated, which would allow motor vehicle drivers and trail users to be aware of where to travel cautiously. A dedicated facility would also reduce the likelihood of nonmotorized injury incidents by providing a facility that safely traverses or avoids obstacles in the study area such as the railroad tracks. The BGT Missing Link would be designed to clearly delineate trail user space from the roadway and would include safety features such as buffers, pavement markings, raised crosswalks, curb treatments, signage, and lighting.

Although the Preferred Alternative would improve overall safety compared to the No Build Alternative, there is potential for some new impacts depending on final design. Those potential impacts include:

- Sight distance concerns at driveway crossings with the BGT Missing Link;
- Conflicts between vehicles and nonmotorized users at trail crossings;
- Conflicts between nonmotorized users and trail design features, such as planter strips and curbing; and
- Conflicts between vehicles and trail design features, such as planter strips and curbing.

These potential new impacts would be minimized through detailed review during the trail design process, such as conducting detailed sight distance reviews at each driveway intersection during final design. However, these impacts may not be eliminated entirely. Under the Preferred Alternative, there would be sight distance concerns for exiting vehicles at four driveways on the south side of NW Market St between the Ballard Locks driveway and 26th Ave NW where buildings are constructed up to the property lines. Buildings and structures adjacent to the trail could reduce visibility for both vehicles and trail users. Sidewalks would be provided between the properties and the trail, which would improve sight distances by providing a buffer of 10 feet from the property frontage.

There could be conflicts at trail crossings with driveways and intersections, including delay for nonmotorized users and vehicles while waiting for shared areas to clear, as well as collisions. As discussed in Section 1.7, Features Common to All Build Alternatives, the final design of the trail would include safety features to reduce conflicts between trail users and vehicles. Under the Preferred Alternative, there would be no sight distance issues on Shilshole Ave NW because the BTR tracks would be relocated to allow the trail to be placed farther from property lines, as discussed in the Freight Rail section. Wherever possible at driveways along the alignment of the Preferred Alternative, signage, pavement markings, and advanced warning systems, among other safety enhancements, would be used to notify trail users and vehicle drivers that there is a trail crossing. In addition to these safety enhancements, drivers would be required to stop before continuing across the trail as described under SMC 11.58.230, which states:

“Except as directed otherwise by official traffic-control devices, the driver of a vehicle emerging from any alley, driveway, private property, or building shall stop such vehicle immediately prior to driving onto a sidewalk or onto the sidewalk area extending across any alley or driveway, or onto a public path, and shall yield the right-of-way to any pedestrian or bicyclist as may be necessary to avoid collision, and upon entering the roadway of a street shall yield the right-of-way to all vehicles approaching on the roadway.”

There would be no sight distance concerns for vehicles entering driveways because trail crossings would be clearly marked with signage, pavement markings, and other safety enhancements, and buildings would not block views of the trail. Driveway widths would be wide enough to safely accommodate industrial and commercial traffic.

Nonmotorized users on the BGT Missing Link would also be traveling in both directions on one side of the street. This would require vehicles crossing the trail to look both directions for nonmotorized users before continuing across the trail. For drivers of large vehicles with reduced visibility, it could be difficult to see in both directions of travel. As mentioned previously, a number of design solutions will be considered in the final design to delineate and provide adequate sight distance for both nonmotorized users and vehicles at trail crossings.

Trail design features, such as vegetated planting areas and curbs, could be obstacles if nonmotorized users lost control of their bicycle, had to dodge other trail users, or if trail users were distracted. Similarly, vehicles could conflict with trail design features if drivers miscalculated a turning movement or veered away from their path of travel. These impacts are expected to occur infrequently, as typical for other nonmotorized trails in the area. Trail design features would be consistent with applicable Seattle design standards, including NACTO and AASHTO guidelines.

7.3.4 Shilshole South Alternative

Construction

Under the Shilshole South Alternative, there could be traffic and freight delays on Shilshole Ave NW during construction. If construction activities require the closure of one lane of the roadway, a flagger could be required to direct travel to other routes within the construction zone. This impact could occur for several hours during the midday but only for short segments of roadway (between three and four street blocks).

Pavement would be added to portions of the BTR rail line to decrease gaps between the tracks and the roadway to improve safety at driveways in the study area. The BTR tracks could also be relocated in various isolated locations along the unimproved NW 54th St right-of-way, Shilshole Ave NW, and NW 45th St. This could include removing pieces of passing rail that are no longer used or relocating track to allow additional right-of-way space for the trail. These construction activities would be coordinated with BTR operations and would occur during times when BTR trains are not operating; construction equipment would be cleared from the tracks each day. Because construction activities near the rail line would be coordinated with BTR train movements, impacts on rail operations from construction activities would be minimized. Any construction activities near the BTR rail line would be coordinated with the BTR and any other appropriate agencies.

Operation

Roadway Network

The Shilshole South Alternative would provide a dedicated nonmotorized facility for the entire length of the study area. This facility would be 10- to 12-foot wide (except for a small segment on NW 45th St where it narrows to 8 feet) with a 1- to 6-foot wide buffer on each side of the trail between the roadway and adjacent properties.

Under the Shilshole South Alternative, the unimproved NW 54th St right-of-way between the Ballard Locks driveway and Shilshole Ave NW would allow travel in both directions; however, only one vehicle could travel in the lane at a time. In various locations, driveways would cross the trail to allow access to businesses. The roadway channelization on Shilshole Ave NW would be similar to the No Build Alternative, with one travel lane in each direction for vehicles. There are approximately 37 driveways and loading zone spaces along the alignment. To the extent necessary, driveway access to all businesses would be reconstructed and provided in the same location as the No Build Alternative, but some properties with multiple accesses could have the driveways consolidated into a single access point in

coordination with SDOT and property owners. On Shilshole Ave NW at 17th Ave NW, a left-turn pocket in the eastbound direction and new signal would be provided.

One travel lane in each direction would be provided on NW 45th St between Shilshole Ave NW and 11th Ave NW under the Shilshole South Alternative. At the intersection of 14th Ave NW and NW 45th St, a left-turn pocket would be provided in both the eastbound and westbound directions. At the intersection of 11th Ave NW and NW 45th St, a left-turn pocket would be provided in the eastbound direction. A 5- to 17-foot wide clear zone would be provided between the Ballard Bridge overpass and 11th Ave NW on NW 45th St. The 17-foot wide clear zone would be centered on the railroad tracks for clearance and safety.

All other roadways in the study area would be the same as the No Build Alternative.

Traffic Volumes and Operations

Depending on the traffic volume at a particular driveway, vehicles exiting could experience up to 11 seconds of increased delay at driveways that would cross the Missing Link compared to the No Build Alternative. However, many driveways that would not cross the trail would experience no increases or decreases in delay because nonmotorized users would shift to the trail.

The Shilshole South Alternative would cause one intersection, NW 46th St/Shilshole Ave NW (Intersection J), to operate at LOS E that would otherwise operate at LOS D or better under the No Build Alternative. However, this delay would be experienced by a small number of vehicles and would be between the delay threshold for LOS D and E for unsignalized intersections. Mitigation is not required because the City does not have an adopted intersection LOS standard for either signalized or unsignalized intersections.

Six intersections (described below) would operate at a different LOS or have a change in delay of at least 5 seconds when compared to the No Build Alternative (Figure 7-13).

Intersections where LOS would improve include:

- Intersection H: 11th Ave NW/NW 46th St

The intersection at 11th Ave NW and NW 46th St (Intersection H) would operate at LOS B compared to LOS C because traffic would shift from NW 46th St to NW 45th St as NW 45th St is restored to a two-way street.

- Intersection K: Shilshole Ave NW/17th Ave NW (southbound approach)

The intersection at Shilshole Ave NW and 17th Ave NW (Intersection K) would be signalized under the Shilshole South Alternative. This would improve intersection operations to LOS B as compared to LOS F under the No Build Alternative.

- Intersection M: NW 56th St/24th Ave NW; Intersection N: NW Vernon Pl/Ballard Ave NW; Intersection R: NW Leary Way/17th Ave NW; and Intersection S: NW Ballard Way/17th Ave NW

These intersections would experience reduced delay when compared to the No Build Alternative because some nonmotorized users in the study area would shift to the trail. This would reduce the amount of conflicting nonmotorized and vehicle movements at the intersection, which would reduce overall delay.



Figure 7-13. Shilshole South Alternative PM Peak Hour Study Intersection Level of Service

Freight

Operations at most study area intersections are expected to have similar impacts on freight mobility under the Shilshole South Alternative compared to the No Build Alternative. The Shilshole South Alternative would cause one intersection, NW 46th St/Shilshole Ave NW (Intersection J), to operate at LOS E or F that would otherwise operate at LOS D or better under the No Build Alternative. Mitigation is not required because the City does not have an adopted intersection LOS standard for either signalized or unsignalized intersections.

Freight mobility at the intersections of 11th Ave NW and NW 46th St would be improved under the Shilshole South Alternative compared to the No Build Alternative. This is because NW 45th St would be restored to a two-way roadway, which would redistribute traffic in this part of the study area. Freight mobility at the intersection of Shilshole Ave NW and 17th Ave NW would also be improved under the Shilshole South Alternative because a signal would be provided, improving intersection operations from LOS F to LOS B compared to the No Build Alternative.

Approximately 37 driveways and loading zone spaces are located along the alignment of the Shilshole South Alternative. At driveways, freight vehicles could be delayed by an additional 11 seconds (on average) above the No Build Alternative during the PM peak hour. With the anticipated volume of trail users, and because trail users would be spread out, this delay would occur sporadically during the PM peak hour and throughout the day. Although some driveways could experience additional delay compared to the No Build Alternative, this delay would not be considered a significant impact because while it would be an inconvenience, this additional delay is not expected to be substantial enough to alter freight operations. Please see the Economic Considerations Report (ECONorthwest, 2016) for additional detail.

Driveway activity and usage would be similar under the Shilshole South Alternative as compared to the No Build Alternative. Backing into or out of driveways adjacent to the trail could be considered a hazardous maneuver. Vehicles backing into or out of driveways, particularly large vehicles, could have difficulty seeing other users in the area, including nonmotorized users crossing the driveway.

Up to 10 freight access points (driveways and loading zone spaces) to private properties could change because the Missing Link would be constructed within the City's unimproved right-of-way along the north side of NW 54th St, the south side of Shilshole Ave NW, and the south side of NW 45th St. Some businesses that currently use the City right-of-way to access parking or loading zone spaces on their properties might need to relocate their access points to driveways or possibly to the ends of the blocks. The change in access would potentially change how private property owners use the space between their buildings and the City's right-of-way. Some businesses may not be able to access their businesses as they currently do, and they may have to reorient their business operations to accommodate freight by relocating loading zone spaces or driveways. Businesses that currently use the public right-of-way for loading and unloading activities would no longer be allowed to continue this unpermitted use under the Shilshole South Alternative. Properties with multiple driveways or access points may need to consolidate these where possible to improve safety and operations.

Nonmotorized Facilities

The project would provide a dedicated 8- to 12-foot wide multi-use trail for nonmotorized users for the entire length of the study area. Additional nonmotorized improvements under the Shilshole South Alternative could include curb treatments, pavement markings and treatments, signage, wayfinding, and lighting.

The trail would cross approximately 37 driveways and loading zone spaces under the Shilshole South Alternative. Trail crossings with driveways and intersections would be clearly delineated, which would

improve comfort and safety for nonmotorized users in the study area compared to the No Build Alternative. The Missing Link would organize and create predictability at potential conflict points between vehicles and nonmotorized users. Vehicles would be required to stop for trail users at all driveway and trail intersections. However, after stopping before the trail, vehicles would continue forward over the trail and stop at the roadway. It is possible that vehicles blocking the trail would occasionally delay trail users during the day. On average, trail users could have to wait 15 to 25 seconds for a vehicle to clear the trail.

Signal timing for both vehicles and nonmotorized users would be included at study area intersections. Signal timing would be optimized for all movements so that delay would be minimized for nonmotorized users and vehicles.

Public Transportation

No impacts on transit under the Shilshole South Alternative are anticipated because transit service is not available on streets along this alignment.

Freight Rail

Under the Shilshole South Alternative, the BTR tracks could be relocated in various isolated locations along the unimproved NW 54th St right-of-way, Shilshole Ave NW, and NW 45th St. This could include removing pieces of passing rail that are no longer used or relocating track to allow additional right-of-way space for the trail. All track relocation would be coordinated with BTR so that impacts on rail operations would be minimized.

The Shilshole South Alternative would improve separation between nonmotorized users and the rail line, which would improve safety. The Missing Link would cross the rail line near the Ballard Mill Marina. Signage and other design elements would be provided to warn nonmotorized users of train activity.

Safety

Safety improvements for nonmotorized users and motor vehicles in the study area as a result of the trail would be similar to those resulting from the Preferred Alternative (see Section 7.3.3). Although the Shilshole South Alternative would improve overall safety compared to the No Build Alternative, there is potential for some new impacts depending on final design. Those potential impacts include:

- Sight distance concerns at driveway crossings;
- Conflicts between vehicles and nonmotorized users at trail crossings;
- Conflicts between nonmotorized users and trail design features, such as planter strips and curbing; and
- Conflicts between vehicles and trail design features, such as planter strips and curbing.

These potential new impacts would be minimized through detailed review during the trail design process, such as conducting detailed sight distance reviews at each driveway intersection during final design. However, these impacts may not be eliminated entirely.

Under the Shilshole South Alternative, there would be sight distance concerns for exiting vehicles at up to eight driveways on the south side of the alignment between 20th Ave NW and 11th Ave NW where buildings are constructed up to the property lines. Buildings and structures adjacent to the trail could reduce visibility for both vehicles and trail users.

There could be conflicts at trail crossings with driveways and intersections, including delay for nonmotorized users and vehicles while waiting for shared areas to clear, as well as collisions. However, the final trail design would include safety features to reduce conflicts between trail users and vehicles. The placement of the trail could also be moved to locations farther from the property lines, but this would require additional relocation of the BTR tracks. The final placement of the trail would be decided during final design. Where possible, signage, pavement markings, and advanced warning systems, among other safety enhancements, would notify trail users and vehicle drivers of the trail crossing. Under SMC 11.58.230, driveways along the Shilshole South Alternative alignment would operate safely. Drivers would be required to stop before crossing the trail, which would allow drivers to look for trail users before continuing to the roadway. There would be no sight distance concerns for vehicles entering driveways because trail crossings would be clearly marked with signage, pavement markings, and other safety enhancements, and buildings would not block views of the trail. Driveways would be wide enough to safely accommodate industrial and commercial traffic.

Nonmotorized users on the BGT Missing Link would also be traveling in both directions on one side of the street. This would require vehicles crossing the trail to look in both directions for nonmotorized users before continuing across the trail. For drivers of large vehicles with reduced visibility, it could be difficult to see in both directions of travel. As discussed previously, a number of design solutions will be considered in the final design to delineate and provide adequate sight distance for both nonmotorized users and vehicles at trail crossings.

Trail design features, such as vegetated planting areas and curbs, could be obstacles if nonmotorized users lost control of their bicycle, had to dodge other trail users, or if trail users were distracted. Similarly, vehicles could conflict with trail design features if drivers miscalculated a turning movement or veered away from their path of travel. However, this impact is expected to occur infrequently, as typical for other nonmotorized trails in the area. Trail design features would be consistent with applicable Seattle design standards and NACTO and AASHTO guidelines.

7.3.5 Shilshole North Alternative

Construction

Under the Shilshole North Alternative, there could be additional traffic and freight delay during construction on Shilshole Ave NW because the roadway is a two-lane street (one lane of traffic in each direction). If construction activities would require the closure of one lane of the roadway, traffic on Shilshole Ave NW would have to be controlled by a flagger to direct travel through the construction zone. Traffic could be affected for several hours during midday.

Under the Shilshole North Alternative, construction would occur on NW Market St, a transit corridor, which could have temporary impacts on public transportation. It is possible that delay and congestion could increase as a result of traffic diversion and road closures during construction. However, these impacts would be minimal because construction would occur in segments of three or four street blocks. Construction activities could also require temporary relocations of bus stops in the study area. Any construction activities that could affect public transportation on NW Market St would be coordinated with King County Metro.

Operation

Roadway Network

The Shilshole North Alternative would provide a dedicated nonmotorized facility for the entire length of the study area. This facility would be 10- to 12-foot wide with a 3- to 11-foot wide buffer between the roadway and the trail. A sidewalk between 5- and 12-foot wide would be provided between the trail and adjacent properties. There are approximately 54 driveways and loading zones along the alignment. To the extent necessary, driveway access to all businesses would be reconstructed and provided in the same location as the No Build Alternative. However, some properties with multiple accesses could have their driveways consolidated into a single access point in coordination with SDOT and property owners.

Under the Shilshole North Alternative, NW 54th St between NW Market St and 32nd Ave NW would be a two-lane roadway with one lane in each direction. A left-turn pocket would be provided at 32nd Ave NW in the westbound direction. NW Market St between 30th Ave NW and 24th Ave NW would be a three-lane roadway with one travel lane in each direction and a two-way center-turn lane. At the intersection of NW Market St and 24th Ave NW, right- and left-turn pockets would be provided in the eastbound direction. On Shilshole Ave NW and NW 46th St, one travel lane in each direction would be provided. A signal at 17th Ave NW and Shilshole Ave NW would be provided.

All other roadways in the study area would be the same as the No Build Alternative.

Traffic Volumes and Operations

Depending on the traffic volume at a particular driveway, vehicles exiting could experience up to 10 seconds of additional delay at driveways that cross the Missing Link compared to the No Build Alternative.

The Shilshole North Alternative would cause one intersection, NW 46th St/Shilshole Ave NW (Intersection J), to operate at LOS E that would otherwise operate at LOS D or better under the No Build Alternative. However, this delay would be experienced by a small number of vehicles and would be between the delay threshold for LOS D and E for unsignalized intersections. Mitigation is not required because the City does not have an adopted intersection LOS standard for either signalized or unsignalized intersections.

Nine intersections (described below) would operate at a different LOS or have changes in delay of at least 5 seconds when compared to the No Build Alternative (Figure 7-14).

The intersections where LOS would improve include:

- Intersection H: 11th Ave NW/NW 46th St

The intersection at 11th Ave NW and NW 46th St (Intersection H) would operate better under the Shilshole North Alternative (LOS B) compared to the No Build Alternative (LOS C). This is because traffic would shift from NW 46th St to NW 45th St as NW 45th St is restored to a two-way street.

- Intersection K: Shilshole Ave NW/17th Ave NW (southbound approach)



Figure 7-14. Shilshole North Alternative PM Peak Hour Study Intersection Level of Service

The intersection at Shilshole Ave NW and 17th Ave NW (Intersection K) would be signalized under the Shilshole North Alternative. This would improve intersection operations to LOS B as compared to LOS F under the No Build Alternative.

- Intersection M: NW 56th St/24th Ave NW; Intersection N: NW Vernon Pl/20th Ave NW; Intersection R: NW Leary Way/17th Ave NW; and Intersection S: NW Ballard Way/17th Ave NW

These intersections would experience reduced delay when compared to the No Build Alternative because some nonmotorized users in the study area would likely shift to the trail. This would reduce the amount of conflicting nonmotorized and vehicle movements at the intersection, which would improve overall delay.

LOS would worsen at the following intersections:

- Intersection A: NW Market St/28th Ave NW

The intersection at NW Market St and 28th Ave NW (Intersection A) would operate at LOS B under the Shilshole North Alternative compared to LOS A under the No Build Alternative. Under the Shilshole North Alternative, NW Market St would be reduced from four lanes to three lanes, which would increase delay during the PM peak hour. However, this intersection would still operate at an acceptable LOS.

- Intersection O: NW Vernon Pl/Shilshole Ave NW and Intersection Q: Shilshole Ave NW/20th Ave NW

These intersections would both operate at LOS D compared to LOS C because the trail would cross the north leg of the intersection as it continues along Shilshole Ave NW. This would create additional delay at these intersections. This delay is not anticipated to have an adverse effect on traffic operations because the intersection would still operate at an acceptable LOS.

Freight

Operations at most study area intersections are expected to have similar impacts on freight mobility under the Shilshole North Alternative compared to the No Build Alternative. The Shilshole North Alternative would cause one intersection, NW 46th St/Shilshole Ave NW (Intersection J), to operate at LOS E or F that would otherwise operate at LOS D or better under the No Build Alternative. Mitigation is not required because the City does not have an adopted intersection LOS standard for either signalized or unsignalized intersections.

Freight mobility at the intersections of 11th Ave NW and NW 46th St would be improved under the Shilshole North Alternative compared to the No Build Alternative. This is because NW 45th St would be restored to a two-way roadway, which would redistribute traffic in this part of the study area. Freight mobility at the intersection of Shilshole Ave NW and 17th Ave NW would also be improved under the Shilshole North Alternative because a signal would be provided, improving intersection operations from LOS F to LOS B compared to the No Build Alternative.

Approximately 54 driveways and loading zone spaces are located along the alignment of the Shilshole North Alternative. At driveways, freight vehicles could be delayed from zero to 10 seconds (on average) above the No Build Alternative during the PM peak hour. With the anticipated volume of trail users, and because trail users would be spread throughout the day, this delay would occur sporadically during the PM peak hour. Although some driveways could experience additional delay compared to the No Build Alternative, this would not be considered an adverse impact because this additional delay, while inconvenient, will not be substantial enough to affect freight operations. Please see the Economic Considerations Report (ECONorthwest, 2016) for additional detail.

Driveway activity and usage would be similar under the Shilshole North Alternative as compared to the No Build Alternative. Backing into or out of driveways adjacent to the trail could be considered a hazardous maneuver. Vehicles backing into or out of driveways, particularly large vehicles, could have difficulty seeing other users in the area, including nonmotorized users crossing the driveway.

Up to six freight access points (driveways and loading zone spaces) to private properties could change because the Missing Link would be constructed within the City's right-of-way along the south side of NW 54th St/NW Market St, the north side of Shilshole Ave NW, and the north side of NW 46th St. Some businesses that currently use the City right-of-way to access parking or loading zone spaces on their properties would need to relocate their access points to driveways or possibly to the ends of the blocks. Approximately four loading zone spaces could be affected between 24th Ave NW and 17th Ave NW on Shilshole Ave NW, and two driveways on NW Market St between NW 54th St and 26th Ave NW.

The change in access could potentially change how private property owners use the space between their buildings and the City's right-of-way by preventing some businesses from accessing their properties as they currently do. This may require some property owners to reorient their business operations to accommodate freight by moving driveways or loading zone spaces. Businesses that currently use the public right-of-way for loading and unloading activities would no longer be allowed to continue this unpermitted use under the Shilshole North Alternative. Properties with multiple driveways or access points, such as properties along NW Market St with two access points to a single parking lot, may need to consolidate these to improve safety and operations. This would reduce the number of conflict points with the trail while maintaining adequate access to the properties.

Nonmotorized Facilities

The project would provide a dedicated 10- to 12-foot wide multi-use trail for nonmotorized users for the entire study area. A 3- to 11-foot wide buffer would be provided between the roadway and the trail. A sidewalk between 5- and 12-foot wide would also be provided between the trail and adjacent properties. Additional nonmotorized improvements under the Shilshole North Alternative could include curb treatments, pavement markings and treatments, signage and wayfinding, and lighting.

The trail would cross approximately 54 driveways and loading zone spaces under the Shilshole North Alternative. Trail crossings with driveways and intersections would be clearly delineated, which would improve comfort and safety for nonmotorized users in the study area. The BGT Missing Link would organize and create predictability at potential conflict points between vehicles and nonmotorized users. Vehicles would be required to stop for trail users at all driveway and trail intersections. However, after stopping before the trail, vehicles would continue forward over the trail and stop at the roadway. It is possible that vehicles blocking the trail would occasionally delay trail users during the day. On average, trail users could have to wait 15 to 25 seconds for a vehicle to clear the trail.

Public Transportation

There would be minimal impacts on transit from the Shilshole North Alternative. At the intersection of NW Market St and 28th Ave NW, which is on a transit corridor, there could be additional delay compared to the No Build Alternative. This intersection would operate at LOS B under the Shilshole North Alternative compared to LOS A under the No Build Alternative. This could affect transit travel times and speeds near this intersection. However, this intersection would operate at an acceptable LOS, and mitigation would not be required.

Freight Rail

No impacts on rail from the Shilshole North Alternative are anticipated because rail facilities and operations would not be altered.

Safety

Safety improvements for nonmotorized users and motor vehicles in the study area as a result of the trail would be similar to those resulting from the Preferred Alternative (see Section 7.3.3).

Although the Shilshole North Alternative would improve overall safety compared to the No Build Alternative, there is potential for some new impacts depending on final design. Those potential impacts include:

- Sight distance concerns at driveway crossings;
- Conflicts between vehicles and nonmotorized users at trail crossings;
- Conflicts between nonmotorized users and trail design features, such as planter strips and curbing; and
- Conflicts between vehicles and trail design features, such as planter strips and curbing.

These potential new impacts would be minimized through detailed review during the trail design process, such as conducting detailed sight distance reviews at each driveway intersection during final design. However, these impacts may not be eliminated entirely.

Under the Shilshole North Alternative, there would be sight distance concerns for exiting vehicles at approximately eight driveways on NW Market St, approximately 16 driveways on Shilshole Ave NW, and approximately four driveways on NW 46th St where buildings are constructed up to the property lines. Sidewalks would be provided between the properties and the trail, which would improve sight distances by providing a buffer of 5- to 12-foot wide from the property frontage.

There could be conflicts at trail crossings with driveways and intersections, including delay for nonmotorized users and vehicles while waiting for shared areas to clear, as well as collisions. Where possible, signage, pavement markings, and advanced warning systems, among other safety enhancements, would notify sidewalk and trail users and vehicle drivers of the trail crossing. Under SMC 11.58.230, driveways along the Shilshole North Alternative alignment would operate safely. Drivers would be required to stop before crossing the trail, which would allow drivers to look for trail users before continuing to the roadway.

There would be no sight distance concerns for vehicles entering driveways because the trail crossings would be clearly marked with signage, pavement markings, and other safety enhancements, and buildings would not block views of the trail. Driveways would be wide enough to safely accommodate industrial and commercial traffic.

Nonmotorized users on the BGT Missing Link would also be traveling in both directions on one side of the street. This would require vehicles crossing the trail to look both directions for nonmotorized users before continuing across the trail. For drivers of large vehicles with reduced visibility, it could be difficult to see in both directions of travel. As discussed previously, a number of design solutions will be considered in the final design to delineate and provide adequate sight distance for both nonmotorized users and vehicles at trail crossings.

Trail design features, such as vegetated planting areas and curbs, could be obstacles if nonmotorized users lost control of their bicycle, had to dodge other trail users, or if trail users were distracted. Similarly, vehicles could conflict with trail design features if drivers miscalculated a turning movement or veered away from their path of travel. This impact is expected to occur infrequently, as typical for other nonmotorized trails in the area. Trail design features would be consistent with applicable Seattle design standards and NACTO and AASHTO guidelines.

7.3.6 Ballard Avenue Alternative

Construction

Under the Ballard Avenue Alternative, there could be additional traffic and freight delay during construction on 28th Ave NW, NW 56th St, 22nd Ave NW, and Ballard Ave NW because these streets are two-lane streets (one lane of traffic in each direction). If construction activities require the closure of one lane of the roadway, a flagger could be required to direct travel via alternative routes within the construction zone, which could be three to four street blocks. It is expected that this impact would be minimal because roadway closures would occur temporarily during the midday for several hours.

Operation

Roadway Network

The Ballard Avenue Alternative would alter the roadway network on NW 54th St, 28th Ave NW, NW 56th St, 22nd Ave NW, Ballard Ave NW, 15th Ave NW, NW 46th St, and 11th Ave NW. The Ballard Avenue Alternative would provide a dedicated nonmotorized facility for the entire length of the study area. This facility would be 10- to 12-foot wide with a 4- to 5-foot wide buffer between the roadway and the trail. A block-long section of trail between NW Ballard Way and NW 46th St would be 20-foot wide. A sidewalk 6- to 10-foot wide would be provided between the trail and adjacent properties.

Under the Ballard Avenue Alternative, all streets along the trail alignment would have one lane in each direction (two-lane roadway), with the exception of the western right-of-way adjacent to 15th Ave NW, which would be converted to trail-only use. There are approximately 41 driveways and loading zone spaces along the alignment. To the extent necessary, driveway access to all businesses would be reconstructed and provided in the same location as the No Build Alternative, but some properties with multiple accesses could have their driveways consolidated into a single access point in coordination with the property owners. All other roadways in the study area would be the same as the No Build Alternative.

Traffic Volumes and Operations

Depending on the traffic volume at a particular driveway, vehicles exiting could experience up to 12 seconds of additional delay at driveways that cross the Missing Link compared to the No Build Alternative.

The Ballard Avenue Alternative would cause one intersection, NW 46th St/Shilshole Ave NW (Intersection J), to operate at LOS E that would otherwise operate at LOS D or better under the No Build Alternative. However, this delay would be experienced by a small number of vehicles and would be between the delay threshold for LOS D and E for unsignalized intersections. Mitigation is not required because the City does not have an adopted intersection LOS standard for either signalized or unsignalized intersections.

Seven intersections (described below) would operate at a different LOS or change in delay by at least 5 seconds when compared to the No Build Alternative (Figure 7-15).

Intersections where LOS would improve include:

- Intersection H: 11th Ave NW/NW 46th St

The intersection at 11th Ave NW and NW 46th St (Intersection H) would operate at LOS B compared to LOS C under the No Build Alternative. Traffic would shift from NW 46th St to NW 45th St because NW 45th St would be restored to a two-way street.

- Intersection K: Shilshole Ave NW/17th Ave NW (southbound approach)

The intersection at Shilshole Ave NW and 17th Ave NW (Intersection K) would operate at LOS E under the Ballard Avenue Alternative compared to LOS F under the No Build Alternative. Nonmotorized users would shift to the trail on NW Ballard Way/Ballard Ave NW rather than travel in a lane with traffic on Shilshole Ave NW. This would reduce the amount of conflicting nonmotorized and vehicle movements at the intersection, which would reduce overall delay.

- Intersection M: NW 56th St/24th Ave NW

The intersection at NW 56th St and 24th Ave NW (Intersection M) would operate at LOS C under the Ballard Avenue Alternative compared to LOS F under the No Build Alternative. Under the Ballard Avenue Alternative, this intersection would be signalized to improve safety for nonmotorized users, which would also improve operations for vehicles compared to the No Build Alternative.

- Intersection R: NW Leary Way/17th Ave NW

Delay at the intersection of NW Leary Way and 17th Ave NW (Intersection R) would be reduced by approximately 50 seconds because nonmotorized users in the study area would shift to the trail. This would reduce the amount of conflicting nonmotorized and vehicle movements at the intersection, which would reduce overall delay.

LOS would worsen at the following intersections:

- Intersection N: NW Vernon Pl/Ballard Ave NW; Intersection P: Ballard Ave NW/20th Ave NW; and Intersection S: NW Ballard Way/17th Ave NW

These intersections would experience increased delay when compared to the No Build Alternative because the trail would cross the south leg of these intersections as it continues along Ballard Ave NW. This would create additional delay at these intersections. This delay is not anticipated to have an adverse effect on traffic operations because these intersections would still operate at an acceptable LOS.

Freight

Operations at most study area intersections are expected to have similar impacts on freight mobility under the Ballard Avenue Alternative compared to the No Build Alternative. The Ballard Avenue Alternative would cause one intersection, NW 46th St/Shilshole Ave NW (Intersection J), to operate at LOS E or F that would otherwise operate at LOS D or better under the No Build Alternative. Mitigation is not required because the City does not have an adopted intersection LOS standard for either signalized or unsignalized intersections.



Figure 7-15. Ballard Avenue Alternative PM Peak Hour Study Intersection Level of Service

Freight mobility at the intersection of 11th Ave NW and NW 46th St would be improved under the Ballard Avenue Alternative compared to the No Build Alternative. This is because NW 45th St would be restored to a two-way roadway, which would redistribute traffic in this part of the study area.

Approximately 41 driveways and loading zone spaces are located along the alignment of the Ballard Avenue Alternative. At driveways, freight vehicles could be delayed an additional 12 seconds (on average) above the No Build Alternative during the PM peak hour. With the anticipated volume of trail users and because trail users would be spread throughout the day, this delay would occur sporadically during the PM peak hour. Although some driveways could experience additional delay compared to the No Build Alternative, this would not be considered as a significant impact because this additional delay, while inconvenient, is not expected to be substantial enough to alter freight operations. Please see the Economic Considerations Report (ECONorthwest, 2016) for additional detail.

Driveway activity and usage would be similar under the Ballard Avenue Alternative as compared to the No Build Alternative. Backing into or out of driveways adjacent to the trail could be considered a hazardous maneuver. Vehicles backing into or out of driveways, particularly large vehicles, could have difficulty seeing other users in the area, including nonmotorized users crossing the driveway.

Under the Ballard Avenue Alternative, up to eight freight access points (driveways and loading zone spaces) to private properties could change because the Missing Link would be constructed within the City's right-of-way along the north side of NW 54th St, the east side of 28th Ave NW, the south side of NW 56th St, the west side of 22nd Ave NW, the southwest side of Ballard Ave NW/NW Ballard Way, the south side of NW 46th St, and the east side of 11th Ave NW. Some businesses that currently use the City right-of-way to access parking or loading zone spaces on their properties would need to relocate their access points to driveways or possibly to the ends of the blocks. Up to three loading zone spaces could be affected between NW 54th St and NW Market St on 28th Ave NW.

The change in access could potentially alter how private property owners use the space between their buildings and the City's right-of-way. Some businesses may not be able to access their properties as they currently do and may have to reorient their business operations to accommodate freight by moving driveways or loading zone spaces. Businesses that currently use the public right-of-way for loading and unloading activities would no longer be allowed to continue this unpermitted use under the Ballard Avenue Alternative. Properties with multiple driveways or access points, such as properties along NW 56th St with two access points to a single parking lot, may need to consolidate access points to improve safety and operations. This would reduce the number of conflict points with the trail while maintaining adequate access to the properties.

Nonmotorized Facilities

The Ballard Avenue Alternative would provide a dedicated 10- to 12-foot wide multi-use trail for nonmotorized users for the entire study area. A 4- to 5-foot wide buffer would be provided between the roadway and the trail. A sidewalk 6- to 10-foot wide would also be provided between the trail and properties along NW 54th St, 28th Ave NW, NW 56th St, 22nd Ave NW, Ballard Ave NW, NW 46th St, and 11th Ave NW. Additional nonmotorized improvements under the Ballard Avenue Alternative could include curb treatments, pavement markings and treatments, signage, wayfinding, and lighting. Curb bulbs would be provided at most intersections along the alignment.

The trail would cross approximately 41 driveways and loading zone spaces under the Ballard Avenue Alternative. Trail crossings with driveways and intersections would be clearly delineated, which would improve comfort and safety for nonmotorized users in the study area. The Missing Link would organize and create predictability at potential conflict points between vehicles and nonmotorized users. Vehicles would be required to stop for trail users at all driveway and trail intersections. However, after stopping

before the trail, vehicles would continue forward over the trail and stop at the roadway. It is possible that vehicles blocking the trail would occasionally delay trail users during the day. On average, trail users could have to wait 15 to 25 seconds for a vehicle to clear the trail.

Public Transportation

No impacts on transit under the Ballard Avenue Alternative are anticipated because there would be no additional delay on transit corridors compared to the No Build Alternative.

Freight Rail

No impacts on rail from the Ballard Avenue Alternative are anticipated because rail operations and facilities would not be altered.

Safety

Safety improvements for nonmotorized users and motor vehicles in the study area as a result of the trail would be similar to those from the Preferred Alternative (see Section 7.3.3).

Although the Ballard Avenue Alternative would improve overall safety compared to the No Build Alternative, there is potential for some new impacts depending on final design. Those potential impacts include:

- Sight distance concerns at driveway crossings;
- Conflicts between vehicles and nonmotorized users at trail crossings;
- Conflicts between nonmotorized users and trail design features, such as planter strips and curbing; and
- Conflicts between vehicles and trail design features, such as planter strips and curbing.

These potential new impacts would be minimized through detailed review during the trail design process, such as conducting detailed sight distance reviews at each driveway intersection during final design. However, these impacts may not be eliminated entirely.

Under the Ballard Avenue Alternative, there could be sight distance concerns for exiting vehicles at up to 16 driveways on the southwest/south side of Ballard Ave NW/NW Ballard Way and up to two driveways on the south side of NW 46th St where buildings are constructed up to the property lines. Sidewalks would be provided between the adjacent properties and the trail, which would improve sight distances by providing a buffer of 7 to 10 feet from the property frontage.

There could be conflicts at trail crossings with driveways and intersections, including delay for nonmotorized users and vehicles while waiting for shared areas to clear, as well as collisions. The final trail design would include safety features to reduce conflicts between trail users and vehicles. Where possible, signage, pavement markings, and advanced warning systems, among other safety enhancements, would notify sidewalk and trail users and vehicles of the trail crossing. Under SMC 11.58.230, driveways along the Ballard Avenue Alternative would operate safely. Drivers would be required to stop before crossing the trail, which would allow drivers to look for trail users before continuing to the roadway.

There would be no sight distance concerns for vehicles entering driveways because trail crossings would be clearly marked with signage, pavement markings, and other safety enhancements, and buildings would not block views of the trail. Driveways would be wide enough to safely accommodate commercial traffic.

Nonmotorized users on the BGT Missing Link would also be traveling in both directions on one side of the street. This would require vehicles crossing the trail to look both directions for nonmotorized users before continuing across the trail. For drivers of large vehicles with reduced visibility, it could be difficult to see in both directions of travel. As discussed previously, a number of design solutions will be considered in the final design to delineate and provide adequate sight distance for both nonmotorized users and vehicles at trail crossings.

Trail design features, such as vegetated planting areas and curbs, could be obstacles if nonmotorized users lost control of their bicycle, had to dodge other trail users, or if trail users were distracted. Similarly, vehicles could conflict with trail design features if drivers miscalculated a turning movement or veered away from their path of travel. This impact is expected to occur infrequently, as typical for other nonmotorized trails in the area. Trail design features would be consistent with applicable Seattle design standards and NACTO and AASHTO guidelines.

There could be potential safety impacts associated with the Ballard Farmers Market under the Ballard Avenue Alternative. The market occurs every Sunday, year-round, and takes place on Ballard Ave NW between Vernon Pl and 22nd Ave NW and on 22nd Ave NW between Ballard Ave NW and NW Market St. When the market is open, Ballard Ave NW between Vernon Pl and 22nd Ave NW and 22nd Ave NW between Ballard Ave NW and NW Market St is closed to vehicle traffic to accommodate market stalls, which are set up in the right-of-way. The market attracts a large number of pedestrians to the area when open, which could conflict with trail use. The potential for collisions between trail users and visitors to the market could be a safety concern under the Ballard Avenue Alternative. Additional information on the Farmers Market is presented in Chapter 5, Recreation.

7.3.7 Leary Alternative

Construction

Under the Leary Alternative, there could be additional traffic and freight delay during construction on 11th Ave NW, a two-lane street (one lane of traffic in each direction). If construction activities require the closure of one lane of the roadway, a flagger could be required to direct travel to alternative routes through the construction zone. This impact would likely be minimal.

Under the Leary Alternative, construction would occur on a transit corridor, which could have temporary impacts on public transportation similar to those described for general-purpose traffic. Increases in delay and congestion from traffic diversion and road closures could be possible during construction. However, these impacts are expected to be minimal because construction would occur in segments of three to four street blocks. Construction activities could also require temporary relocations of bus stops in the study area. Any construction activities that could affect public transportation would be coordinated with King County Metro.

Operation

Roadway Network

The Leary Alternative would provide a dedicated nonmotorized facility for the entire length of the study area. This facility would be 10- to 12-feet wide with a 3- to 13-foot wide buffer between the roadway and the trail. A sidewalk 6- to 10-feet wide would be provided between the trail and adjacent properties.

Under the Leary Alternative, NW Market St and Leary Ave NW/NW Leary Way would no longer be two lanes in each direction (four-lane roadway) along the trail alignment; these streets would have one travel

lane in each direction and a center two-way left-turn lane (three-lane roadway). NW 54th St would have one travel lane in each direction (two-lane roadway), similar to existing conditions.

At the intersection of NW Market St and 24th Ave NW, right- and left-turn lanes would be provided in the eastbound and westbound directions. At the NW Leary Way and 15th Ave NW intersection, left-turn lanes would be provided in the eastbound and westbound directions.

There are approximately 29 driveways and loading zone spaces along the alignment. To the extent necessary, driveway access to all businesses would be reconstructed and provided in the same location as the No Build Alternative. However, some properties with multiple access points could have their driveways consolidated into a single access point in coordination with the City and property owners.

All other roadways in the study area would be the same as the No Build Alternative.

Traffic Volumes and Operations

Depending on the traffic volume at a particular driveway, vehicles exiting could experience up to 27 seconds of additional delay at driveways that cross the Missing Link compared to the No Build Alternative.

The Leary Alternative would cause the intersections of 15th Ave NW/NW Leary Way southbound off-ramp, NW Leary Way/11th Ave NW, and NW 46th St/Shilshole Ave NW (Intersections E1, G, and J) to operate at LOS E or worse that would otherwise operate at LOS D or better under the No Build Alternative. In addition, this alternative would cause delay to increase by 5 seconds or more at the intersection of 15th Ave NW/NW Leary Way northbound off-ramp (Intersection E2) that operates at LOS E or worse under both alternatives.

Because NW Leary Way/Leary Ave NW would be reduced from four lanes to three lanes to accommodate the trail, intersections E1 and G on NW Leary Way/Leary Ave NW would operate at LOS D or better under the No Build Alternative and LOS E or F under the Leary Alternative. The delay at Intersection E2 would increase by more than 5 seconds under the Leary Alternative compared to the No Build Alternative even though the intersection would operate at LOS E or F under both alternatives. Mitigation is not required because the City does not have an adopted intersection LOS standard for either signalized or unsignalized intersections.

The Leary Alternative would also cause NW 46th St/Shilshole Ave NW (Intersection J) to operate at LOS E that would otherwise operate at LOS D or better under the No Build Alternative. However, this delay would be experienced by a small number of vehicles and would be between the delay threshold for LOS D and E for unsignalized intersections. Mitigation is not required because the City does not have an adopted intersection LOS standard for either signalized or unsignalized intersections.

Eight additional intersections would operate at a different LOS or experience a change in delay of at least 5 seconds when compared to the No Build Alternative. These intersections are described below and shown in Figure 7-16.

The intersections where LOS would improve include:

- Intersection H: 11th Ave NW/NW 46th St

The intersection at 11th Ave NW and NW 46th St (Intersection H) would operate at LOS B compared to LOS C under the No Build Alternative. Traffic would shift from NW 46th St to NW 45th St because NW 45th St would be restored to a two-way street.



Figure 7-16. Leary Alternative PM Peak Hour Study Intersection Level of Service

- Intersection K: Shilshole Ave NW/17th Ave NW (southbound approach); Intersection M: NW 56th St/24th Ave NW; Intersection N: NW Vernon Pl/Ballard Ave NW; and Intersection S: NW Ballard Way/17th Ave NW

These intersections would experience reduced delay under the Leary Alternative compared to the No Build Alternative. Trail users would shift to the trail, which would reduce the amount of conflicting nonmotorized and vehicle movements at the intersection.

- Intersection R: NW Leary Way/17th Ave NW

The intersection at NW Leary Way/17th Ave NW (Intersection R) would have between approximately 40 seconds less delay under the Leary Alternative because the southbound turning movements at 17th Ave NW would no longer be conflicting with bicyclists riding in-lane with traffic, which would improve overall delay.

LOS would worsen at the following intersections:

- Intersection A: NW Market St/28th Ave NW

The intersection at NW Market St and 28th Ave NW (Intersection A) would operate at LOS B under the Leary Alternative compared to LOS A under the No Build Alternative. Under the Leary Alternative, NW Market St would be reduced from four lanes to three lanes, which would increase delay during the PM peak hour. However, this intersection would still operate at an acceptable LOS.

- Intersection F: NW Leary Way/14th Ave NW

Intersection F would operate at an acceptable LOS under the No Build Alternative and the Leary Alternative, but LOS would be reduced to LOS D from LOS A. This is because NW Leary Way/Leary Ave NW would be reduced from four lanes to three lanes to accommodate the trail.

Freight

The Leary Alternative would cause the following four intersections to operate at LOS E or F that would otherwise operate at LOS D or better under the No Build Alternative:

- Intersection E1: 15th Ave NW/NW Leary Way southbound off-ramp;
- Intersection E2: 15th Ave NW/NW Leary Way northbound off-ramp;
- Intersection G: NW Leary Way/11th Ave NW; and
- Intersection J: NW 46th St/Shilshole Ave NW.

The decline in LOS experienced on these corridors is described in the previous section. Mitigation is not required because the City does not have an adopted intersection LOS standard for either signalized or unsignalized intersections.

Intersection operations at the following intersections would be similar to or improve under the Leary Alternative when compared to the No Build Alternative:

- Intersection H (11th Ave NW and NW 46th St) would experience improvements in freight mobility because NW 45th St would be restored to a two-way roadway, which would redistribute traffic in this part of the study area.

- Intersections K, L, M, Q, and R would experience improvements in freight mobility because trail users would shift to the trail on NW Leary Way/Leary Ave NW rather than ride in a lane with traffic on Shilshole Ave NW.
- Intersections B and I would have similar amounts of delay under the Leary Alternative compared to the No Build Alternative.

The following two intersections would operate at a lower LOS under the Leary Alternative when compared to the No Build Alternative:

- Intersection A: NW Market St/28th Ave NW, and
- Intersection F: NW Leary Way/14th Ave NW.

However, this would not be considered a significant impact because the intersections would still operate at an acceptable LOS.

Freight mobility could be affected on NW Leary Way between 15th Ave NW and the eastern edge of the study area because NW Leary Way would be reduced by one lane in each direction. The decline in LOS experienced on these corridors is described in the previous section.

There are approximately 29 driveways and loading zone spaces along the alignment of the Leary Alternative. At driveways, freight vehicles could be delayed an additional 27 seconds (on average) above the No Build Alternative during the PM peak hour. With the anticipated volume of trail users and because trail users would be spread throughout the day, this delay would occur sporadically during the PM peak hour. Although some driveways could experience additional delay compared to the No Build Alternative, this would not be considered as a significant impact because this additional delay is not expected to substantially alter freight operations. Please see the Economic Considerations Report (ECONorthwest, 2016) for additional detail.

Driveway activity and usage would be similar under the Leary Alternative as compared to the No Build Alternative. Backing into or out of driveways adjacent to the trail could be considered a hazardous maneuver. Vehicles backing into or out of driveways, particularly large vehicles, could have difficulty seeing other users in the area, including nonmotorized users crossing the driveway.

Up to three freight access points (driveways and loading zone spaces) to private properties could change because the Missing Link would be constructed within the City's right-of-way along the south side of NW 54th St/NW Market St, the southwest side of Leary Ave NW/NW Leary Way, and the east side of 11th Ave NW. Some businesses that currently use the City right-of-way to access parking or loading zone spaces on their properties might need to relocate their access points to driveways or possibly to the ends of the blocks so as not to block the trail. Two driveways on NW Market St and one driveway on NW Leary Way/Leary Ave NW might need to be moved.

The change in access could potentially change how private property owners use the space between their buildings and the City's right-of-way. Some businesses may not be able to access their properties as they currently do, and may have to reorient their business operations to accommodate freight by relocating access. Properties with multiple driveways or access points, such as properties along NW 54th St with two access points to a single parking lot, may need to consolidate access points to improve safety and operations. This would reduce the number of conflict points with the trail while maintaining adequate access to the properties.

Nonmotorized Users

The Leary Alternative would provide a dedicated 10- to 12-foot wide multi-use trail for nonmotorized users for the entire study area. A 3- to 13-foot wide buffer would be provided between the roadway and the trail. A sidewalk 6- to 10-foot wide would also be provided between the trail and adjacent properties. Curb bulbs would be provided at most study area intersections. Additional nonmotorized improvements under the Leary Alternative could include curb treatments, pavement markings and treatments, signage and wayfinding, and lighting.

The trail would cross approximately 29 driveways and loading zone spaces under the Leary Alternative. Trail crossings with driveways and intersections would be clearly delineated, which would improve comfort and safety for nonmotorized users in the study area. Vehicles would be required to stop for trail users at all driveway and trail intersections. However, after stopping before the trail, vehicles would continue forward over the trail and stop at the roadway. It is possible that vehicles blocking the trail would occasionally delay trail users during the day. On average, trail users could have to wait 15 to 25 seconds for a vehicle to clear the trail.

Public Transportation

Under the Leary Alternative, impacts on public transportation would be similar to those described for general-purpose traffic on NW Leary Way/Leary Ave NW and NW Market St, which are both transit corridors. Additional congestion and delay at intersections on these streets could affect public transportation service on King County Metro Routes 17, 18, 29, 40, 44, and RapidRide D.

Freight Rail

No impacts on rail are anticipated from the Leary Alternative because rail operations and facilities would not be altered.

Safety

Safety improvements for nonmotorized users and motor vehicles in the study area as a result of the trail would be similar to those for the Preferred Alternative (see Section 7.3.3).

Although the Leary Alternative would improve overall safety compared to the No Build Alternative, there is potential for some new impacts depending on the final design. Those potential impacts include:

- Sight distance concerns at driveway crossings;
- Conflicts between vehicles and nonmotorized users at trail crossings;
- Conflicts between nonmotorized users and trail design features, such as planter strips and curbing; and
- Conflicts between vehicles and trail design features, such as planter strips and curbing.

These potential new impacts would be minimized through detailed review during the trail design process, such as conducting detailed sight distance reviews at each driveway intersection during final design. However, these impacts may not be eliminated entirely.

Under the Leary Alternative, there could be sight distance concerns for exiting vehicles at up to nine driveways on the southwest/south side of Leary Ave NW/NW Leary Way and up to eight driveways on the south side of NW Market St, where buildings are constructed up to the property lines. Sidewalks

would be provided between the properties and the trail, which would improve sight distances by providing a buffer of 8- to 10-feet wide from the property frontage.

There could be conflicts at trail crossings with driveways and intersections, including delay for nonmotorized users and vehicles while waiting for shared areas to clear, as well as collisions. The final design of the trail would include safety features to reduce conflicts between trail users and vehicles. Where possible, signage, pavement markings, and advanced warning systems, among other safety enhancements, would notify sidewalk and trail users and motorists of the trail crossing. Under SMC 11.58.230, driveways along the Leary Alternative would operate safely. There would be no sight distance concerns for vehicles entering driveways because trail crossings would be clearly marked with signage, pavement markings, and other safety enhancements, and buildings would not block views of the trail. Driveways would be wide enough to safely accommodate industrial and commercial traffic.

The Leary Alternative would reduce the existing sidewalk on NW Market St between 24th Ave NW and 22nd Ave NW by up to 12 feet to accommodate the Missing Link. This location is a heavy-use pedestrian corridor, and the potential for conflicts between pedestrians and trail users could increase if the sidewalk were narrowed to accommodate the trail. Safety improvements, such as pavement variations and signage, could be used to slow trail user traffic through this portion of the Leary Alternative.

Nonmotorized users on the BGT Missing Link would also be traveling in both directions on one side of the street. This would require vehicles crossing the trail to look in both directions for nonmotorized users before continuing across the trail. For drivers of large vehicles with reduced visibility, it could be difficult to see in both directions of travel. As discussed previously, a number of design solutions will be considered in final design to delineate and provide adequate sight distance for both nonmotorized users and vehicles at trail crossings.

Trail design features, such as vegetated planting areas and curbs, could be obstacles if nonmotorized users lost control of their bicycle, had to dodge other trail users, or if trail users were distracted. Similarly, vehicles could conflict with trail design features if drivers miscalculated a turning movement or veered away from their path of travel. This impact is expected to occur infrequently, as typical for other nonmotorized trails in the area. Trail design features would be consistent with applicable Seattle design standards and NACTO and AASHTO guidelines.

7.3.8 Connector Segments

Construction

Construction impacts on traffic volumes and operations, freight, nonmotorized users, public transportation, rail, and safety would be similar among all of the connector segments to those described for the Build Alternatives.

Operation

The specific design and impacts of the connector segments would depend on which alignments were being connected. Potential impacts associated with any connector segment could include the following:

- Increased intersection delay for general-purpose vehicles, freight, and public transportation;
- Altered loading zone space and driveway access for businesses;
- Pedestrian congestion if sidewalks are reduced; and
- Potential sight distance concerns at driveways.

However, improvements on any of the connector segments would improve safety and comfort for nonmotorized users and vehicles.

7.4 Avoidance, Minimization, and Mitigation Measures

7.4.1 Measures Common to All Alternatives

Construction

To mitigate impacts from construction, SDOT will require the contractor to develop a Traffic Control Plan to reduce impacts on traffic operations and to protect and control motor vehicle, pedestrian, and bicycle traffic during all phases of construction. The plan would be developed in accordance with City construction specifications and would be updated as appropriate for each construction phase. The plan would outline specific impact-reducing measures, which could include the following:

- Clearly marked detours for motor vehicles, developed in coordination with other agencies and adjacent construction projects, to provide alternative routes for access through the study area and to avoid active construction areas;
- Accommodations for vehicles that require loading zone access to properties for services such as business deliveries, taxi and bus service, and garbage pickup;
- Use of flaggers, uniformed police officers, barricades, signing, or other traffic control devices;
- Designated construction haul routes to minimize construction traffic impacts on other roadways;
- Accommodations for oversized freight vehicles to travel through construction zones, if necessary, during road closures;
- Clearly marked pedestrian and bicycle access routes as well as proposed locations of detour signage and other wayfinding elements; accessible routes would be within a reasonable distance of temporarily closed trails and other pathways;
- Transit stop closures, alternative transit stop locations, and interim transit routes developed and publicized in coordination with King County Metro;
- Arrangements for emergency access to and travel through construction areas to minimize impacts on emergency response times, developed in coordination with emergency response providers; and
- Maintenance of rail facilities and operations to minimize impacts on freight rail service, developed in coordination with BTR in accordance with Federal Railroad Administration specifications.

The City would maintain access to private property to the maximum extent feasible, and would notify property owners in advance of activities that might temporarily limit access. In addition, SDOT would coordinate with businesses affected by construction to provide wayfinding information for customers and support other outreach activities to minimize the potential adverse impacts of construction.

Operation

Avoidance, minimization, and mitigation measures for potential impacts on operations under each alternative are described below.

SDOT will work with individual property and business owners, as well as with interested stakeholders and the general public, throughout the design process. Roadway modifications, intersection treatments,

driveway design, and parking lot changes will be incorporated during the final design phase of the project to address safety, access, nonmotorized users, and vehicle types. Similar concepts can be found implemented throughout Seattle, consistent with Seattle design standards and presented in design documents such as the NACTO Urban Bikeway Design Guide (NACTO, 2015), and AASHTO Guide for Development of Bicycle Facilities (AASHTO, 2012). Roadway designs would vary for each alternative based on factors such as intersection geometry, vehicle volumes, and types of vehicles. These roadway design considerations would be discussed with business owners, with the understanding that SDOT would make final design decisions.

7.4.2 Measures Specific to Each Alternative

Preferred Alternative

Traffic Operations

The intersection at NW 46th St and Shilshole Ave NW (Intersection J) is anticipated to operate at LOS E or worse under the Preferred Alternative when it would operate at LOS D or better under the No Build Alternative. Mitigation is not required because the City does not have an adopted intersection LOS standard for either signalized or unsignalized intersections. However, further monitoring of traffic volumes and intersection operations at this intersection could be completed in the future to determine if signalization is needed.

Freight

Mitigation for freight would be similar as described for traffic operations.

Two access points to a business along NW 54th St could be combined into one access point to improve safety and operations along the Missing Link. Because access to the parking lot can be accommodated by a single access point, combining access points would not be considered an impact. This would decrease the potential driveway conflicts while not significantly affecting business access.

Nonmotorized Users

Under the Preferred Alternative, nonmotorized facilities and comfort in the study area would be improved compared to the No Build Alternative. Therefore, no mitigation measures would be required.

Public Transportation

The Preferred Alternative is not expected to adversely affect public transportation compared to the No Build Alternative. Therefore, no mitigation measures would be necessary.

Freight Rail

The Preferred Alternative would require relocation of the BTR tracks between the Hatton Marine driveway (approximately 600 feet west of 17th Ave NW) and just east of the Ballard Bridge. All track relocation would be coordinated with BTR so that impacts to rail operations would be minimized. BTR would complete removal and reconstruction of any track segments prior to construction of the BGT Missing Link.

Safety

The Preferred Alternative would improve safety in the study area compared to the No Build Alternative by providing a dedicated facility for nonmotorized users. The final design would also include safety

considerations so that the trail operates safely, such as buffers, pavement markings, raised crosswalks, curb treatments, signage, and lighting.

In locations with sight distance concerns, design elements such as pavement markings, signage, or bubble mirrors could be used to further improve safety. Variations in the use of asphalt and concrete, different paint or thermoplastic striping and symbols, and elevations at driveway entrances could be used to clearly identify where the trail intersects driveways. Driveway notification signage could be used to maintain trail usage at safe speeds and to notify trail users and vehicles that a trail intersection exists. Therefore, no additional mitigation would be required.

SDOT will work with individual property and business owners, as well as with key stakeholders, the bicycle and pedestrian community, and the general public, throughout the design process to determine the best means of reducing potential conflicts along the trail alignment. During the design process, SDOT will evaluate improvements, such as intersection signalization or advanced warning systems with vehicle detection that activates elevated flashing beacons that could be used to improve safety at key intersections or driveways. In coordination with businesses, driveways could also be combined into fewer access points to reduce the number of conflict locations.

Shilshole South Alternative

Traffic Operations

The intersection at NW 46th St and Shilshole Ave NW (Intersection J) is anticipated to operate at LOS E or worse under the Shilshole South Alternative, compared to intersections that operate at LOS D or better under the No Build Alternative. Mitigation measures would be similar to those described for the Preferred Alternative.

Freight

Mitigation measures for freight delay would be similar to those mentioned above for traffic operations.

Up to 10 freight access points to businesses along the unimproved NW 54th St right-of-way, Shilshole Ave NW, and NW 45th St could be reoriented to improve safety and operations along the Missing Link. To mitigate this impact, SDOT would coordinate with affected businesses to reorient their access points to access driveways or possibly to the ends of the blocks. This could result in different access locations, but overall access to properties would be maintained.

Nonmotorized Users

Under the Shilshole South Alternative, nonmotorized facilities and comfort in the study area would be improved compared to the No Build Alternative. Therefore, no mitigation measures would be required.

Public Transportation

The Shilshole South Alternative is not expected to adversely affect public transportation compared to the No Build Alternative. Therefore, no mitigation measures would be necessary.

Freight Rail

Mitigation measures for impacts to freight rail would be similar to those described for the Preferred Alternative.

Safety

Mitigation measures for safety would be similar to those described for the Preferred Alternative.

Shilshole North Alternative

Traffic Operations

The intersection at NW 46th St and Shilshole Ave NW (Intersection J) is anticipated to operate at LOS E or worse under the Shilshole North Alternative, compared to intersections that operate at LOS D or better under the No Build Alternative. Mitigation measures would be similar to those described for the Preferred Alternative.

Freight

Mitigation measures for freight delay would be similar to those mentioned above for traffic operations.

Mitigation measures for changes to access points to businesses would be similar to those described for the Shilshole South Alternative.

Nonmotorized Users

Under the Shilshole North Alternative, nonmotorized facilities and comfort in the study area would be improved compared to the No Build Alternative. Therefore, no mitigation measures would be required.

Public Transportation

The Shilshole North Alternative is not expected to adversely affect public transportation compared to the No Build Alternative. Therefore, no mitigation measures would be necessary.

Freight Rail

The Shilshole North Alternative is not expected to adversely affect rail compared to the No Build Alternative. Therefore, no mitigation measures would be necessary.

Safety

Mitigation measures for safety would be similar to those described for the Preferred Alternative.

Ballard Avenue Alternative

Traffic Operations

The intersection at NW 46th St and Shilshole Ave NW (Intersection J) is anticipated to operate at LOS E or F under the Ballard Avenue Alternative, compared to intersections that operate at LOS D or better under the No Build Alternative. Mitigation measures would be similar to those described for the Preferred Alternative.

Freight

Mitigation measures for freight delay would be similar to those mentioned above for traffic operations.

Mitigation measures for changes to access points to businesses would be similar to those described for the Shilshole South Alternative.

Nonmotorized Users

Under the Ballard Avenue Alternative, nonmotorized facilities and comfort in the study area would be improved compared to the No Build Alternative. Therefore, no mitigation measures would be required.

There could be some impacts on nonmotorized users and mobility near the Ballard Farmers Market during operating hours. Potential mitigation measures could include requiring nonmotorized users to walk through the market area during operating hours, or closing the trail near the market during operating hours.

Public Transportation

The Ballard Avenue Alternative is not expected to adversely affect public transportation compared to the No Build Alternative. Therefore, no mitigation measures would be necessary.

Freight Rail

The Ballard Avenue Alternative is not expected to adversely affect rail compared to the No Build Alternative. Therefore, no mitigation measures would be necessary.

Safety

Mitigation measures for safety would be similar to those described for the Preferred Alternative. In addition, pedestrian safety near the Ballard Farmers Market during operating hours could be affected by the BGT Missing Link project under the Ballard Avenue Alternative. To mitigate this impact, SDOT could require trail users to walk through the market area during operating hours, or the BGT Missing Link in the market area could be closed during operating hours.

Leary Alternative

Traffic Operations

The Leary Alternative would cause three intersections to operate at LOS E or worse that would otherwise operate at LOS D or better under the No Build Alternative (Intersections E1, G, and J). The Leary Alternative would also cause delay increases by 5 seconds or more at one intersection that operates at LOS E or worse under both alternatives (Intersection E2). The additional delay that would be experienced at Intersections E1, E2, and G would likely occur only during the PM peak hour when traffic volumes are highest. Also, the City does not have an adopted intersection LOS standard; therefore, mitigation is not required for these four intersections.

Because the right-of-way on NW Market St and Leary Ave NW/Leary Way NW is constrained, additional parking loss would result if SDOT were to maintain four travel lanes to mitigate additional delay at E1, E2, and G.

The intersection of NW 46th St and Shilshole Ave NW (Intersection J) would operate at LOS E under the Leary Alternative compared to LOS A under the No Build Alternative. Mitigation measures would be similar those described for the Preferred Alternative.

Freight

Mitigation measures for freight delay would be similar to those mentioned above for traffic operations.

Mitigation measures for changes to access points to businesses would be similar to those described for the Shilshole South Alternative.

Nonmotorized Users

Under the Leary Alternative, the sidewalk width on NW Market St between 24th Ave NW and 22nd Ave NW would be reduced to accommodate the Missing Link. This could create some pedestrian congestion on the sidewalk; however, the multi-use trail would alleviate some pedestrian congestion. Design elements such as landscaping, pavement variations and markings, and signage could be used to mitigate impacts. Elsewhere in the study area, nonmotorized facilities and comfort would be improved compared to the No Build Alternative.

Public Transportation

The Leary Alternative could affect public transportation on Leary Ave NW/NW Leary Way. SDOT could evaluate mitigation measures such as queue jumps to mitigate transit impacts under the Leary Alternative. Queue jumps are additional travel lanes provided for transit vehicles only that give transit priority over general-purpose vehicles at intersections. Queue jumps are often accompanied by a signal with an early green light for transit vehicles only.

Freight Rail

The Leary Alternative would not adversely affect rail compared to the No Build Alternative. Therefore, no mitigation measures would be necessary.

Safety

Mitigation measures for the reduction in sidewalk width on NW Market St would be similar to those mentioned above for nonmotorized users. Mitigation for other safety impacts would be similar to those described for the Preferred Alternative.