Ballard Interbay Regional Transportation System (BIRT) Study

Appendix D: Multimodal Needs Assessment

November 2020

Seattle Department of Transportation

Ballard-Interbay Regional Transportation System:

Multimodal Needs Assessment – Background Report

Prepared for:
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FEHR & PEERS

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Introduction

This background report describes existing and anticipated future conditions in the study area for the Ballard-Interbay Regional Transportation (BIRT) project. It identifies existing and possible future deficiencies and highlights areas in need of access and comfort improvements for all modes of travel – walking, bicycling, taking transit, driving and moving freight. Each chapter of this report covers the unique needs and opportunities for each mode within the study area. This analysis will be used to identify potential projects in the study area that improve transportation access and comfort for people using the system, which will subsequently be evaluated for inclusion in the final BIRT report to the Washington State Legislature.

Study Area & Adopted Plans

Figure 1: Study Area illustrates the BIRT project study area, which includes the Ballard, Interbay, Magnolia, and Queen Anne neighborhoods. The study area is generally bound by NW Market Street to the north, Terminal 91 and the Expedia campus to the South, 10th Avenue West to the east, and 28th Avenue West to the west. The Ballard and Interbay neighborhoods are experiencing significant residential and employment growth, and the Ballard-Interbay-Northend Manufacturing and Industrial Center (BINMIC) is an important local and regional economic and employment asset. The BINMIC includes maritime, commercial, and industrial uses, local and regional freight routes, and an evolving transportation system that includes three future Sound Transit light rail stations. The Manufacturing Industrial Center is highlighted in yellow in **Figure 1**.

Figure 1: Study Area

The Ballard-Interbay area has been studied extensively over the years, and this report builds on findings from a variety of previous plans and studies, which are listed in **Table 1**. The Magnolia and Ballard bridges have been studied at length over the last decade due to the 2001 Nisqually earthquake and because they are aging infrastructure serving increasing travel demand. In 2002, the year after the Nisqually earthquake, SDOT received a grant to identify a Magnolia bridge alternative that would meet community needs and be well-suited to environmental conditions in the area. The community's preference was for an in-kind replacement that would parallel the existing bridge to the south. In 2014, SDOT's Bridge Seismic Retrofit Program completed work to minimize movement on the Ballard bridge in the event of an earthquake.[1]

In addition to bridge studies, planning is underway for major projects and developments that will shape the future of the Ballard-Interbay area. These include the future West Seattle and Ballard Link light rail extension (WSBLE), transit-oriented development at the future Link stations and along the high-capacity transit corridor, and redevelopment of several major properties, including Terminal 91, Fishermen's Terminal, the Armory, and the new Expedia corporate campus. Significant capital improvements are already underway related to these projects, and in many cases, they call for investments in the surrounding public realm and transportation networks.

Planning for the WSBLE project is currently in progress, and the final station locations and rail alignments are not yet determined. The Draft EIS has several options for station locations and alignments, but this report's graphics only show the Preferred Alternative for each station in the study area. The light rail stations in Ballard, Interbay, and Smith Cove will influence how people travel in the study area, so it is important to consider how people will access the stations using all modes of transportation, as well as how bus and light rail service will interact at the stations.

Table 1. Previous Plans and Studies Referenced

Category	Plan or Document
Transit Expansion	▪ Sound Transit West Seattle and Ballard Link Extensions (2019) ▪ METRO CONNECTS (2017) ▪ Seattle Transit Master Plan (2016) ▪ Ballard to Downtown Transit Expansion Study (2014)
Land Use and Development	▪ Fishermen's Terminal Redevelopment (2019-2023) ▪ Terminal 91 Uplands Development (Phase I, 2019) ▪ Terminal 91 2019 Traffic Monitoring Study (2019) ▪ The Interbay Project: National Guard Armory Redevelopment (2019) ▪ The Interbay Public Development Advisory Committee's Recommendations and Implementation Plan (2019) ▪ Expedia Environmental Impact Statement (2016) ▪ Industrial Lands Policy Discussion Summary and Recommendations (2015)

[1] https://sdotblog.seattle.gov/2014/04/08/seven-bridges-retrofitted-to-rock-n-roll/

Category	Plan or Document
Ballard Bridge	▪ Ballard Bridge Planning Study Draft Alternatives Comparison Report (2020) ▪ Ballard Bridge Planning Study (2020) ▪ Ballard Bridge Planning Study: Transportation Discipline Report (2019) ▪ Ballard Bridge Outreach Summary (2019) ▪ Bridge Safety Analysis (2018) ▪ Ballard Bridge Seismic Retrofit Environmental Conditions Memorandum (2018) ▪ Ship Canal Crossing Study (2015) ▪ Missed Connection: Ballard Bridge Safety Recommendations (2015) ▪ Ballard Bridge Sidewalk Widening Concept Study (2014)
Ballard Area	▪ Burke-Gilman Trail Missing Link (2018) ▪ Interbay Trail Connections Project (2016) ▪ Ballard Urban Design Transportation Framework (2016) ▪ Move Ballard (2016)
Magnolia Bridge	▪ Magnolia Bridge Planning Study Technical Memorandum (2019) ▪ Magnolia Bridge Replacement Environmental Assessment Report (2015)
Multimodal Plans	▪ Seattle Bike and Pedestrian Safety Analysis: Phase 2 (2020) ▪ Seattle Pedestrian Master Plan 5-Year Implementation Plan and Progress Report (2019) ▪ SDOT 2019-2024 Implementation Plan: Bicycle Master Plan (2019) ▪ SDOT Sidewalk Condition Assessment Report (2018) ▪ Seattle Pedestrian Master Plan (2017) ▪ Seattle Trails Upgrade Plan (2017) ▪ Seattle Freight Master Plan (2016) ▪ Seattle Bicycle Master Plan (2014)

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Pedestrian Network

This section describes the facilities currently available for people walking in the study area. It includes considerations such as sidewalk presence and condition, crosswalk presence, distance between formal crossings along arterials, access to existing RapidRide bus stops, and proximity to the future light rail stations. This section is organized by the neighborhoods receiving future Sound Transit light rail stations – Ballard, Interbay, and Smith Cove.

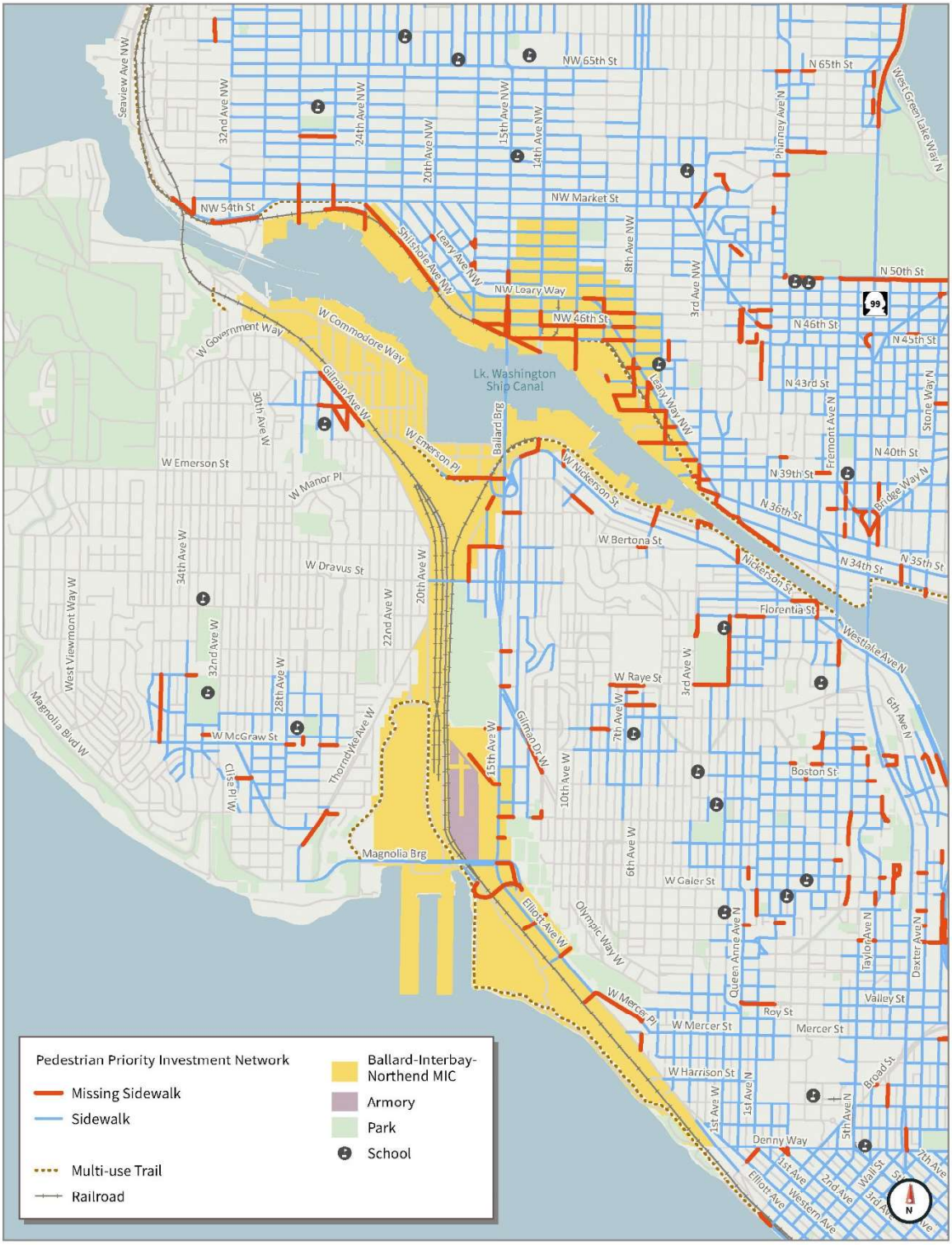
10-Minute Walksheds to Light Rail Stations

The future light rail stations will be key destinations for people walking in the study area. To help identify opportunities and challenges for accessing the stations, this analysis considers 10-minute walksheds – or the distance a fully mobile person can walk in 10 minutes – from each station. This translates to roughly a half-mile walk distance from a station via streets and trails. Signalized crossing delay at intersections and topography were factored into the analysis because they affect travel times and travel choices, particularly for people with disabilities.

Pedestrian Priority Investment Network

The City of Seattle's adopted 2017 Pedestrian Master Plan (PMP) presents a Priority Investment Network, which identifies the street segments that are priorities for improvements, such as adding sidewalks where they are currently missing. This network, shown in **Figure 2**, provides guidance on the components of the pedestrian network in the study area that the City finds to be most important and will be referenced in the sections below. It should be noted that many of the missing sidewalks in the study area are unlikely to be a City priority in the upcoming years considering economic conditions and the City's emphasis on equity.

Figure 2: Seattle Pedestrian Priority Investment Network



Data Source: Seattle Pedestrian Master Plan, 2017

Ballard

Existing Conditions

This subarea focuses on the BINMIC near the future Ballard light rail station and the southern portion of the Ballard Urban Village near NW Market Street. Sidewalks exist on most streets in Ballard, providing various walking route options to access the future light rail station, RapidRide bus stops, and key destinations. The condition of these sidewalks varies, with some sidewalks in excellent condition and others needing improvements, as shown in **Figure 3.** The most noteworthy sidewalk gaps and challenges are highlighted below.

- **Generally poor conditions for walking around industrial land uses.** Sidewalks are either missing (many industrial properties have parking that abuts the property line, making it challenging to navigate the roadway on foot) or can be narrow and have impediments to ADA access, such as fire hydrants in the middle of the sidewalk. An example of this condition can be found on NW Ballard Way west of the Ballard Bridge.
- **The Burke-Gilman Trail "missing link."** This important east-west pedestrian and bicycle connection in Ballard does not continue on Shilshole Avenue NW and NW 45th Street between the Ballard Locks and the Fred Meyer near Leary Way NW east of the Ballard Bridge. This segment generally lacks sidewalks, forcing pedestrians to walk in the roadway or on adjacent routes. Additional impediments that make the missing link challenging to navigate on foot include haphazard parking for the industrial uses, long block lengths, and freight presence.
- **The Ballard Bridge is an extremely challenging environment for walking.** The sidewalk is narrow (3-5 feet at its narrowest) leaving little room for pedestrians and bicyclists traveling in the same or opposite direction to pass one another. The sidewalk has minimal separation from vehicle traffic and high vehicle speeds. There is only a 12-inch high concrete curb, which lacks a railing to separate moving vehicles from bicyclists and pedestrians using the sidewalk. Additionally, the on/off ramps at NW Ballard Way are uncomfortable for people walking. On the northbound side, the sidewalk ends, forcing pedestrians to walk through a circuitous series of unclear crossings to exit the off-ramp.

Marked crosswalks exist at most key intersections on arterial and collector streets but are generally not found on residential streets, as they are not typically provided on this roadway type. **Figure 4** shows locations on arterials that are more than 300 feet from a signalized intersection crossing. These locations serve as a starting point for analyzing where additional enhanced crossings might be considered.

Seattle's 2020 *Bicycle and Pedestrian Safety Analysis: Phase 2* identifies the top 20 priority pedestrian locations by Council District to address locations that exhibit one or more characteristics found to be significantly associated with pedestrian crashes and/or have a crash history. Several of these priority locations are located in Ballard and serve as a starting point for identifying safety enhancements. As described in Chapter 4, there was one pedestrian fatality in the study area between 2014-2018[2], which

[2] https://www.seattle.gov/Documents/Departments/SDOT/VisionZero/2019_Traffic_Report.pdf

occurred on NW 45th Street near the Ballard Bridge, though studies have shown that collisions involving pedestrians are often underreported.

Future Conditions

As shown in **Figure 2**, Seattle's adopted 2017 *Pedestrian Master Plan* (PMP) identifies high priority streets where the City desires to add sidewalks where they are currently missing. There are no projects included in the 2020-2024 Pedestrian Master Plan Implementation Plan that are in Ballard, though there are several missing sidewalks on high priority streets in the study area.

Under the preferred light rail station alternative, people walking to the Ballard station would likely walk along 14th Avenue NW or NW Market Street. There would be station entrances on both sides of NW Market Street at 14th Avenue NW, and the elevated station platform would cross NW Market Street to connect the entrances. This will minimize the need for people walking to the station to cross NW Market Street at grade. There would also be a pedestrian and bicycle bridge across 14th Avenue NW connecting the station entrances on either side of 14th Avenue NW.

Opportunities and Potential Projects

Ballard Bridge

In the near-term, the pedestrian environment of the existing bridge could be improved by redesigning the on/off ramps and sidewalks per the recommendations in the *City of Seattle Bridge Safety Analysis Report*, which calls for curb extensions and high-visibility crosswalks for the ramps, as well as railings on the bridge. The ideal replacement of the Ballard Bridge would provide wide, comfortable facilities for pedestrians to ensure that people of all ages and abilities feel safe walking. The on and off ramps should clearly indicate how pedestrians are intended to use the roadway, making it clear to motorists to look for these vulnerable users. Three options are being considered as part of the Ballard Bridge Planning Study, which will release its final report in 2020, though options 1 and 2 have the most support. All three options provide improved facilities for bicycles and pedestrians, including:

- **Option 1** – **Low-Level Bridge Rehabilitation**: creates a 14-foot wide shared use path on the west side of the existing bridge, extending from Ballard Way at the north end to a new Emerson-Nickerson interchange at the south end (discussed under the Interbay section below). The east sidewalk on the approach structures would also be widened to 6-feet to match the existing bascule bridge.
- **Option 2 – Mid-Level Movable Bridge Alternative:** creates a 14-foot wide shared use path on the west side of the bridge, extending from NW Leary Way to a new Emerson-Nickerson interchange at the south end. No bicycle or pedestrian facilities are provided on the east side of the bridge.
- **Option 3 – High-Level Fixed Bridge Alternative:** creates a 14-foot wide shared use path on the west side of the bridge, extending from NW Market Street to a new Emerson-Nickerson interchange at the south end. An elevated signalized intersection would also provide a connection to 14th Avenue. No bicycle or pedestrian facilities are provided on the east side of the bridge.

Options 1 and 2 provide the most comfortable and accessible facilities for pedestrians and are therefore preferable over Option 3. Elevators could be explored as a way of improving bridge access for pedestrians. These options are discussed in greater detail in Chapter 4 on the auto and freight network and Chapter 5 on the transit network.

A second, new bridge adjacent to the Ballard Bridge may carry the light rail extension to Ballard. The Draft Environmental Impact Statement for the WSBLE project does not include bicycle and pedestrian facilities on this bridge.

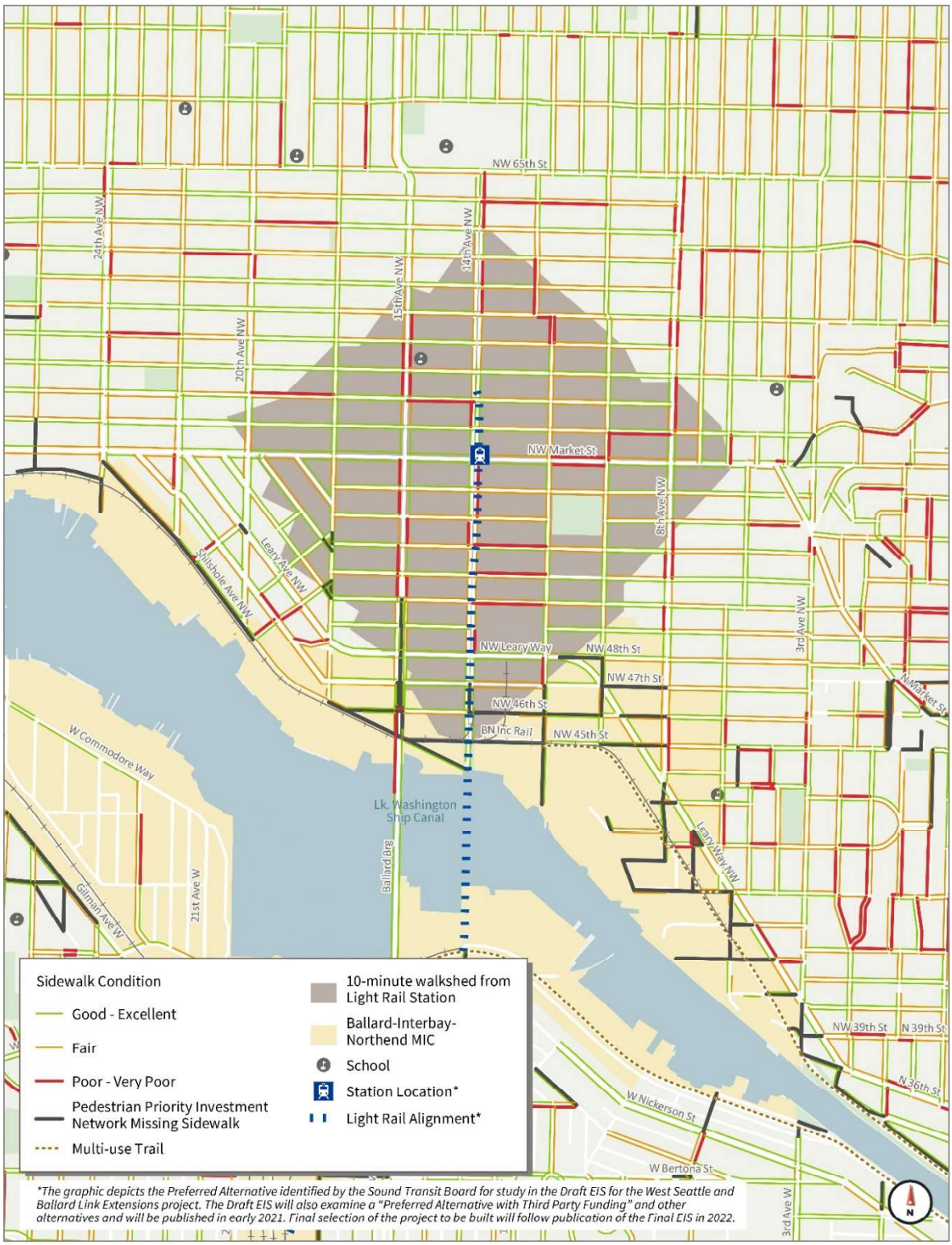
Light Rail Station and RapidRide Access

At the light rail station, it will be important to provide infrastructure that facilitates safe walking and minimizes barriers to people with disabilities. This includes sidewalks in good condition with widths wide enough to support future demand, well-maintained elevators and escalators, and wayfinding within the station area. It will also be important to provide infrastructure and wayfinding on adjacent roadways to ensure that people of all ages and abilities can access the light rail station and RapidRide bus stops. This will in part be achieved by implementing projects included in the PMP, but there are also opportunities for additional improvements, highlighted below.

Additional Opportunities

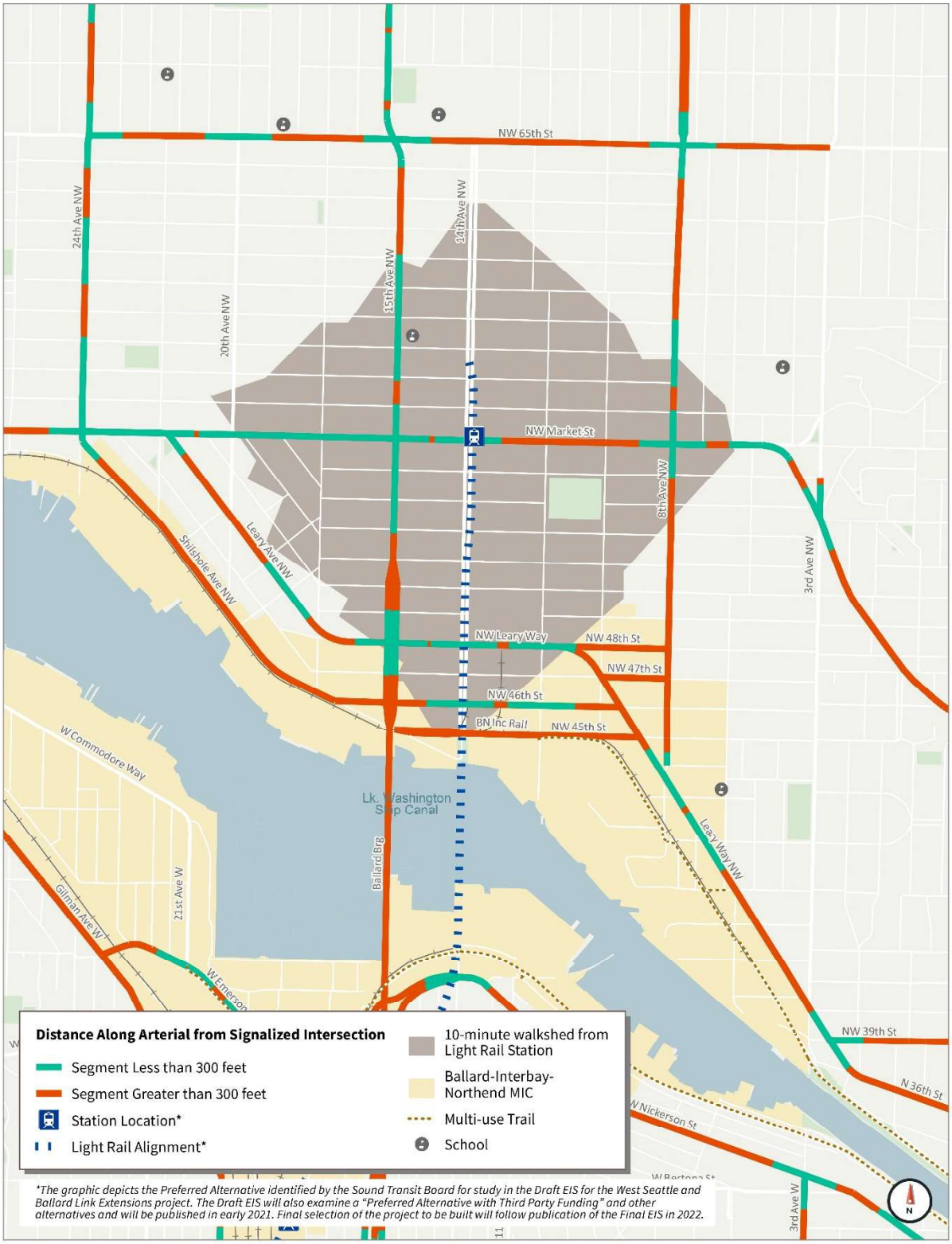
See **Figure 9** for an overview of pedestrian opportunities in the study area.

Figure 3: Ballard Sidewalk Condition and 10-Minute Walkshed to Light Rail



Data Sources: City of Seattle GeoData, 2019 (Sidewalks); Seattle Pedestrian Master Plan, 2017 (Pedestrian Priority Investment Network).

Figure 4: Ballard Proximity to Signalized Intersection Crossing on Principal and Minor Arterials



Interbay

Existing Conditions

This subarea focuses on the BINMIC near the future Interbay light rail station and the areas of Magnolia and Queen Anne immediately adjacent to it. There are generally sidewalks on at least one side of most streets in Interbay, but there are several gaps in coverage, interruptions by parking near industrial land uses, and some sidewalks are narrow, unbuffered, and/or have impediments to ADA access. The condition of these sidewalks varies, with some sidewalks in excellent condition and others needing improvements, as shown in **Figure 5**. The most noteworthy sidewalk gaps and challenges are highlighted below.

- **The intersection of 15th Avenue W and W Emerson Street at the southern terminus of the Ballard Bridge is very challenging for pedestrians.** There is no at-grade pedestrian crossing of W Emerson Street or of 15th Avenue W, so pedestrians must use staircases that travel underneath these roadways. This makes accessing the RapidRide bus stops and navigating the intersection on foot inconvenient for many and unnavigable for people who use mobility devices.
- **The W Emerson Street bridge lacks facilities on the southside, funneling everyone to the northside**. The W Emerson Bridge between 15th Avenue W and 16th Avenue W has a 5-foot sidewalk along its north side, but no sidewalk along the south side. Pedestrians and bicyclists typically share this narrow space, which is separated from the vehicle lanes by a low metal railing.
- **17th Avenue West near the future light rail station has an intermittent sidewalk** on the west side of the street that is interrupted by parking for the industrial uses. Additional impediments include a lack of a physical curb separating the sidewalk from the roadway, long block lengths, and freight presence.
- **20th Avenue W lacks a sidewalk on the east side of the roadway** between W Dravus Street and W Bertona Street, which **continues on Gilman Avenue W** between 23rd Avenue W and W Government Way. This is problematic due to bus stops on this side of the roadway, and there is clear demand for a pedestrian facility, as evidenced by the well-worn goat trail that exists.
- **The industrial areas east of Gilman Avenue W and north of W Emerson Place have several missing sidewalks** on at least one side of the roadway with parking that abuts the property line, making it challenging to navigate the roadway on foot. Sidewalks that exist near industrial land uses can be narrow and have impediments to ADA access.
- The sidewalk on **W Nickerson Street** is interrupted by a gravel parking lot west of 13th Avenue W on the south side of the street.
- The **industrial areas north of the Ship Canal Trail and east of the Ballard Bridge** lack sidewalks, and there are no designated crossings across the railroad tracks for pedestrians.
- **W Dravus Street between 20th Avenue W and 17th Avenue W** has narrow sidewalks without a buffer, which forces pedestrians to walk directly next to motor vehicles traveling at high speeds. The bridge over the BNSF railroad tracks has narrow sidewalks with a low concrete barrier separating pedestrians from motor vehicles.

The **Ship Canal Trail** is an east-west pedestrian and bicycle connection in Interbay. The trail starts under the south end of the Fremont Bridge and runs west mostly along the water following an abandoned railroad grade, ending just south of the Fishermen's Terminal marina before turning into the Emerson Street Bike Trail that connects to the protected bike lanes on Gilman Avenue W. The trail is more industrial through this Interbay section, flanked on both sides by marine industries and chain link fences. The trail has the potential to be an important connection for the neighborhoods surrounding Interbay, but a lack of connectivity and adequate width limits its current use. There is no connection to 15th Avenue W or Thorndyke Avenue W where the light rail station will be, so pedestrians currently have to take the trail to W Emerson Street & 16th Avenue W and walk east on W Emerson Street using the sidewalk on the north side. Since there is no crossing on W Emerson Street at 15th Avenue W (as discussed above), people take the stairs to cross underneath W Emerson Street in order to continue walking south. This makes navigating this route on foot inconvenient for many and unnavigable for others. Additionally, there is no pedestrian-scale lighting on the trail.

Marked crosswalks exist at most key intersections on arterial and collector streets, but due to long block lengths, they can be more than 600 feet apart. They are generally not found on residential streets, as they are not typically provided on this roadway type. As mentioned above, the intersection of 15th Avenue W and W Emerson Street is particularly challenging. **Figure 6** shows locations on arterials that are more than 300 feet from a signalized intersection crossing. These locations serve as a starting point for analyzing where additional enhanced crossings might be considered.

Steep topography is another challenge for pedestrians in the Interbay area. Gilman Avenue W, W Emerson Place, W Nickerson Street, and W Dravus Street are the main roadways through the study area and they all have slopes, making walking more difficult. Several of the roadways west of Gilman Avenue W and east of 15th Avenue W have slopes greater than 10 percent. Slopes with these grades are uncomfortable to walk for many and can be impassable for pedestrians with limited mobility. Having direct connections to destinations are critical in areas with steep topography, as they shorten distances and can potentially reduce grades.

Seattle's 2020 *Bicycle and Pedestrian Safety Analysis: Phase 2* identifies the top 20 priority pedestrian locations by Council District to address locations that exhibit one or more characteristics found to be significantly associated with pedestrian crashes and/or have a crash history, but none of the top locations for Council District 7 fall within Interbay. As described in Chapter 4, there was two pedestrian fatalities in the study area between 2014-2018[3], which occurred on 15th Avenue W near W Armory Way, though studies have shown that collisions involving pedestrians are often underreported.

Future Conditions

As shown in **Figure 2**, Seattle's adopted 2017 PMP identifies in the Priority Investment Network which roadway segments are priorities for improvements, such as adding sidewalks where they are currently

[3] https://www.seattle.gov/Documents/Departments/SDOT/VisionZero/2019_Traffic_Report.pdf

missing. There is only one project included in the 2020-2024 Pedestrian Master Plan Implementation Plan that is in Interbay:

- Add a sidewalk on Gilman Avenue W between W Emerson Place and W Jameson Street

Under the preferred light rail station alternative, people walking to the Interbay station would likely use W Dravus Street or the new trail connection proposed in the Bicycle Master Plan that connects the Ship Canal Trail to Thorndyke Avenue W. There are no new pedestrian bridges, crossings, or other improvements assumed as part of the station design for this alternative.

Opportunities and Potential Projects

15th Avenue W & W Emerson Street Intersection

In the near-term, the intersection should be redesigned per the recommendations in the *City of Seattle Bridge Safety Analysis Report*, which calls for adding a crosswalk at W Emerson Street & W Nickerson Street and a 6-foot wide shared use path on the south side of W Emerson Street that connects between W Nickerson Street and 15th Avenue W. In the longer-term, the intersection will be completely redesigned when the Ballard Bridge is replaced, as it will terminate at this intersection. All three bridge alternatives call for a Modified Single Point Urban Interchange (MSPUI) at this intersection. While this design improves upon existing conditions, it is still challenging for people of all ages and abilities to navigate, so there are opportunities to improve upon the design. Beyond this intersection, there are opportunities to repurpose right-of-way along 15th Avenue W to ensure comfortable and convenient access for all modes of transportation.

Light Rail Station and RapidRide Access

At the light rail station, it will be important to provide infrastructure that facilitates safe walking and minimizes barriers to people with disabilities. This includes sidewalks in good condition with widths wide enough to support future demand, well-maintained elevators and escalators, and wayfinding within the station area. It will also be important to provide infrastructure and wayfinding on adjacent roadways to ensure that people of all ages and abilities can access the light rail station and RapidRide bus stops. This will in part be achieved by implementing projects included in the PMP, but there are also opportunities for additional improvements, highlighted below.

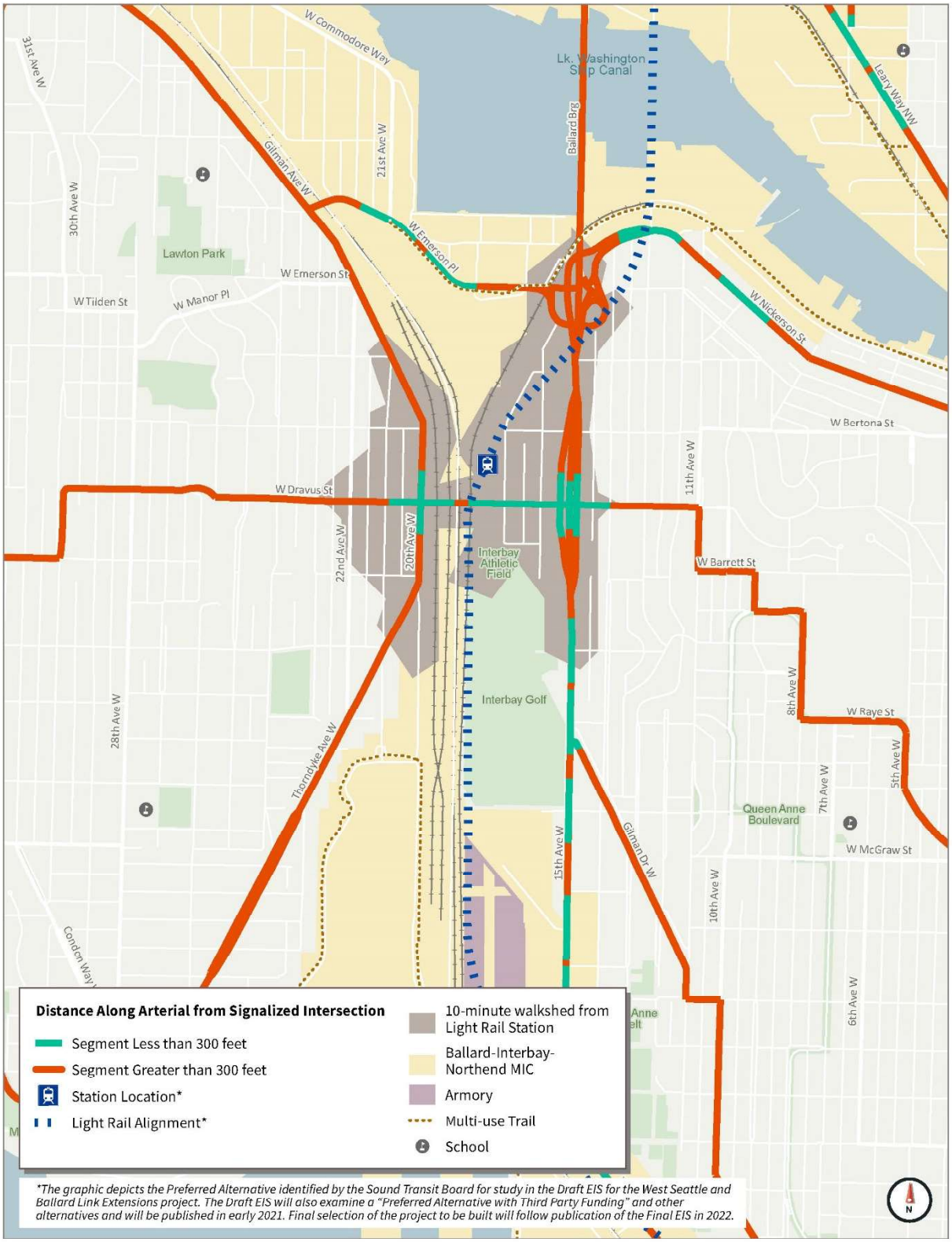
Additional Opportunities

See **Figure 9** for an overview of pedestrian opportunities in the study area.

Figure 5: Interbay Sidewalk Condition and 10-Minute Walkshed to Light Rail

Data Sources: City of Seattle GeoData, 2019 (Sidewalks); Seattle Pedestrian Master Plan, 2017 (Pedestrian Priority Investment Network).

Figure 6: Interbay Proximity to Signalized Intersection Crossing on Principal and Minor Arterials



Smith Cove

Existing Conditions

This subarea focuses on the BINMIC near the future Smith Cove light rail station and the areas of Magnolia and Queen Anne immediately adjacent to it. There are generally sidewalks on both sides of the roadway in Smith Cove, but there are some gaps in coverage. The condition of these sidewalks varies, with some sidewalks in excellent condition and others needing improvements, as shown in **Figure 7**. The most noteworthy sidewalk gaps and challenges are highlighted below.

- Smith Cove has several **areas that are in the process of redeveloping or that may redevelop in the future**, such as the Seattle Armory site, the commercial area between the Armory and Interbay Golf Center, and Expedia campus. Sidewalk presence in these areas are inconsistent.
- Smith Cove has several **industrial areas**, such as Terminal 91, freight buildings associated with the Port of Seattle north of the Magnolia Bridge and west of the railroad tracks, and the grain elevator facility south of Expedia. While much of this land use is private property, some areas are open to the public and can be challenging to navigate as a pedestrian due to lack of sidewalks, marked crosswalks, etc.
- **15th Avenue W** has sidewalks on both sides of the roadway with a landscaped buffer in some locations, but the sidewalk is frequently only 4-feet wide, lacks a buffer in most locations, and has obstructions like telephone poles in some places. Since this corridor has six to seven lanes of motor vehicle traffic, heavy vehicle volumes, and high vehicle speeds, it is not comfortable for pedestrians to walk along or cross, even though people must do so to access RapidRide bus stops. There are long stretches on this corridor without crosswalks, as shown **Figure 8** and discussed further below, which forces people to jaywalk or walk out of the way to access a crosswalk.
- **W Mercer Place** east of Elliott Avenue W (just outside the study area) is a key route into Lower Queen Anne, and it lacks a sidewalk on both sides of the street.

The **Magnolia Bridge** is a challenging environment for walking. There is a contiguous, narrow sidewalk on the south side that is approximately five-feet wide. Portions of the sidewalk are separated from vehicle traffic by a short concrete or metal barrier, but many sections have no buffer, providing minimal protection from vehicle traffic traveling at high speeds. Since there are no marked bicycle facilities, some bicyclists use the sidewalk as opposed to riding in one of the vehicles lanes, which creates conflicts with pedestrians. There is a pedestrian stairway linking the south side sidewalk to Terminal 91. There is a short segment of sidewalk on the north side of the bridge, connecting a distribution building to a bus stop and a second pedestrian stairway to Terminal 91, though the sidewalk dead-ends part way down the Magnolia Bridge off-ramp to Terminal 91.

The **Elliott Bay Trail** links Smith Cove to Downtown Seattle, Magnolia, Interbay, and other neighborhoods. The Elliott Bay Trail is primarily located along the western edge of BNSF's railroad tracks and connects south through Centennial Park and Myrtle Edwards Park to downtown. A spur of this trail loops to the west side of Terminal 91, connecting to 20th Avenue W and Smith Cove Park and Marina. The

northern portion of the trail, starting at the Magnolia Bridge, is flanked by fences on both sides and extremely narrow in some places, which hinders shared use travel in two directions and is a safety hazard.

Marked crosswalks exist at most key intersections on arterial and collector streets, but are not typically found on residential streets, as they are not typically provided on this roadway type. **Figure 8** shows locations on arterials that are more than 300 feet from a signalized intersection crossing. These locations serve as a starting point for analyzing where additional enhanced crossings might be considered.

While much of the area in Smith Cove is relatively flat, steep topography is a challenge for pedestrians walking to Smith Cove from Queen Anne or Magnolia. Several of the roadways west of 23rd Avenue W in Magnolia and east of 15th Avenue W/Elliott Avenue W have slopes greater than 10 percent. Slopes with these grades are uncomfortable to walk for many and can be impassable for pedestrians with limited mobility. Having direct connections to destinations are critical in areas with steep topography, as they shorten distances and can potentially reduce grades.

Seattle's 2020 *Bicycle and Pedestrian Safety Analysis: Phase 2* identifies the top 20 priority pedestrian locations by Council District to address locations that exhibit one or more characteristics found to be significantly associated with pedestrian crashes and/or have a crash history, but none of the top locations for Council District 7 fall within Smith Cove.

Future Conditions

As shown in **Figure 2**, Seattle's adopted 2017 PMP identifies in the Priority Investment Network which street segments are priorities for improvements, such as adding sidewalks where they are currently missing. There is only one project included in the 2020-2024 Pedestrian Master Plan Implementation Plan that is in Smith Cove:

- Install a crossing at Elliott Avenue W & W Lee Street

Under the preferred light rail station alternative, people walking to the Smith Cove station from Terminal 91 and Expedia would likely use the Elliott Bay Trail and the non-motorized ramp on the West Galer Street Flyover. People walking from residential areas in Queen Anne and the Armory would walk along 15th Avenue W/Elliott Avenue W. People are not likely to walk to this station from Magnolia, as it is too far away. There would be a bridge connecting the Galer Street flyover facility for pedestrians and bicycles to the station mezzanine under this alternative.

Opportunities and Potential Projects

Magnolia Bridge

The replacement Magnolia Bridge should provide wide, comfortable facilities for bicycles and pedestrians to ensure that people of all ages and abilities feel safe walking. The on and off ramps should clearly indicate how pedestrians are intended to use the roadway, making it clear to motorists to look for these vulnerable users. The Magnolia Bridge planning study considers four bridge replacement options, and two

options are being considered by this study, both of which provide improved facilities for bicycles and pedestrians, including:

- **Alternative 1** – **Armory Way**: constructs a new bridge over the railroad tracks connecting 15th Avenue W & W Armory Way to Thorndyke Avenue W just south of W Raye Street. The new Armory Way bridge would include a shared use path on the south side. It provides a new connection to the Elliott Bay Trail.
- **Alternative 4 – In-Kind Replacement:** constructs a new bridge immediately south of the existing Magnolia Bridge. The existing "center ramps" to Terminal 91 would be eliminated. The new bridge would feature a 10-foot wide shared use path on the south side, though it would not connect to the Elliott Bay Trail.

While it is important to provide facilities for pedestrians on the bridge, people will likely continue using existing travel routes regardless of the alternative chosen because of the steep grades under both bridge replacement options. Speeding on the Magnolia Bridge is a key safety concern, so it will be important to keep vehicle speeds at the 35 mph speed limit and add signage to make motorists aware of pedestrians. Elevators could be explored as a way of improving bridge access for pedestrians.

Light Rail Station and RapidRide Access

At the light rail station, it will be important to provide infrastructure that facilitates safe walking and minimizes barriers to people with disabilities. This includes sidewalks in good condition with widths wide enough to support future demand, well-maintained elevators and escalators, and wayfinding within the station area. It will also be important to provide infrastructure and wayfinding on adjacent roadways to ensure that people of all ages and abilities can access the light rail station and RapidRide bus stops. This will in part be achieved by implementing projects included in the PMP, but there are also opportunities for additional improvements, highlighted below.

Additional Opportunities

See **Figure 9** for an overview of pedestrian opportunities in the study area.

Figure 7: Smith Cove Sidewalk Condition and 10-Minute Walkshed to Light Rail

Data Sources: City of Seattle GeoData, 2019 (Sidewalks); Seattle Pedestrian Master Plan, 2017 (Pedestrian Priority Investment Network).

Figure 8: Smith Cove Proximity to Signalized Intersection Crossing on Principal and Minor Arterials

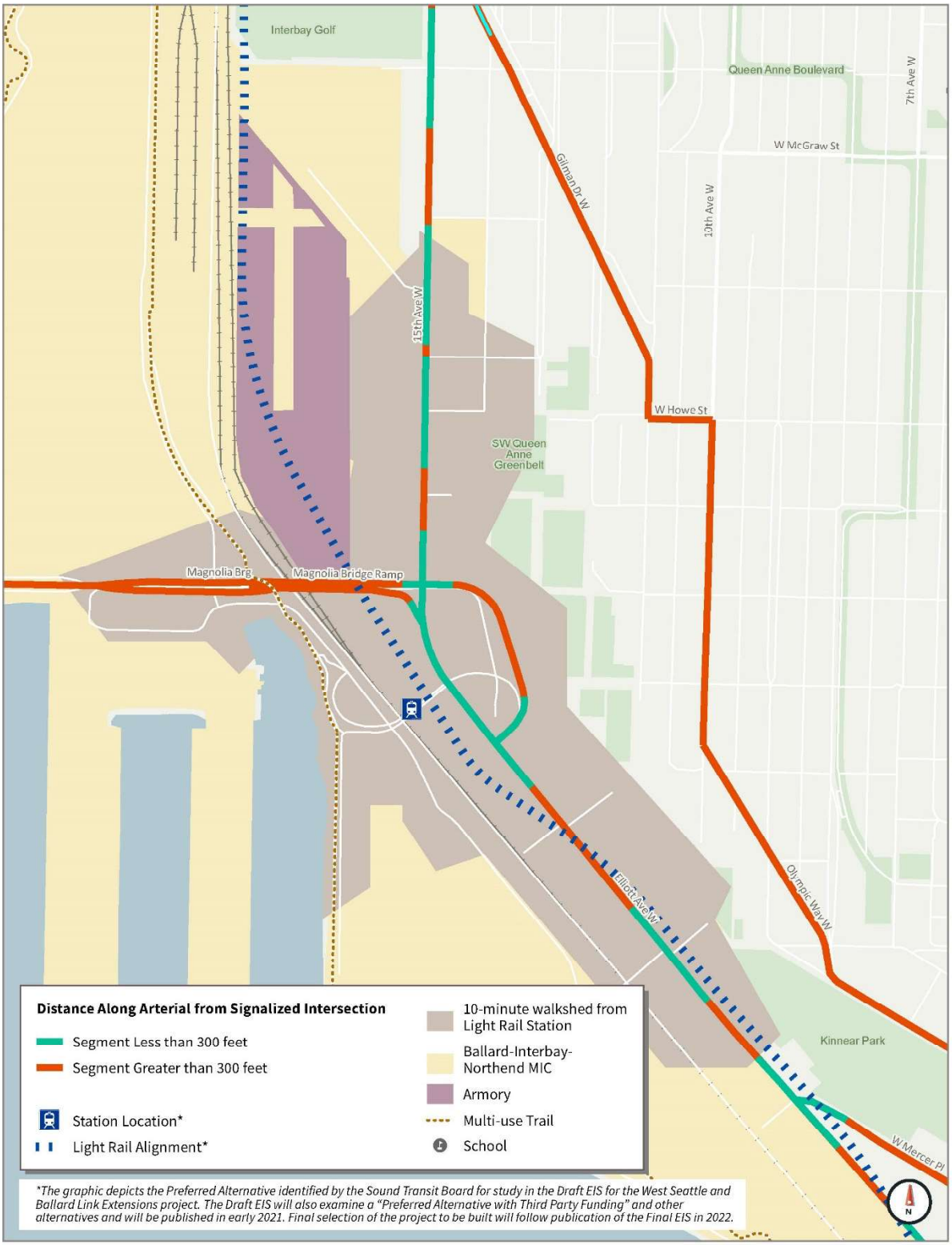
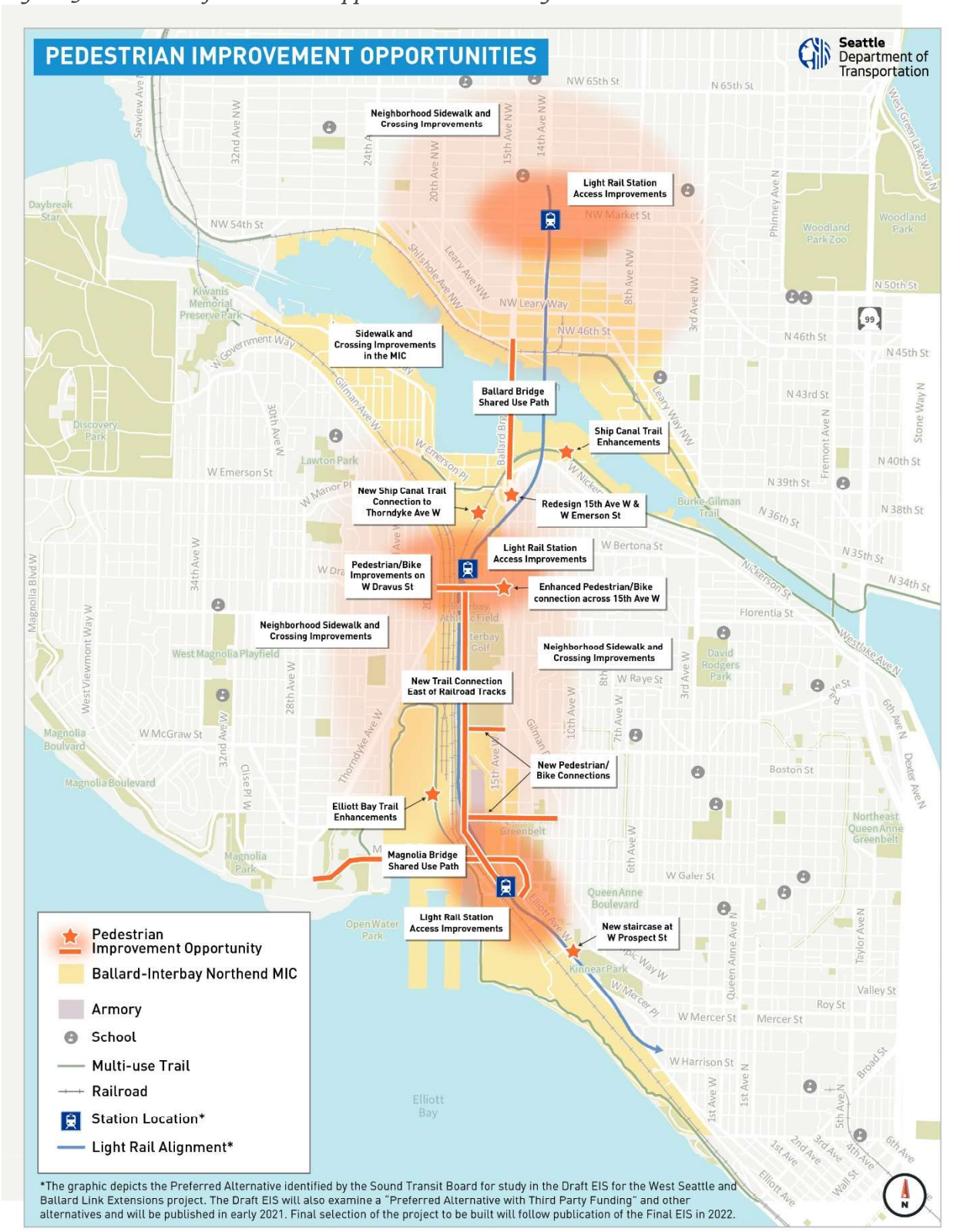
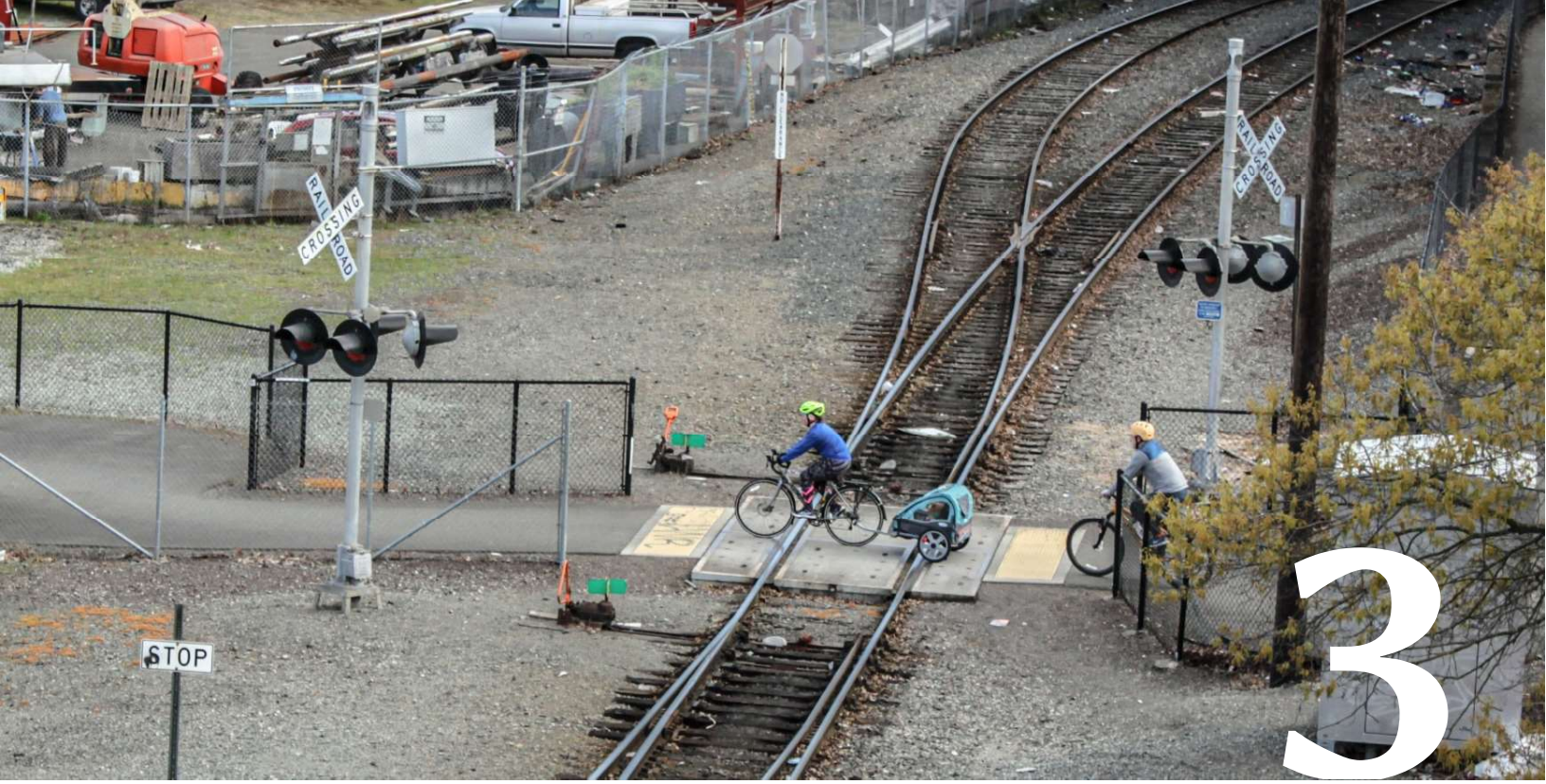


Figure 9: Overview of Pedestrian Opportunities in Study Area





3

Bicycle Network

This section describes the transportation network for people bicycling in the study area. This includes considerations such as bicycle facility presence and type, level of comfort for users of all ages and abilities, distance to the nearest crosswalk along arterials, access to existing RapidRide bus stops, and proximity to the future light rail stations. This section is organized by the neighborhoods receiving future Sound Transit light rail stations – Ballard, Interbay, and Smith Cove.

Bicyclist Comfort & Level of Traffic Stress

How comfortable people feel while bicycling is a major factor in the number of trips people make by bicycle. Where streets are stressful due to heavy traffic or auto speeds, many people will feel uncomfortable and may avoid making trips by bike altogether. On low-stress, highly comfortable streets, studies have shown that more people report interest in making trips by bike.[4]

One way of measuring comfort is using the Level of Traffic Stress (LTS) metric. LTS describes the experiential quality of biking based on user comfort. It measures cyclist comfort on every street based on traffic speeds, number of travel lanes, bicycle facilities present, and other roadway characteristics.[5] Based on those variables, a score from 1 to 4 is used to classify streets based on the type of cyclist who typically tolerates the level of stress. LTS 1 represents the least stressful facility that is often tolerable to children or the most concerned and/or inexperienced adult bicyclists. These are typically shared-use paths; separated

[4] Jennifer Dill and Nathan McNeil, "Revisiting the Four Types of bicyclists: Findings from a National Survey," Transportation Research Record: Journal of the Transportation Research Board, 2587: 90-99, 2016.

[5] Mekuria, Furth, and Nixon, "Network Connectivity for Low-Stress Bicycling," Transportation Research Record, Vol. 2587, 2016.

bikeways; low-volume, low-speed residential streets; or bicycle lanes on calm, narrow streets. LTS 4 represents the most stressful type of facility that is only tolerable to the most experienced bicyclists, who do so out of necessity (e.g. it is the only route to get to their destination or they are riding fast enough that it may be less of a concern). These are typically major arterials with multiple lanes of traffic (with or without bicycle lanes in some cases, depending on speeds) or narrower streets with high speed limits.

Research has shown that LTS generally matches up with how people identify as a bicyclist:

- **"Strong and Fearless"**: the most experienced bicyclists, long-haul commuters, and recreational riders who feel comfortable sharing travel lanes with autos.
- **"Enthused but Confident"**: often more utilitarian bicyclists who enjoy biking, have a high degree of skill, but prefer biking in more comfortable conditions than shared travel lanes.
- **"Interested but Concerned":** people interested in biking but who are not making trips by bicycle today. They may have less bicycling experience, but can be encouraged to make more biking trips with more comfortable bicycle facilities and increased experience.
- **"No Way, No How"**: these people are simply not interested in biking or may not physically be able to do so.

Most people fall into the "interested but concerned" category of bicyclists. To attract new bicycle trips from this group, it is essential to provide a connected network of comfortable, low stress (LTS 1 or a maximum of LTS 2) facilities. For the purposes of this analysis, roadways that are LTS 1 and LTS 2 are deemed low stress to be consistent with prior work done as part of the WSBLE project. While LTS 2 roadways may not be truly low stress for all users, most roadways in the study area are LTS 1.

10-Minute Bikesheds to Light Rail Stations

The future light rail stations will be key destinations for people biking in the study area. To help identify opportunities and challenges for accessing the stations, this analysis considers 10-minute bikesheds – or the distance a person can bicycle in 10 minutes from each station using any available roadway or trail. While some people may be willing to bike longer distances to access light rail stations, these bikesheds are intended to capture a typical user, especially since there is steep topography in the surrounding neighborhoods. It also considers 10-minute low-stress bikesheds – or the distance a person can bicycle in 10 minutes from each station using only roadways or trails that are LTS 1 or 2. This translates to roughly a 1.5-mile bicycle distance from a station via streets and trails. Signalized crossing delay at intersections and topography were factored into the analysis because they affect travel times and travel choices.

Existing and Future Bicycle Demand

A key consideration is how many bicyclists currently ride through the study area, and how many bicyclists are anticipated in the future. Future demand will be affected by changes in land use and/or the transportation network, such as the development of the light rail stations, implementation of BMP projects, and land use changes involving Expedia and the Armory development.

Unfortunately, there are not accurate methods for estimating existing and future bicycle demand. Studies have shown that many people are interested in bicycling, but do not currently bike because they do not feel comfortable on existing infrastructure. Additionally, travel models do not provide accurate estimates of forecasted bicycle counts because they do not account for the "build it and they will come" phenomenon. Therefore, this analysis qualitatively assesses bicycle demand based on the land use and transportation network changes.

Ballard

Existing Conditions

Ballard's existing bicycle network is composed of a variety of different facility types – bicycle lanes without separation, neighborhood greenways, and multi-use trails, as shown in **Figure 10**. The main north-south spines are 8th Avenue Northwest, the 17th Avenue Northwest neighborhood greenway, and 24th Avenue Northwest. The main east-west spines are the Burke-Gilman Trail, which provides access for recreational users and commuters from Sunset Hill, Fremont, and Wallingford, and NW 58th Street, which is a neighborhood greenway farther to the north.

There are several challenges for bicyclists in Ballard today. First, Ballard's bicycle network **lacks connectivity for people of all ages and abilities**. There are many gaps in the network, and most facilities that do exist have an LTS score of 3 or 4, which are not comfortable for most users, as shown in **Figure 11**. As a result, fewer people choose to ride a bicycle. For example, the Burke-Gilman Trail is an essential bicycle connection for recreational users and commuters, but as mentioned in the Pedestrian Network

chapter, there is a **"missing link"** between the Ballard Locks and the Fred Meyer near Leary Way NW that requires bicycling on roadways without designated bicycle facilities and crossing in-street railroad tracks. This deters less confident bicyclists from traveling by bicycle.

The **Ballard Bridge** is an important facility that could connect bicyclists to Interbay, Downtown Seattle, and the region at large, as there are few comparable alternatives for those traveling between Ballard and points south (described in more detail below). However, it is a choke point and a challenging environment for bicyclists for several reasons:

- Since there are no designated sidewalks on the bridge, bicyclists must either "take the lane" in vehicle traffic and ride over the bridge grating, which can be challenging, or share the narrow sidewalk with pedestrians, which has minimal separation from traffic lanes. There is only a 12-inch high concrete curb, which lacks a railing to separate moving vehicles from bicyclists and pedestrians using the sidewalk.
- The sidewalk is narrow (3-5 feet at its narrowest) leaving little room for bicyclists and pedestrians traveling in the same or opposite direction to pass one another. Standard bike handlebars can be almost 3 feet wide, which doesn't allow a margin of safety when people meet or have to pass.
- The Ballard Bridge on/off ramps at NW Ballard Way are uncomfortable for people biking.
- There is no clear, designated route connecting the Ballard Bridge and the Burke-Gilman Trail.
- The southern terminus of the bridge is challenging and will be addressed in the Interbay section.

As a result, people who may be interested in biking south from Ballard to Downtown Seattle or other destinations must either navigate this tough environment that is challenging even for the most confident rider, or divert to alternate crossings via the Ballard Locks or Fremont Bridge, which are significantly out of the way and take longer. The Ballard Locks crossing is also not ideal since people must dismount and walk their bikes across the canal. The Fremont Bridge provides a higher-quality crossing environment, but it is still out of the way.

Seattle's 2020 *Bicycle and Pedestrian Safety Analysis: Phase 2* identifies the top 20 priority bicycle locations by Council District to address locations that exhibit one or more characteristics found to be significantly associated with bicycle crashes and/or have a crash history. Several are located in Ballard and serve as a starting point for identifying safety enhancements. As described in Chapter 4, no fatal bicycle collisions were reported in the study area between 2014-2018 in SDOT's *2019 Traffic Report*[6], though studies have shown that collisions involving bicyclists are often underreported.

Future Conditions

The City of Seattle's adopted 2014 *Bicycle Master Plan* (BMP) outlines the proposed improvements to the City's bicycle network, which are intended to be installed by 2034. The full list of projects for the study area are included in **Figure 10**, but the most relevant projects for Ballard that have not yet been implemented include:

[6] https://www.seattle.gov/Documents/Departments/SDOT/VisionZero/2019_Traffic_Report.pdf

- Complete the missing link of the Burke-Gilman Trail
- Provide a shared use path on the new Ballard Bridge (though the BMP does not provide specifics)*
- Add bicycle lanes on 14th Avenue NW and 32nd Avenue NW*
- Create a variety of neighborhood greenways that are both north-south and east-west oriented, providing additional route options*
- Build an additional ship canal bicycle-pedestrian crossing between the Ballard and Fremont bridges to provide a new connection between the Burke-Gilman Trail and Ship Canal Trail, though the BMP doesn't specify an exact location*

It should be noted that projects that are not in the *2019-2024 Implementation Plan* (indicated with an asterisk in the bulleted list above) are currently unfunded and do not have a clear path to delivery.

Implementation of projects in the BMP would generally provide comfortable facilities for bicyclists of all ages and abilities wishing to access the new light rail station in Ballard. Based on facilities that exist or are currently planned, bicyclists would generally access the Ballard light rail station via bicycle lanes on 14th Avenue NW (where the station is located), the Burke Gilman Trail, one of the many planned neighborhood greenways running both north-south and east-west, and bicycle lanes on 32nd Avenue NW, 24th Avenue NW, and 8th Avenue NW, but steep topography is a limiting factor and may limit people's ability or decision to bicycle to the Ballard Station.

Opportunities and Potential Projects

Ballard Bridge

In the near-term, the on and off ramps and sidewalks on the bridge should be redesigned per the recommendations in the *City of Seattle Bridge Safety Analysis Report*, which calls for curb extensions and high-visibility crosswalks for the ramps, as well as railings on the bridge. The replacement Ballard Bridge should provide wide, comfortable facilities for bicycles and pedestrians to ensure that people of all ages and abilities feel safe bicycling. The on and off ramps should clearly indicate how bicyclists and pedestrians are intended to use the roadway, making it clear to motorists to look for these vulnerable users. Three options are being considered as part of the Ballard Bridge Planning Study, which will release its final report in 2020, though options 1 and 2 have the most support. All three options provide improved facilities for bicycles and pedestrians, including:

- **Option 1** – **Low-Level Bridge Rehabilitation**: creates a 14-foot wide shared use path on the west side of the existing bridge, extending from Ballard Way at the north end to a new Emerson-Nickerson interchange at the south end (discussed under the Interbay section below). The east sidewalk on the approach structures would also be widened to 6-feet to match the existing bascule bridge.
- **Option 2 – Mid-Level Movable Bridge Alternative:** creates a 14-foot wide shared use path on the west side of the bridge, extending from NW Leary Way to a new Emerson-Nickerson

interchange at the south end. No bicycle or pedestrian facilities are provided on the east side of the bridge.

- **Option 3 – High-Level Fixed Bridge Alternative:** creates a 14-foot wide shared use path on the west side of the bridge, extending from NW Market Street to a new Emerson-Nickerson interchange at the south end. An elevated signalized intersection would also provide a connection to 14th Avenue. No bicycle or pedestrian facilities are provided on the east side of the bridge.

A second, new bridge adjacent to the Ballard Bridge may carry the light rail extension to Ballard. The Draft Environmental Impact Statement for the WSBLE project does not include bicycle and pedestrian facilities on this bridge.

Light Rail Station and RapidRide Access

At the light rail station, it will be important to provide infrastructure that minimizes barriers to bicyclists to capture this potential user group. This includes safe and secure bicycle parking, such as lockers, well-maintained elevators, and wayfinding within the station area. It will also be important to provide infrastructure and wayfinding on adjacent roadways to ensure that bicyclists of all ages and abilities can access the light rail station and RapidRide bus stops, which will generally be achieved by implementing projects included in the BMP. However, the BMP does not identify specific intersections where crossing improvements for bicyclists will be necessary, so locations where bicycle routes cross arterials and collector roadways should be evaluated. These locations could include, but are not limited to:

- 14th Avenue NW & NW 50th Street
- 14th Avenue NW & NW 64th Street
- NW Market Street & 14th Avenue NW
- NW Market Street & 11th Avenue NW
- NW Market Street & NW 64th Street

Additional Opportunities

See **Figure 12** for an overview of bicycle opportunities in the study area.

Interbay

Existing Conditions

Interbay's existing bicycle network is composed of a variety of bicycle lanes (both with and without separation) and multi-use trails, as shown in **Figure 10**. The main north-south spines are Gilman Avenue W/20th Avenue W/Thorndyke Avenue W and the Elliott Bay Trail, both west of the railroad tracks. The Ballard Locks and Fremont Bridge also serve as key north-south alternatives over the ship canal to the Ballard Bridge, but as discussed earlier, they require substantial detours for many trips. The main east-west spines are W Emerson Place/the Ship Canal Trail and W Dravus Street.

There are several challenges for bicyclists in Interbay today:

- A chief challenge is that Interbay **lacks a north-south spine for bicyclists east of the railroad tracks**. There are no designated bicycle facilities on the Ballard Bridge or 15th Avenue W, so bicyclists wanting a direct southerly route must either share the lane with fast-moving cars and buses on 15th Avenue W or ride on the sidewalk. Many bicyclists on the Ballard Bridge opt for a less-direct route, which requires detouring nearly a mile west along W Emerson Street to Gilman Avenue W and then the Elliott Bay Trail.
- The **intersection of 15th Avenue W and W Emerson Street** at the southern terminus of the Ballard Bridge lacks dedicated bicycle facilities or treatments through the intersection to provide space for or awareness of bicyclists using the facility. Currently, southbound bicyclists that wish to continue south on 15th Avenue W must come to a stop just north of W Emerson Street, turn to look back at oncoming southbound traffic, and wait for a gap before entering the roadway nearly perpendicular to oncoming traffic, then quickly accelerate to merge with traffic. There is limited signage for motorists to let them know bicyclists are entering the roadway. Southbound bicyclists that wish to head west or east must travel west on W Emerson Street to connect to the Ship Canal Trail.

Challenging merge for southbound bicyclists at 15th Avenue W & W Emerson Street

- There is a **lack of bicycle facilities** to connect adjacent neighborhoods to the Ship Canal Trail, Elliott Bay Trail, and protected bicycle lanes on Gilman Avenue W/20th Avenue W. For instance, there are no neighborhood greenways in Interbay.
- **Steep topography** is a challenge. Gilman Avenue W, W Emerson Place, W Nickerson Street, and W Dravus Street are the main roadways through the study area and they all have slopes, making bicycling more difficult. Several of the roadways west of Gilman Avenue W and east of 15th Avenue W have slopes greater than 10 percent. If slopes are too steep, it can deter people from biking. Having direct route options to key destinations that avoid steep slopes are that much more important in areas with steep topography.

Seattle's 2020 *Bicycle and Pedestrian Safety Analysis: Phase 2* identifies the top 20 priority bicycle locations by Council District to address locations that exhibit one or more characteristics found to be significantly associated with bicycle crashes and/or have a crash history. W Emerson Place & 23rd Avenue W is identified as a top location for Council District 7, which serves as a starting point for identifying safety enhancements. As described in Chapter 4, no fatal bicycle collisions were reported in the study area between 2014-2018 in SDOT's *2019 Traffic Report*[7], though studies have shown that collisions involving bicyclists are often underreported.

[7] https://www.seattle.gov/Documents/Departments/SDOT/VisionZero/2019_Traffic_Report.pdf

Future Conditions

The City of Seattle's adopted 2014 BMP outlines the proposed improvements to the City's bicycle network, which are intended to be installed by 2034. The full list of projects for the study area are included in **Figure 10**, but the most relevant projects for Interbay that have not yet been implemented include:

- A north-south neighborhood greenway on 32nd Avenue W that turns into protected bicycle lanes at W Barrett Street*
- An east-west neighborhood greenway connecting 32nd Avenue W to 20th Avenue W, using W Raye Street and other local streets*
- Construct a new trail connection to link the Ship Canal Trail to Thorndyke Avenue W and a neighborhood greenway along 16th Avenue W*
- Construct a cycle track on W Dravus Street between 20th Avenue W and 14th Avenue W*
- A north-south neighborhood greenway on 14th Avenue W and other local streets connecting W Nickerson Street to 10th Avenue W*
- Construct a new north-south, off-street trail through Interbay. The trail would connect to the Elliott Bay Trail to the south, run along the western edge of the Interbay Golf Course, and connect to W Dravus Street near 16th Avenue W. This is essentially a northern leg of the Elliott Bay Trail on the east side of the railroad tracks.*

It should be noted that none of these projects are in the *2019-2024 Implementation Plan* (indicated with an asterisk in the bulleted list above), so they are currently unfunded and do not have a clear path to delivery.

Based on facilities that exist or are currently planned, bicyclists would generally access the Interbay light rail station via W Dravus Street, the Ship Canal Trail, and a new trail connecting the Ship Canal Trail to Thorndyke Avenue W. Planned neighborhood greenways, bicycle lanes, and protected bicycle lanes would greatly improve access to the station from Queen Anne and Magnolia, as existing infrastructure in these neighborhoods is minimal, but steep topography is a limiting factor and may limit people's ability or decision to bicycle to the Smith Cove Station.

Opportunities and Potential Projects

15th Avenue W & W Emerson Street Intersection

In the near-term, the intersection should be redesigned per the recommendations in the *City of Seattle Bridge Safety Analysis Report*, which calls for adding a crosswalk at W Emerson Street & W Nickerson Street and a 6-foot wide shared use path on the south side of W Emerson Street that connects between W Nickerson Street and 15th Avenue W. In the longer-term, the intersection will be completely redesigned when the Ballard Bridge is replaced, as it will terminate at this intersection. All three bridge alternatives call for a Modified Single Point Urban Interchange (MSPUI) at this intersection. While this design improves upon existing conditions, it is still challenging for bicyclists and pedestrians of all ages and abilities to navigate, so there are opportunities to improve upon the design. Beyond this intersection, there are

opportunities to repurpose right-of-way along 15th Avenue W to ensure comfortable and convenient access for all modes of transportation.

Light Rail Station and RapidRide Access

At the light rail station, it will be important to provide infrastructure that minimizes barriers to bicyclists to capture this potential user group. This includes safe and secure bicycle parking, such as lockers, well-maintained elevators, and wayfinding within the station area. It will also be important to provide infrastructure and wayfinding on adjacent roadways to ensure that bicyclists of all ages and abilities can access the light rail station and RapidRide bus stops, which will generally be achieved by implementing projects included in the BMP. However, the BMP does not identify specific intersections where crossing improvements for bicyclists will be necessary, so locations where bicycle routes cross arterials and collector roadways should be evaluated. These locations could include, but are not limited to:

- W Dravus Street & 16th Avenue W (or 17th Avenue W, depending on where the new Elliott Bay Trail extension connection ends)
- W Dravus Street & 14th Avenue W
- Thorndyke Avenue W & 20th Avenue W
- Thorndyke Avenue W & W Armour Street

Additional Opportunities

See **Figure 12** for an overview of bicycle opportunities in the study area.

Smith Cove

Existing Conditions

The primary bicycle facility in Smith Cove is the Elliott Bay Trail, as shown in **Figure 10**. The Elliott Bay Trail links Smith Cove to Downtown Seattle, Magnolia, Interbay, Ballard, and other neighborhoods. The Elliott Bay Trail is primarily located along the western edge of BNSF's railroad tracks and connects south through Centennial Park and Myrtle Edwards Park to downtown. A spur of this trail loops to the west side of Terminal 91, connecting to 20th Avenue W and Smith Cove Park and Marina. In 2018, the City completed the protected bike lanes on 20th Avenue W/Gilman Avenue W, connecting the Elliott Bay Trail to Interbay and beyond.

There are several challenges for bicyclists in Smith Cove today:

A narrow section of the Elliott Bay Trail.

- Due to limited right-of-way, the northern portion of the Elliott Bay Trail, starting at the Magnolia Bridge, is flanked by fences on both sides and **extremely narrow** in some places, which hinders shared use travel in two directions and can be a safety hazard. bicyclists handlebars can get caught in the fencing or clip those of other bicyclists.
- The Elliott Bay Trail has **inconsistent pedestrian and bicycle markings and trail speed signage** that needs to be brought up to consistent trail standards.
- While much of the area in Smith Cove is relatively flat, steep **topography** is a challenge for people bicycling between Smith Cove/the Elliott Bay Trail and Queen Anne/Magnolia. Several of the roadways west of 23rd Avenue W in Magnolia and east of 15th Avenue W/Elliott Avenue W have slopes greater than 10 percent. If slopes are too steep, it can deter people from biking. Having direct route options to key destinations that avoid steep slopes are that much more important.
- The **Magnolia Bridge** is a challenging environment for biking, as there are no marked bicycle facilities. There is a contiguous, narrow sidewalk on the south side that is approximately 5-feet wide, which some bicyclists use instead of riding in one of the vehicles lanes, which creates conflicts with pedestrians. Portions of the sidewalk are separated from vehicle traffic by a short concrete or metal barrier, but many sections have no buffer, providing minimal protection from heavy vehicle volumes and high vehicle speeds. There is a pedestrian stairway linking the south side sidewalk to Terminal 91.

Seattle's 2020 *Bicycle and Pedestrian Safety Analysis: Phase 2* identifies the top 20 priority bicycle locations by Council District to address locations that exhibit one or more characteristics found to be significantly associated with bicycle crashes and/or have a crash history, but none of the top locations for Council District 7 fall within Smith Cove. As described in Chapter 4, no fatal bicycle collisions were reported in the study area between 2014-2018 in SDOT's *2019 Traffic Report*[8], though studies have shown that collisions involving bicyclists are often underreported.

Future Conditions

The City of Seattle's adopted 2014 BMP outlines the proposed improvements to the City's bicycle network, which are intended to be installed by 2034. The full list of projects for the study area are included in **Figure 10**, but the most relevant projects for Smith Cove that have not yet been implemented include:

- Construct off-street bicycle lanes on the Magnolia Bridge and Galer Flyover that connect to a new cycle track on Magnolia Boulevard W/Clise Place W and 34th Avenue W*

[8] https://www.seattle.gov/Documents/Departments/SDOT/VisionZero/2019_Traffic_Report.pdf

- Construct bicycle lanes on Thorndyke Avenue W to close the gap*
- Protected bicycle lanes on 10th Avenue W and Olympic Way W/W Olympic Place in Queen Anne*
- Construct a new north-south, off-street trail through Interbay/Smith Cove, as mentioned in the Interbay section. The trail would connect to the Elliott Bay Trail to the south, run along the western edge of the Interbay Golf Course, and connect to W Dravus Street near 16th Avenue W. This is essentially a northern leg of the Elliott Bay Trail on the east side of the railroad tracks.*

It should be noted that none of these projects are in the *2019-2024 Implementation Plan* (indicated with an asterisk in the bulleted list above), so they are currently unfunded and do not have a clear path to delivery.

Based on facilities that exist or are currently planned, bicyclists coming from the Armory or Expedia would generally access the Smith Cove light rail station via the Elliott Bay Trail and W Galer Street Flyover. There are several planned neighborhood greenways, bicycle lanes, and protected bicycle lanes that provide east-west connections to access the station from Queen Anne and Magnolia, including separated bicycle-pedestrian facilities on the new Magnolia Bridge, but steep topography is a limiting factor and may limit people's ability or decision to bicycle to the Smith Cove Station.

Opportunities and Potential Projects

Magnolia Bridge

The replacement Magnolia Bridge should provide wide, comfortable facilities for bicycles and pedestrians to ensure that people of all ages and abilities feel safe bicycling. The on and off ramps should clearly indicate how bicyclists and pedestrians are intended to use the roadway, making it clear to motorists to look for these vulnerable users. The Magnolia Bridge planning study considers four bridge replacement options, and two options are being considered by this study, both of which provide improved facilities for bicycles and pedestrians, including:

- **Alternative 1** – **Armory Way**: constructs a new bridge over the railroad tracks connecting 15th Avenue W & W Armory Way to Thorndyke Avenue W just south of W Raye Street. The new Armory Way bridge would include a shared use path on the south side. It provides a new connection to the Elliott Bay Trail.
- **Alternative 4 – In-Kind Replacement:** constructs a new bridge immediately south of the existing Magnolia Bridge. The existing "center ramps" to Terminal 91 would be eliminated. The new bridge would feature a 10-foot wide shared use path on the south side, and the off-ramp to Smith Cove will connect to the Elliott Bay Trail.

While it is important to provide facilities for bicyclists on the bridge, many bicyclists have indicated through public outreach that they will likely continue using existing travel routes to Ballard, Fremont, the shared use trails, and W Dravus Street regardless of the alternative chosen because of the steep grades under both bridge replacement options. Speeding on the Magnolia Bridge is a key safety concern, so it will be important to keep speeds at the speed limit and add signage to make motorists aware of bicyclists and pedestrians.

Light Rail Station and RapidRide Access

At the light rail station, it will be important to provide infrastructure that minimizes barriers to bicyclists to capture this potential user group. This includes safe and secure bicycle parking, such as lockers, well-maintained elevators, and wayfinding within the station area. It will also be important to provide infrastructure and wayfinding on adjacent roadways to ensure that bicyclists of all ages and abilities can access the light rail station and RapidRide bus stops, which will generally be achieved by implementing projects included in the BMP. However, the BMP does not identify specific intersections where crossing improvements for bicyclists will be necessary, so locations where bicycle routes cross arterials and collector roadways should be evaluated. These locations could include, but are not limited to:

- Elliott Avenue W & W Galer Street
- 15th Avenue W & the Magnolia Bridge on/off ramps
- W Galer Street & Thorndyke Avenue W
- W Galer Street & 29th Avenue W

Additional Opportunities

See **Figure 12** for an overview of bicycle opportunities in the study area.

Figure 10: Existing / Planned Bicycle Network and 10-Minute Bikeshed to Light Rail

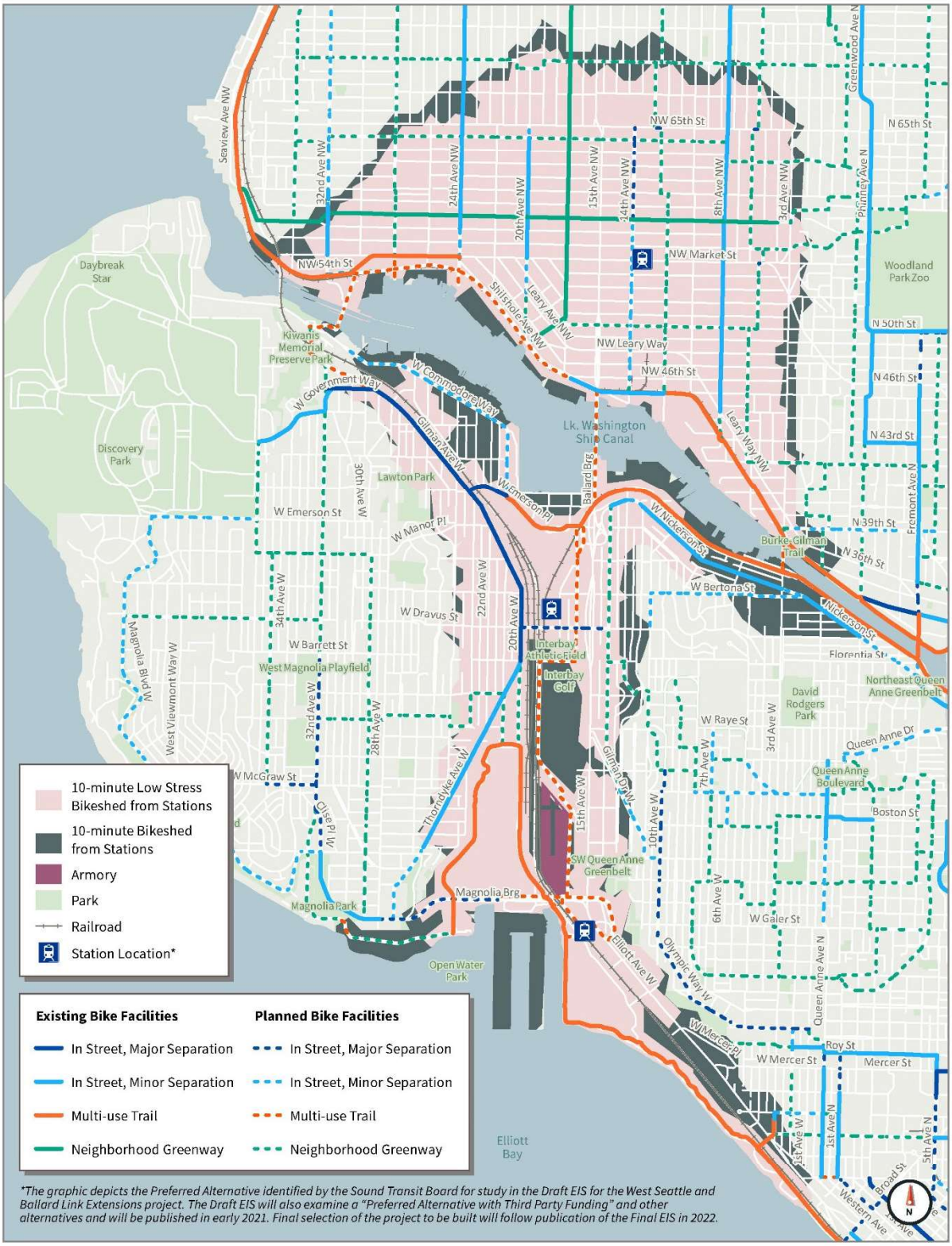
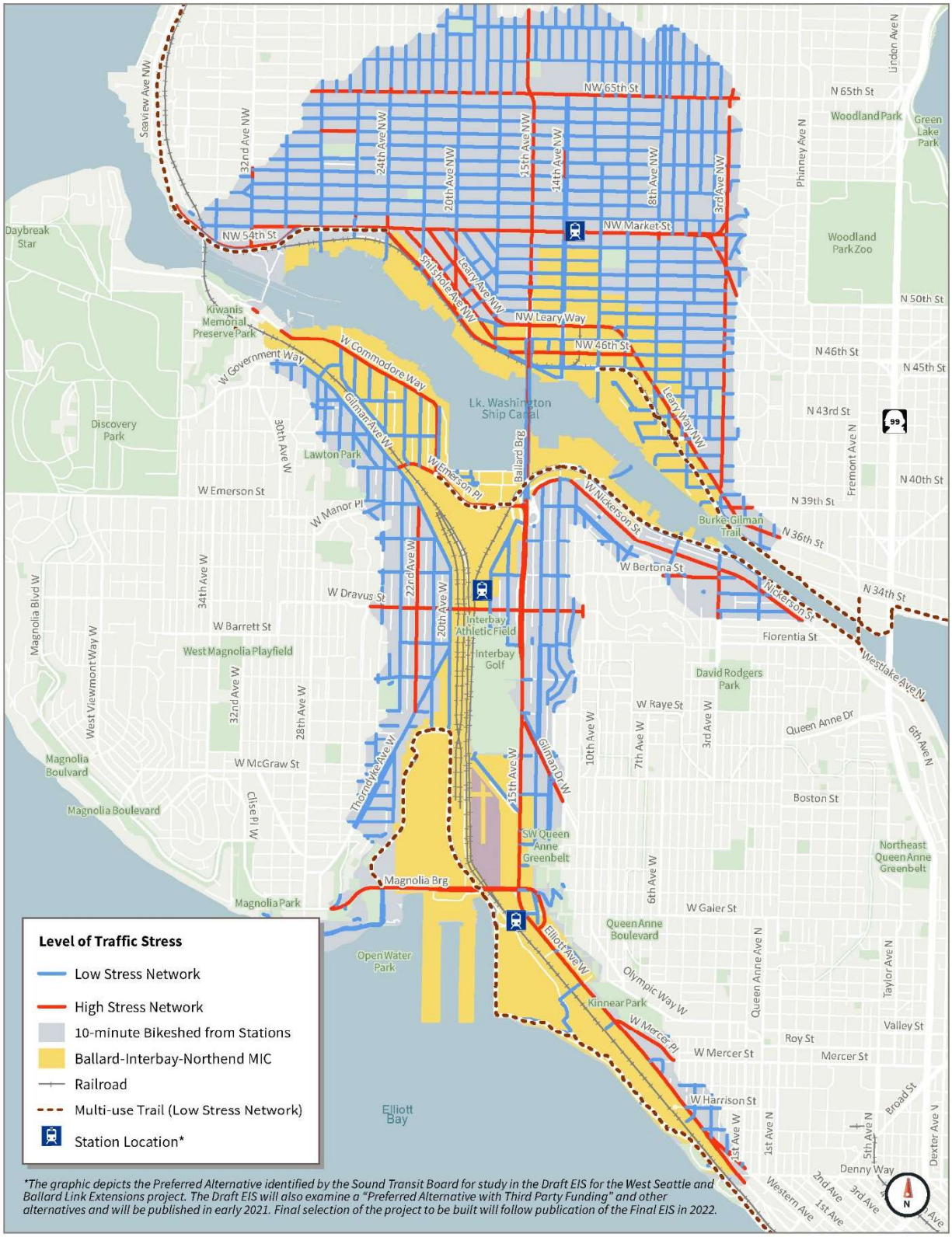
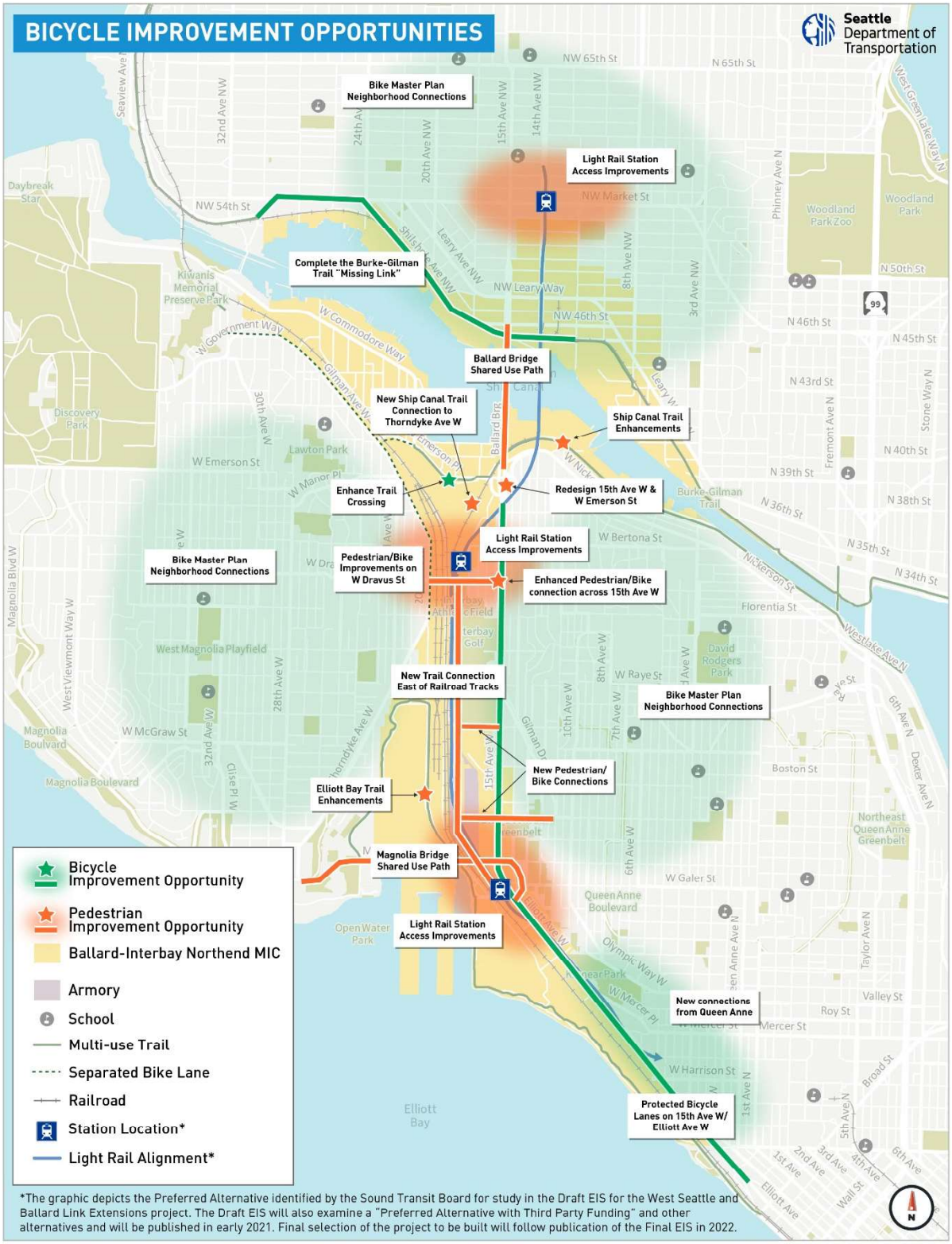


Figure 11: Existing Level of Traffic Stress and 10-minute Bikeshed to Light Rail



The graphic depicts the Preferred Alternative identified by the Sound Transit Board for study in the Draft EIS for the West Seattle and Ballard Link Extensions project. The Draft EIS will also examine a "Preferred Alternative with Third Party Funding" and other alternatives and will be published in early 2021. Final selection of the project to be built will follow publication of the Final EIS in 2022.

Figure 12: Overview of Bicycle Opportunities in Study Area



4

Auto & Freight Network

The existing street network in the BIRT study area serves a variety of land uses. This section focuses on mobility for those traveling by private vehicle and moving freight in the study area. Traffic analysis provides an overview of how auto and freight modes operate within the shared roadway space on key corridors.

As the epicenter of Seattle's fishing and maritime industry, there are several critical freight corridors that pass through the BIRT study area. 15th Avenue W/NW serves as the primary north-south spine for this mode as well, highlighting the importance for the Ballard Bridge and connectivity within the overall study area.

Modal priority is assigned to roadways within the study area by SDOT, and in some cases modal priority overlaps on roadway segments, as shown in **Figure 13**. By 2042, it is assumed that the area would be served by light rail connecting downtown Seattle to Ballard via Interbay and related changes to the bus network. Additional major changes anticipated over the next 20 years include development of the Armory site and replacement of the Magnolia and Ballard Bridges.

Figure 13: Existing Motorized Transit Network and Key Modal Corridors

Existing Roadway Environment

Auto/Personal Vehicle

The existing auto network consists of several key corridors including 15th Avenue W/NW, Gilman Avenue West, West Nickerson Street, West Dravus Street, 20th Avenue West, Thorndyke Avenue West, West Galer Street, Elliott Avenue West, and the Magnolia Bridge and access ramps. All of these corridors are listed as arterials by SDOT, each providing the capacity to accommodate thousands of vehicles per day, as shown in **Figure 14**. Connecting to these arterials are local streets and key intersections that were evaluated for how well they accommodate vehicles based on average vehicle delay, as described by level of service (LOS) during the AM and PM peak hours. Study intersections were identified in coordination with SDOT and project stakeholders to ensure that this effort was adequately considering roadway operations throughout the study area.

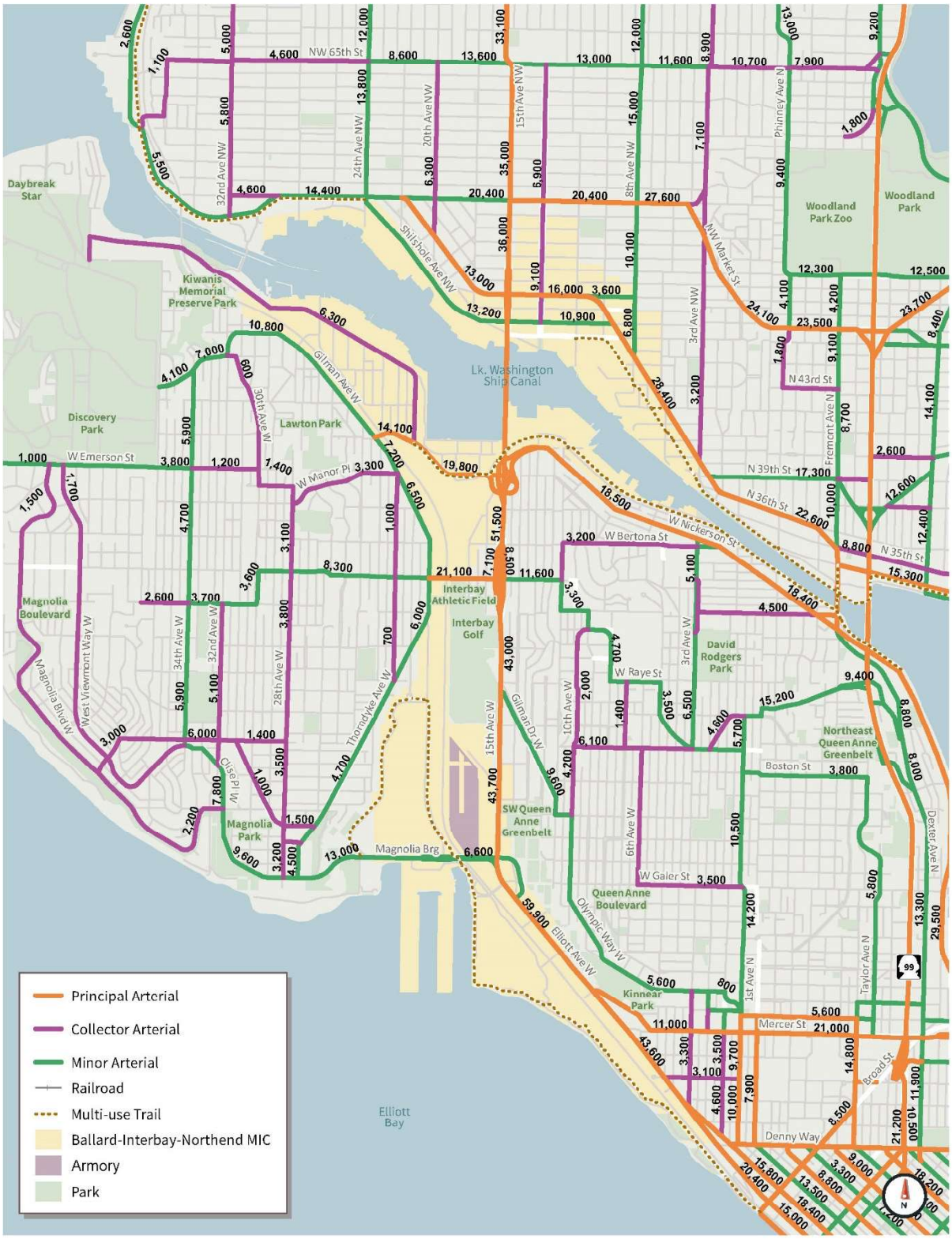
Collision History

Within the study area there were three pedestrian fatalities, one vehicle fatality, and three serious injury collisions in 2018, as indicated in the Seattle Department of Transportation 2019 Traffic Report[9]. There were no bicycle fatalities in the study area. The pedestrian fatalities were located on 15th Avenue W near W Armory Way and on NW 45th Street near the Ballard Bridge; the vehicle fatality was located on Thorndyke Avenue W near W Boston Street. Serious injury collisions can involve persons driving cars, bicyclists, pedestrians, or a user of any other transportation mode. In 2018, serious injury collisions were located primarily on 15th Avenue W and in downtown Ballard.

According to SDOT's Annual Traffic Reports, between 2014 and 2017, no pedestrian or bicycle fatalities were reported in the study area; however, studies have shown that non-fatal collisions involving pedestrians and bicyclists are often underreported. Across the five-year timeframe, additional bicycle and pedestrian collisions that did not involve fatal or serious injuries were generally concentrated in the Ballard downtown historic area, east of the Ballard bridge/south of NW Leary Way, and in Magnolia along 28th Avenue W. While 15th Avenue W/NW did not have any serious injury or fatal bicycle or pedestrian collisions between 2014 and 2017, this trend may not hold in the future as walking and biking increases related to the opening of the light rail stations. Citywide, the fatal and serious injury trends have been growing over the last decade, with 2019 being the biggest year since 2006.

[9] https://www.seattle.gov/Documents/Departments/SDOT/VisionZero/2019_Traffic_Report.pdf

Figure 14: Existing Auto Network and Average Daily Volumes (All-Way)



Freight Mobility

SDOT classifies freight corridors in the Freight Master Plan as Major and Minor Truck Streets, First/Last Mile Connectors, and roadways with Limited Access to freight. 15th Avenue W/NW is a key freight corridor in the City of Seattle, providing a connection between port and maritime uses in Interbay to Ballard and areas of North Seattle, as well as downtown and areas south of Downtown Seattle. Few roadway alternatives are available for freight, so resiliency of the existing network is important to maintain freight operations. Within the study area, 15th Avenue W/ NW, NW Market Street, NW Leary Way, and Shilshole Avenue NW are all listed as Major Truck Streets; while W Emerson Place, Gilman Avenue W, and W Dravus Street create a Minor Truck Street loop serving Fisherman's Terminal. **Figure 15** shows freight corridors, classifications, and important freight land use areas.

Within the study area, the areas near 15th Avenue W/NW, Smith Cove, Salmon Bay and the Fremont Cut, are all classified as Manufacturing and Industrial Centers in the Freight Master Plan, as shown in **Figure 15**. Areas to the south generally include the cruise ship terminal at Terminal 91 and provide access to rail freight, while areas in the north generally include fishing industries and shipyards. Manufacturing and Industrial Centers are key destinations for local and regional freight travel and freight access to these areas should be maintained and enhanced when possible to ensure safe and efficient travel.

As discussed in Chapters 2 and 3, generally there are poor conditions for walking and biking around industrial land uses. Sidewalks are either missing (many industrial properties have parking that abuts the property line, making it challenging to navigate the roadway on foot) or can be narrow and have impediments to ADA access, such as fire hydrants in the middle of the sidewalk. An abundance of driveways around industrial land uses can be particularly challenging for bicyclists, such as along Shilshole Avenue NW. These conditions create conflicts between freight and people walking and biking – both employees and customers.

Dedicated curbspace for freight and deliveries are limited in Interbay, primarily concentrated around the denser commercial areas in Magnolia Village and W Dravus Street. Downtown Ballard has dedicated loading areas throughout the historic district to serve the dense area with narrow street right-of-way. Downtown Ballard can be a popular destination for non-industrial activity, so maintaining freight access and loading areas is important for freight access and resiliency.

Ballard & Magnolia Bridges – Alternative Routing

The City recognizes the critical importance of the Ballard and Magnolia bridges to moving people and goods in the BIRT study area. As described earlier in this memo, the City has done a substantial amount of planning for replacement of the Ballard and Magnolia bridges. As such, this planning has included consideration of alternative routing, should the bridges need to be closed during reconstruction. While the BIRT study is considering the infrastructure needs associated with each bridge replacement, it is important to note that potential bridge closure scenarios have also been considered by the City.

Figure 15: Freight Corridors

Future Roadway Environment

To develop the future (year 2042) forecasts for this project, Fehr & Peers applied a version of the PSRC model that is currently being used for the WSBLE project. This version of the PSRC model is an appropriate tool for the BIRT effort given its level of detail in the study area (in terms of both land uses and transportation network), built in assumptions for transit investments, and future land use assumptions that are consistent with growth anticipated through 2042. The model contains household and employment land use control totals from Sound Transit that closely align with PSRC data and are distributed in accordance with the 2035 Comprehensive Plan/Mandatory Housing Affordability (MHA) EIS land use distribution throughout the City of Seattle. For locations outside Seattle, the 2042 WSBLE model uses Sound Transit land use and growth assumptions. Post-processing of traffic volumes incorporated future pipeline projects such as T-91 development, Expedia Campus, and Armory Development for the baseline scenario. The 2042 model also incorporates planned transportation facilities into the model network. Overall, this study will evaluate up to four future scenarios in 2042 for the AM and PM peak periods; two of these scenarios have been defined for evaluation in this Needs Assessment memo and up to two are anticipated to coincide with the Mayor's Seattle Industrial Maritime Strategy EIS project.

Scenarios 1 and 2 incorporate two different bridge options for the Ballard Bridge: low-height and mid-height; and two for the Magnolia Bridge: one-to-one replacement of existing bridge and a new bridge on Armory Way that replaces the current bridge. These scenarios provide varying access to and from the Ballard Bridge, the Magnolia neighborhood, and 15th Avenue W/NW.

The low-height Ballard Bridge option includes enhanced access to the bridge on the southern section while access on the northern part in Ballard is the same as current and baseline conditions. For the purposes of this report, the roadway system in Network Scenario 1 is assumed to be the same as the future baseline except at W Nickerson Street/W Emerson Street where a modified SPUI design is assumed for both Scenario 1 and 2. It is assumed the low and high Ballard bridge options would have the same capacity as the current bridge in both Network Scenario 1 and 2. **Figure 17** shows the low-height bridge alignment.

1. **Network Scenario 1:** Land uses and transportation network consistent with WSBLE model and inclusion of interim Armory Development land use; low-height Ballard Bridge (one-to-one replacement of Ballard Bridge) and Magnolia Bridge Alternative 4 (one-to-one replacement of Magnolia Bridge)
2. **Network Scenario 2:** Land uses and transportation network consistent with WSBLE model and inclusion of interim Armory Development land use; mid-height Ballard Bridge and Armory Bridge Alternative 1 (new bridge between 15th Avenue W & Armory Way and Thorndyke Avenue), new intersections at 20th Avenue W and Thorndyke Avenue, and new flyover ramp access at Galer Street for access across BSNF rail to Pier 91 and adjacent facilities
3. **Network Scenario 3:** (to be defined at later date)
4. **Network Scenario 4:** (to be defined at later date)

As noted above, Scenarios 1 and 2 each combine a Magnolia Bridge and Ballard Bridge option, however future analysis for this project will consider revising the scenarios to evaluate low and high cost options, as shown in **Figure 16.**

Figure 16: Potential Future Investment Scenarios for Evaluation

Investment Scenario	Magnolia Bridge	Ballard Bridge	Land Use	Transportation Infrastructure
One	In-Kind Replacement	Mid Level	2042 land uses consistent with West Seattle and Ballard Link Extension study, plus updated assumptions for: • Armory • Terminal 91 • Fishermen's Terminal	• ST Ballard Link Extension • Bike Master Plan • Additional supporting facilities TBD
Two	Armory Way Concept	Low Level		

Source: BIRT Interagency Team Meeting #3 (May 21, 2020)

Figure 17: Proposed Low-Height Ballard Bridge Option

The mid-height Ballard Bridge option, assumed in Network Scenario 2, would replace the existing structure and re-design access to and from the bridge on the northern and southern ends. The modified SPUI would connect W Nickerson Street to W Emerson Street across 15th Avenue W and provide longer on and off ramps from 15th Avenue W on the southern end of the bridge. On the northern side in Ballard, a southbound on-ramp from 17th Avenue NW & NW Leary Way would replace existing southbound bridge access, and a northbound off-ramp at NW 49th Street on the east side would replace the existing off-ramp access. The 17th Avenue NW & NW Leary Way intersection would be reconfigured to enhance freight mobility from Shilshole Avenue NW via 17th Avenue NW and includes two new signals to move vehicles through the intersection.

Figure 18 shows the mid-height Ballard Bridge alignments.

Figure 18: Proposed Mid-Height Ballard Bridge Option

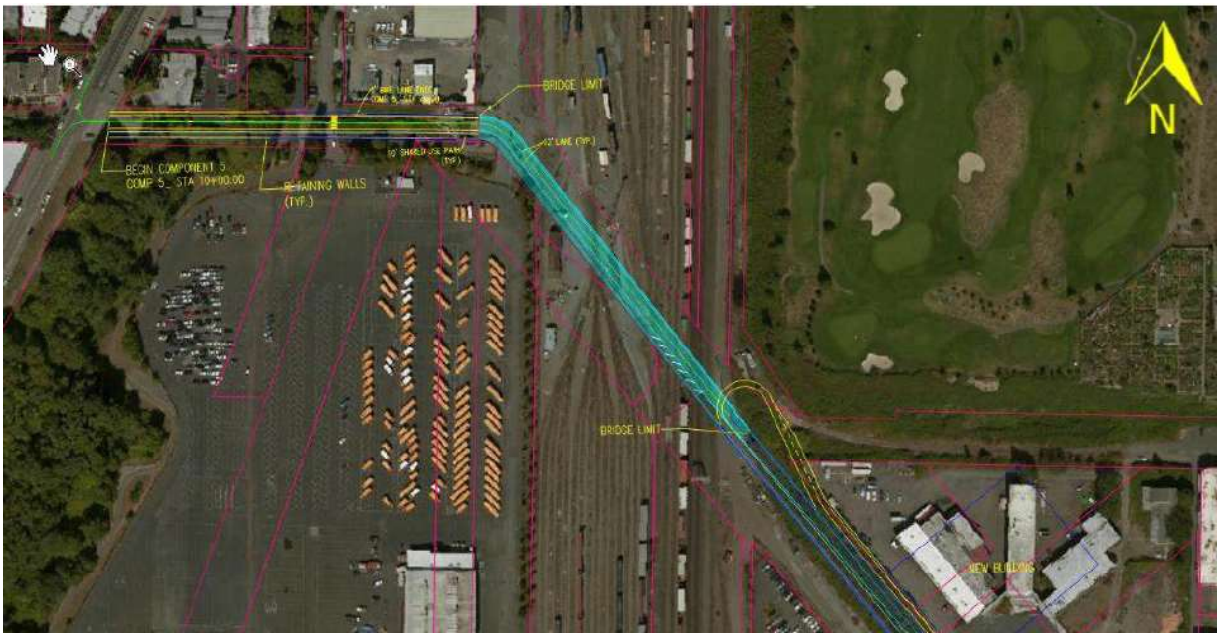
The Magnolia Bridge Alternative 4 option is a one-to-one replacement of the existing bridge. The Armory Way Bridge described in Network Scenario 2 would replace the existing Magnolia Bridge by providing an elevated connection to Thorndyke Ave W from 15th Avenue W & Armory Way. This alignment includes an elevated northbound-left movement from 15th Avenue W which is then at-grade on part of Armory Way to allow local access to and from the bridge, then is elevated over the tracks and up the hillside. The

bridge alignment assumed in this study is based on the Magnolia Bridge Planning Study (2019)[10]. Additional improvements to Thorndyke Avenue W, 20th Avenue W, West Uplands Perimeter Road, and the W Galer Street Overpass and flyover.

Figure 19 shows the proposed Armory Way bridge alignment.

Figure 19: Proposed Armory Way Bridge Alignment – Component 5B

[10] https://www.seattle.gov/Documents/Departments/SDOT/BridgeStairsProgram/bridges/Magnolia/MBPS-AlternativeAnalysisMemo-Spring2019.pdf



The future freight network is assumed to be similar to what currently exists, as available right-of-way and land to create new freight network connections is limited in the study area. While most of the key freight destinations are assumed to still be in place in 2042, the Mayor's Seattle Industrial and Maritime Strategy project will identify changes to the study area, specifically at the Armory Development, including potential changes to the freight network. The evaluation in this section focuses on the land use and roadway network assumptions for future baseline, Scenario 1, and Scenario 2.

Roadway Operational Conditions

This section considers auto and freight operations and discusses current and future impacts to the roadway network. Auto and freight frequently share the same roadway space and are both impacted by delay within the street network. Intersection operations analysis can be used as a proxy to assess freight mobility, including access and travel time.

Roadway Operations at Key Locations

This section discusses vehicle operational characteristics at key locations in the study area where existing and/or future analysis shows a need for improvement. Based on the technical analysis, most study intersections experience for acceptable levels of delay in existing and future baseline conditions in the AM and PM peak periods, though general congestion is experienced throughout the 15th Avenue W/NW corridor during these periods, especially towards downtown in the morning and northbound in the afternoon and evening.

Operations analysis was conducted in Synchro software utilizing the networks and traffic volumes assumed in the both the Magnolia and Ballard Bridge studies. Due to changes in travel patterns and trips related to COVID-19 during existing conditions phase of this project, new traffic counts were not collected

as this would not have been reflective of typical roadway traffic volumes. The project team started with 2017 traffic counts provided in the existing bridge study Synchro networks and included additional recent traffic counts from relevant studies. Maps showing existing and future operations results can be found in **Appendix A**.

The locations described in the next several pages include details related to average intersection delay and delay for the worst movement that a vehicle experiences while at that intersection. These seven locations are:

- Elliott Avenue W/15th Avenue W & W Galer Street Flyover
- 15th Avenue W & W Howe Street
- 15th Avenue W & W Armory Street
- 15th Avenue W & W Gilman Street
- 15th Avenue W & W Nickerson Street/W Emerson Street
- 15th Avenue W & NW Leary Way
- 15th Avenue NW & NW Market Street

To understand what this experience is like to the average person in a vehicle, **Table 2** lists ranges of delay and how it corresponds to roadway conditions. The 2042 Baseline and Network Scenario 1 roadway environments are assumed to be the similar for all of the key locations listed below, except at the 15th Avenue W & W Emerson Street/W Nickerson Street interchange where the roadway design for Scenarios 1 and 2 are the same.

Table 2. Level of Service for Signalized Intersections

Average Control Delay (sec/veh)	Roadway Environment
< 10 seconds	Free Flow
> 10- 20 seconds	Slight Delays (stable roadway flow)
> 20 – 35 seconds	Acceptable Flow (stable roadway flow)
> 35 – 55 seconds	Noticeable, Inconvenient Flow (tolerable Delay, may wait through more than one signal cycle before proceeding)
> 55 – 80 seconds	Intolerable flow
> 80 seconds	Highly congested (traffic jam)

Notes: Average control delay from HCM 2010. Study intersections were evaluated in Synchro using HCM 2000 methodology

Elliott Avenue W/15th Avenue W & W Galer Street Flyover

Figure 20: Elliott Ave W at W Galer Street Flyover, looking south

Current Conditions: In current conditions, most movements experience acceptable flow levels except for those users accessing Elliott Avenue W from the W Galer Street flyover during the AM peak period, which experience about 80 seconds of delay; and roadway users accessing the flyover from southbound 15th Avenue W during the PM, which experience almost 70 seconds of delay.

2042 Baseline and Network Scenario 1 Conditions: Roadway users at Elliott Avenue W & W Galer Street flyover are expected to experience substantially greater delays by 2042 due to increased volume along 15th Avenue W, especially northbound in the PM peak hour. Peak vehicle volumes are generally northbound throughout the study area during the PM peak as people travel from downtown to Ballard, Magnolia, and neighborhoods north. As such, vehicles in the NB through lanes experience over 300 seconds of delay during the PM peak by 2042. Traffic volumes developed for this study represent a 13 percent increase in the AM and 10 percent PM increase over 2035 volumes assumed in the Magnolia Bridge Planning Study which may be contributing to delay, as the roadway operates at or over capacity.

Network Scenario 2 (Armory Way Bridge): Roadway users can expect a similar roadway environment compared to the 2042 Baseline/Network Alternative 1 with slightly less overall intersection delay, likely due to the new W Galer Street flyover removing access to westbound vehicles at this intersection, which in turn removes the side street phase from the signal. Eastbound vehicles accessing 15th Avenue W will do so via W Garfield Street.

15th Avenue W & W Howe Street

Figure 21: 15th Avenue W at W Howe Street, looking north

Current Conditions: This signalized intersection provides access to retail and grocery to the west and storage and a gas station to the east. While on average roadway users at this intersection experience acceptable levels of delay, westbound users experience congestion during both the AM and PM peaks. Southbound-right users may be experiencing delay during the AM peak due to the curbside lane operating as a BAT lane during this period where transit may be bunched and/or personal vehicles are driving in the BAT lane through the intersection. Currently, a roadway runs between Armory Way and retail parking lot that provides additional options for users to access southbound 15th Avenue W and serves as delivery access.

2042 Baseline and Network Scenario 1 Conditions: The 15th Avenue W & W Howe Street intersection is anticipated to experience additional AM and PM peak hour delay compared to existing conditions by 2042 in large part due to redevelopment of the Armory. This study assumes 515 inbound and 425 outbound trips related to the Armory Development by 2042, with access points to 15th Avenue W at both Armory Way and at W Howe Street. These additional trips, in addition to assumed background growth in vehicle traffic by 2042, are likely to lead to noticeable increases in intersection delays – estimated to be 85 seconds on average in the AM peak hour for all users and 63 seconds in the PM peak hour. The northbound left movement from 15th Avenue W on to W Howe Street is forecast to experience very long delays if current intersection geometries are maintained - over 230 seconds of delay in the AM, with the eastbound left turn lane from the development waiting 110 seconds to enter 15th Avenue W in the afternoon.

Network Scenario 2 (Armory Way Bridge): Roadway users can expect a similar environment to the 2042 baseline/network alternative 1, with additional delay for the through movements as users travel through the intersection to access the new Armory Way bridge since the Magnolia Bridge no longer exists. As a result, southbound delays in the morning are forecast to grow to 243 seconds; with similar delays expected for northbound traffic in the afternoon (205 seconds).

15th Avenue W & W Armory Way

Figure 22: 15th Avenue W at W Armory Way, looking north

Current Conditions: This intersection currently operates with minimal amounts of delay given the site today contains a number of retail stores on a short access street, with most of the signal time being given to 15th Avenue W. Users to and from Armory Way can experience congestion due to the high number of vehicles passing through this intersection on 15th Avenue W northbound and southbound.

2042 Baseline and Network Scenario 1 Conditions: In 2042 baseline conditions, this site is one of two access points for the Armory Development, with the other on W Howe Street. As described above, the site is assumed to generate 515 inbound and 425 outbound trips during the PM peak, split between the two access points. As a result of the increase in development and background growth vehicle trips, the intersection is expected to experience more delay than is seen today, 69 seconds of average delay in the AM peak, with the most noticeable levels of delay experienced by users making the northbound left and southbound through movements, 248 and 93 seconds of delay, respectively. PM peak delay is experienced primarily for users coming out of the Armory Development, with the eastbound left and right-turn movements experiencing 69 seconds and 57 seconds of delay, respectively.

Network Scenario 2 (Armory Way Bridge): This scenario assumes a new bridge from 15th Avenue W & Armory Way to Magnolia over the BNSF tracks, which would replace the Magnolia Bridge. As a result, the vehicle trips that once used the Magnolia Bridge now use this new Armory Way bridge. This scenario assumes an elevated bridge serves the northbound left-turning movement from 15th Avenue W. While this movement will be grade separated and no longer experience delays at the intersection, eastbound vehicles from the Armory Way bridge mix with at-grade vehicles leading to congestion during the AM and PM peak periods. The southeast bound right-turn movement from the Armory Way Bridge is expected to experience over 300 seconds of delay during the AM peak and 146 seconds in the PM peak, while southbound vehicles in the AM and northbound vehicles in the PM travelling through the intersection also experience congestion. Deliveries and freight drivers accessing Magnolia would experience this delay

and dedicated transit and freight lanes or alternate freight pathways would be necessary to provide efficient transit and freight pathways.

15th Avenue W & Gilman Drive W

Figure 23: 15th Avenue W at Gilman Drive W, looking north

Current Conditions: The 15th Avenue W & Gilman Drive W intersection connects Queen Anne Hill to the east and the Interbay Golf course to the west. The intersection currently experiences minimal amounts of intersection delay, though roadway users to and from W Gilman Street experience congestion during the AM and PM peak periods.

2042 Baseline and Network Scenario 1 Conditions: Roadway users are expected to experience increased delay due to the background growth in vehicle traffic, with the same movements experiencing delay as in current conditions. Overall average intersection delays are expected to grow to 80 seconds in the AM peak, and 108 in the PM peak. Northbound and southbound users will experience additional delay compared to existing conditions, likely due to the increased green time needed for users going to and from W Gilman Street.

Network Scenario 2 (Armory Way Bridge): Roadway users would experience similar conditions compared to the 2042 baseline scenario, with slightly improved delay in the AM peak due to southbound users having to access Magnolia via W Dravus Street since the southbound right-turn movement would be restricted at 15th Avenue W & Armory Way. As a result, there will be fewer southbound users travelling through the intersection during the AM peak.

15th Avenue W & W Nickerson Street/W Emerson Street

Figure 24: 15th Avenue NW at NW Market Street, looking north

Current Conditions: This complex interchange allows for access to 15th Avenue W and the Ballard Bridge via W Nickerson Street and W Emerson Street. Northbound users coming from Queen Anne use access ramps on the east side of 15th Avenue W, while northbound users from Magnolia use a flyover ramp before merging with traffic at an all -way stop control and on to the bridge on-ramps. Southbound users from Queen Anne use the underpass ramp to beginning at 13th Avenue W then proceed onto the 15th Avenue W on-ramps. Southbound users to and from Magnolia can merge directly to/from 15th Avenue W via on and off-ramps. East-west travel on W Nickerson Street and W Emerson Street must currently travel through the interchange. RapidRide buses are located on 15th Avenue W within the interchange and must merge into traffic after serving either of the northbound or southbound stops.

Users experience minimal delay at either of the stop-controlled intersections, with the most the most delay occurring for users accessing the northbound bridge on-ramps during the PM peak, which experience 43 seconds of delay.

2042 Baseline Conditions: The roadway environment is similar to existing conditions, with additional delay experienced northbound during the AM and PM periods. Northbound users accessing the bridge during the AM period experience 63 seconds of delay in the AM peak with a slight increase in delay compared to existing conditions in the PM peak. An increase in northbound volumes at the W Emerson St & W Nickerson St stop-control intersection leads to congestion during the PM peak.

Network Scenario 1 and Network Scenario 2 Conditions: While Scenario 1 assumes the low-height (one-to-one replacement of the Ballard and Magnolia bridges) and Scenario 2 assumes the mid-height Ballard bridge and a new Armory Way bridge to Magnolia, access at the southern part of the Ballard

bridge is the same. This includes a modified SPUI design allowing for better east-west connectivity on W Nickerson Street and W Emerson Street, longer on and off-ramps to/from the Ballard Bridge, and revised access to and from 15th Avenue W. Existing stop-controlled intersections are assumed to be signals in these scenarios, allowing for efficient travel through intersections. Users are expected to experience minimal delay through the interchange, similar to existing and baseline conditions with improved conditions for outside lanes as vehicles are able to exit the roadway earlier due to lengthened on-ramps.

NW Leary Way & 15th Avenue NW

Figure 25: NW Leary Way at 15th Avenue NW, looking east

Current Conditions: The NW Leary Way & 15th Avenue NW intersections are located at the confluence of the Ballard Bridge on and off-ramps, and both roadways are key freight corridors. 15th Avenue NW is three separate roadways – the main elevated bridge and a north/south couplet serving one-way traffic on both sides of the bridge. Transit operates on both the couplets and on the bridge, with RapidRide stops located at the intersections. NW Leary Way provides access to downtown Ballard and is part of a freight network that serves Shilshole Avenue NW via 17th Avenue NW. NW Leary Way eventually transitions into N 36th Street between Fremont and Ballard, which then provides access to the Fremont and University Bridges, as well as the University of Washington. Access to the Aurora Bridge and SR 99 is possible via N 39th Street. These corridors are important linkages for regional freight. Roadway users currently experience minimal delay traveling through either of the northbound or southbound ramps at 15th Avenue NW & NW Leary Way.

2042 Baseline and Network Scenario 1 Conditions: By 2042, roadway users at both of the intersections are anticipated to experience significantly higher levels of congestion for most movements during the AM and PM peaks due to the increase in vehicle traffic. Users can experience over 100 seconds of delay when making a northbound-left movement in the AM and 70 seconds in the PM; while drivers making a southbound-left experience about 56 seconds of delay and drivers on NW Leary Way making a right onto

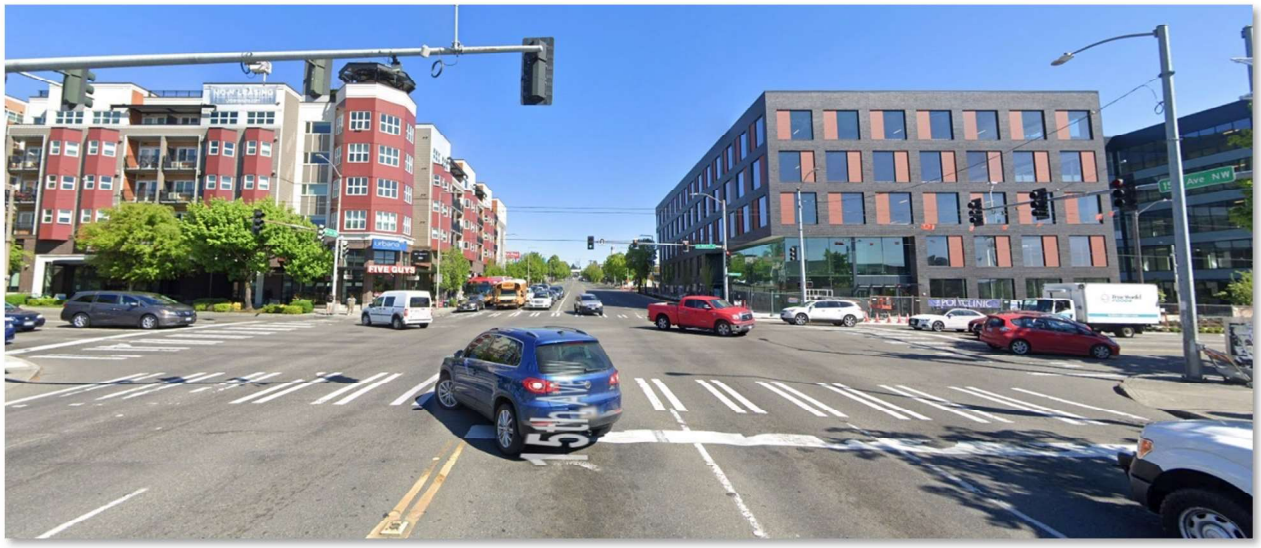
15th Avenue NW to access the bridge experience 72 seconds of delay in the AM. Since Network Scenario 1 assumes the low-height bridge scenario, conditions are expected to be similar to those in the Baseline scenario.

Network Scenario 1 and Network Scenario 2 (Mid-Height Bridge):

The mid-height bridge scenario includes revised connections to the Ballard Bridge. Southbound vehicles will use a new ramp that begins near the 17th Avenue NW & NW Leary Way intersection, and northbound bridge users will exit via a new off-ramp at NW 49th Street. New signals at 17th Avenue NW & NW Leary Way will help to efficiently move vehicles through the intersection. As a result of these improvements, the delay a roadway user experiences decreases overall at both intersections. At the on-ramp, delay is below 16 seconds in the AM and PM peak hours, and southbound-through vehicles at 14th Avenue NW & NW 49th St experiences between 40-50 seconds of delay in the AM and PM peak hours. The improved traffic operations at 17th Avenue NW & NW Leary Way mean improved mobility for freight users.

15th Avenue NW & NW Market Street

Figure 26: 15th Avenue NW at NW Market Street, looking north



Current Conditions: The 15th Avenue NW & NW Market Street is currently a key intersection, serving as the primary gateway to Ballard and neighborhoods to the east and north. Northbound and Southbound BAT lanes allow for enhanced transit mobility across NW Market Street and allows for vehicles to make right turns on to NW Market Street. As a result, general purpose vehicles operate in two through lanes and one left turn lane at the intersection northbound and southbound. The intersection is congested, with 50 seconds of overall average delay in the AM peak and 59 seconds in the PM peak. Traffic making the westbound left turn movement experiences the most congestion, with about 80 seconds of delay during both the AM and PM peaks.

2042 Baseline and Network Scenario 1 Conditions: By 2042, roadway users at this intersection are anticipated to experience significantly higher levels of congestion for most movements during the AM and PM peaks due to the increase in vehicle traffic. In the AM peak, average intersection users will experience 176 seconds of delay, and 118 in the PM peak.

Network Scenario 2 (Mid-Height Bridge): Roadway users will experience similar levels of delay compared to the 2042 baseline scenario. Revised on and off-ramps to/from the Ballard Bridge will be available for southbound users via 17th Avenue NW & Leary Way and for northbound users on NW 49th Street in the mid-height bridge option assumed in this analysis. These new connections may provide some alternative pathways for auto and freight users to avoid traveling through this intersection. However, with the completion of WSBLE, additional pedestrian activity may require longer crossing times for people accessing the new WSBLE station. For the purposes of this study, the mid-height Ballard Bridge Planning Study Synchro network developed by SDOT was used north of Ballard bridge.

Freight Operations

Point-to-point travel time to key freight destinations was analyzed in the AM and PM peak periods. Freight travel times are based on movement delay from intersection operations analysis with adjustments made to consider grade and turning radius. The lower range represents the average travel time a vehicle experiences during the peak period, and the upper range is the typical highest travel time a vehicle experiences on days with high levels of congestion. Given the AM and PM peaks are typically when roadways experience the highest vehicle demand, these travel time estimates reflect the worst roadway conditions for freight throughout the day. However the peak freight period may deviate from the overall AM and PM peak hours measured on City streets, as freight often operates in off-peak periods when curbspace is more available, when stores are either closed or are not experiencing a high numbers of customers, or when traffic levels are lower to increase freight mobility. Long-haul freight operations can also lead to variations in when trucks arrive throughout the day given the distance and varying roadway environments freight experiences en-route.

As shown in **Table 3**, travel time in the northern part of the study area from 15th Avenue NW north of NW Market Street to key freight corridors is similar during the AM and PM peak periods. This analysis shows that bridge traffic does not significantly increase southbound freight travel time during the peak periods, with about a4-6 minute travel time to the Shilshole industrial area and about 4-6 minute to travel to Fisherman's Terminal; and about the same in the PM in the northbound direction. Bridges are not permitted to open for boat traffic during peak commute times, so the increase in travel time is likely due to roadway congestion.

Table 3. Existing (2020) Freight Travel Times to/from 15th Ave NW & NW Market St

Start Location	End Location	Route	Freight Travel Time (minutes)	
			AM	PM
15th Avenue NW (N of NW Market Street)	Shilshole-Industrial Area	via NW Leary Way/17th Avenue NW	4-6	4-5
	Fisherman's Terminal	via Emerson Place/21st Avenue W	4-6	4-6
	Terminal 91	via W Galer Street Flyover & Alaskan Way W	11-15	10-14
Shilshole-Industrial Area	15th Avenue NW (N. of NW Market Street)	via NW Leary Way/17th Avenue NW	4-5	4-6
Fisherman's Terminal		via Emerson Place/21st Avenue W	5-7	7-10
Terminal 91		via W Galer Street & Alaskan Way	10-14	10-15

Notes:
- Freight travel times are based on movement delay from intersection analysis results with delay adjustments made for grade and turning radius.
- Lower range represents the average travel time a vehicle experiences aggregated over the peak hours; the upper range represents the typical highest travel time a vehicle experiences on days with high levels of congestion, based on travel times collected along 15th Avenue in October, 2019 from SDOT's Acyclica ITS system.

Table 4 shows baseline/Network Scenario 1 (one-to-one Magnolia Bridge replacement) and Scenario 2 (Armory Bridge) travel time comparisons. Overall, travel time is expected to double for some segments compared to existing conditions, due to the increase in vehicle traffic. Travel time from north of 15th Avenue NW to Terminal 91 is expected to increase from 11-15 minutes to 25-35 minutes in the AM peak from the existing to baseline scenario, due to congestion across the Ballard Bridge and through Interbay due to background development trips and overall background growth. Northbound travel time stays relatively the same across all the scenarios, with additional travel time experienced from Terminal 91 to 15th Avenue NW & NW Market Street in Scenario 2 during the AM and PM compared to the existing and baseline scenarios.

Table 4. Baseline (2042) & Scenario 1 & 2 Freight Travel Times to/from 15th Ave NW & NW Market St

Start Location	End Location	Freight Travel Time (minutes)					
		2042 Baseline		Scenario 1		Scenario 2	
		AM	PM	AM	PM	AM	PM
15th Avenue NW (N of NW Market Street)	Shilshole-Industrial Area	8-11	4-6	7-9	4-6	7-9	4-6
	Fisherman's Terminal	8-11	5-6	8-12	6-8	8-12	5-8
	Terminal 91	25-35	15-21	25-35	15-21	24-33	10-14
Shilshole-Industrial Area	15th Avenue NW (N of NW Market Street)	5-7	7-9	5-7	6-9	5-7	6-9
Fisherman's Terminal		7-9	9-12	6-8	9-12	6-8	9-12
Terminal 91		12-16	19-26	12-16	19-26	16-22	21-30

Notes:
- Freight travel times are based on movement delay from intersection analysis results with delay adjustments made for grade and turning radius.
- Lower range represents the average travel time a vehicle experiences aggregated over the peak hours; the upper range represents the typical highest travel time a vehicle experiences on days with high levels of congestion, based on travel times collected along 15th Avenue in October, 2019 from SDOT's Acyclica ITS system.

Table 5. Existing (2020) Freight Travel Times to/from Elliott Avenue W

Start Location	End Location	Route	Freight Travel Time (minutes)	
			AM	PM
Elliott Avenue. W (South of W Galer St)	Shilshole-Industrial Area	via NW Leary Way/17th Avenue NW	8-11	9-12
	Fisherman's Terminal	via Emerson Place/21st Avenue W	6-8	7-10
	Terminal 91	via W Galer Street & Alaskan Way	2-3	2-3
Shilshole-Industrial Area	Elliott Avenue W (South of W Galer Street)	via NW Leary Way/17th Avenue NW	8-11	8-11
Fisherman's Terminal		via Emerson Place/21st Avenue W	11-15	11-15
Terminal 91		via W Galer Street & Alaskan Way	4-5	3-4

Notes:
- Freight travel times are based on movement delay from intersection analysis results with delay adjustments made for grade and turning radius.
- Lower range represents the average travel time a vehicle experiences aggregated over the peak hours; the upper range represents the typical highest travel time a vehicle experiences on days with high levels of congestion, based on travel times collected along 15th Avenue in October, 2019 from SDOT's Acyclica ITS system.

Compared to existing conditions, the baseline/scenario 1 and Scenario travel times generally see increases in travel time. Travel time to Fisherman's Terminal is expected to increase from 7-10 minutes to 20-28 minutes in the PM, due to increased development trips and due to general northbound commute patterns during the PM peak. Travel time between the two scenarios is similar, with northbound travel time seeing slight decrease in travel time, likely due to the reconfigured Ballard bridge access on the north sound south side of the bridge. Southbound travel time increases in the AM between the two future scenarios, likely due to the reconfiguration of the Armory Way intersection to accommodate the new bridge.

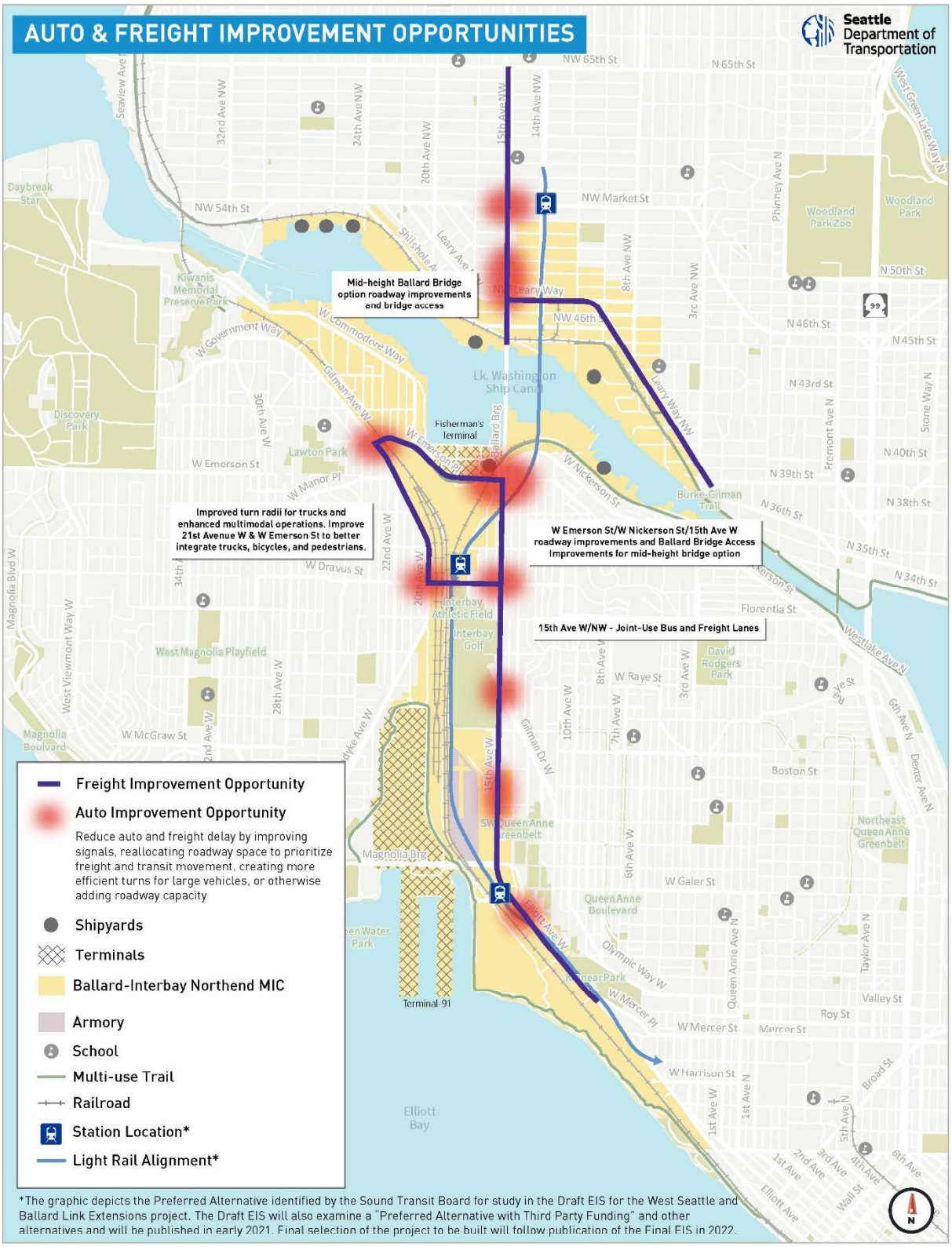
Table 6. Baseline (2042), Scenario 1 & 2 Freight Travel Times To/From Elliott Avenue W

Start Location	End Location	Freight Travel Time (minutes)					
		2042 Baseline		Scenario 1		Scenario 2	
		AM	PM	AM	PM	AM	PM
Elliott Avenue. W (South of W Galer St)	Shilshole-Industrial Area	12-17	20-27	11-15	20-27	10-14	21-29
	Fisherman's Terminal	9-13	18-25	10-13	19-25	9-13	20-28
	Terminal 91	7-10	7-10	7-10	7-10	4-6	7-9
Shilshole-Industrial Area	Elliott Avenue W (South of W Galer Street)	14-19	9-12	13-18	11-15	19-27	9-12
Fisherman's Terminal		16-22	12-17	12-16	7-10	18-24	8-11
Terminal 91		4-5	5-6	4-5	5-6	8-11	4-5

Notes:
- Freight travel times are based on movement delay from intersection analysis results with delay adjustments made for grade and turning radius.
- Lower range represents the average travel time a vehicle experiences aggregated over the peak hours; the upper range represents the typical highest travel time a vehicle experiences on days with high levels of congestion, based on travel times collected along 15th Avenue in October, 2019 from SDOT's Acyclica ITS system.

Based on projects and priorities in the Freight Master plan and concepts developed through review of auto and freight analysis, the following areas of opportunity and potential projects were identified. These concepts are shown in **Figure 27**. Specific projects to enhance freight mobility will be included in a project list being developed as part of this BIRT study.

Figure 27: Auto and Freight Areas of Opportunity and Potential Projects



5

Transit Network

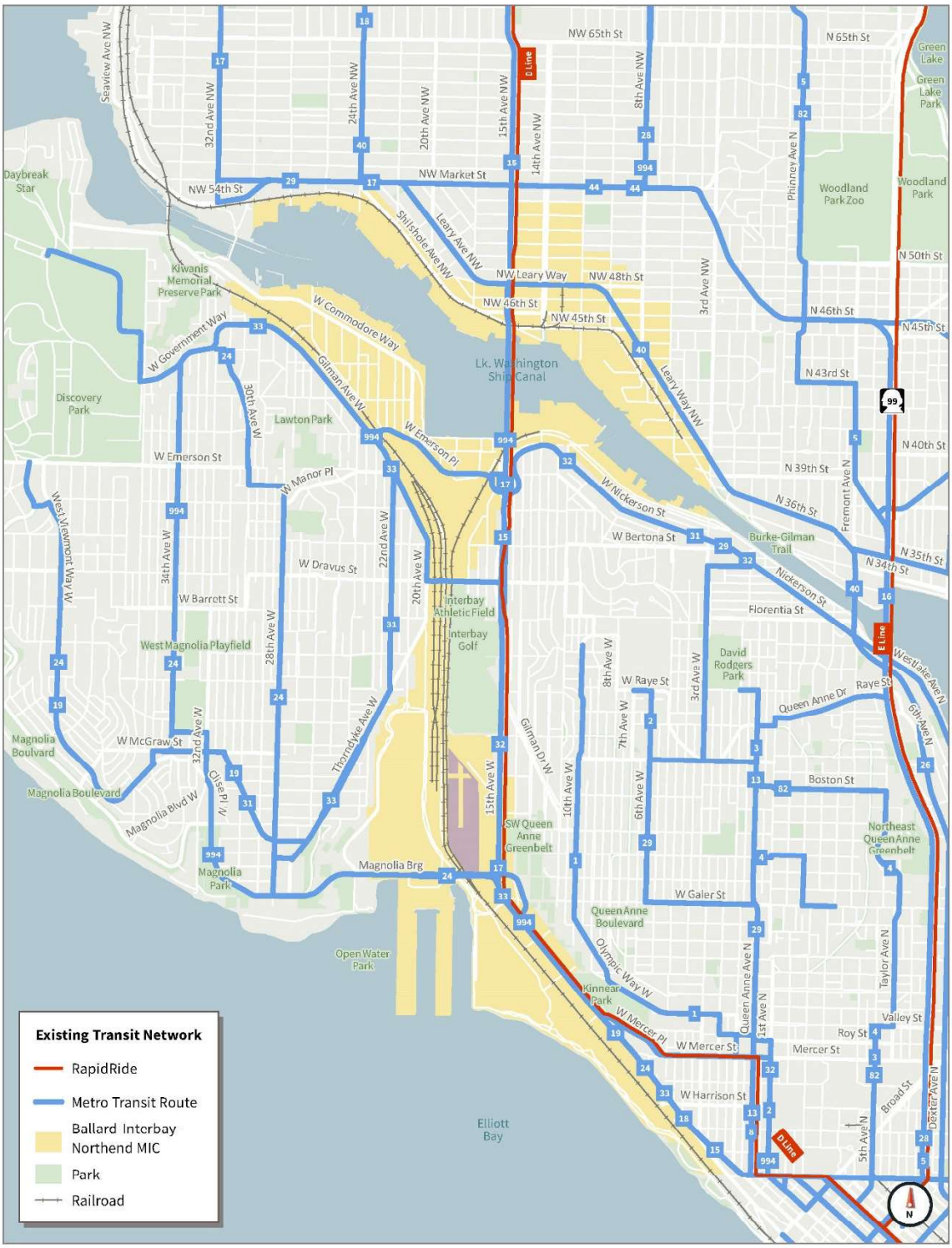
Transit in the project area is currently provided by King County Metro. The transit analysis outlined in this chapter provides an overview of transit travel times on key corridors to and from selected areas within Ballard, Magnolia, and Interbay. Existing and future conditions analysis uses Remix software to determine transit travel times for both the AM and PM peak hours, assumed to be 7-8 am and 5-6 pm, respectively. Future transit network assumptions are consistent with the WSBLE transportation network and include the new WSBLE line and METRO CONNECTS 2040 bus network.

Existing Conditions

The existing transit network consists primarily of King County Metro bus routes that provide connections to downtown Seattle. SDOT has identified priority transit routes in the Transit Master Plan, which ranks roadways by the type of transit service that suited to run on the roadway. As shown in **Figure 13**, roadways identified as part of the Transit Master Plan transit network cover much of the study area. In most cases, King County Metro operates service on transit priority corridors, with additional local connections outside of the priority corridors to Discovery Park and the south end of Magnolia. **Figure 28** shows King County Metro routes in the project area as of March 2020.

Due to the layout of industries in the BINMIC, employees in the area may need to walk or bike long distances to access transit. This is especially true for users near W Commodore Way, Fisherman's Terminal, and Smith Cove where access to frequent transit service may require a ¼ to ½ mile walk or a bus transfer. Employees in this area may work shifts outside of the peak or daytime transit schedules, which means the walking and biking environment may be dark and feel unsafe, and bus options may be limited. Employers in the BINMIC also may not actively encourage transit use, leading to a dependence on personal vehicles.

Figure 28: Existing Transit Network



Transit travel time in the study area can vary based on time of day, the direction of travel, and where someone is travelling. While service in the study area primarily provides connections between Ballard, Magnolia, and Downtown Seattle, east-west service is available on W Nickerson Street to make connections to Wallingford, the University District, and Laurelhurst. Transit service is most frequent on 15th Avenue W and NW, with multiple express and local routes using the corridor as well as the RapidRide D Line. Bus-only lanes on 15th Avenue W are available southbound during the AM peak and northbound during the PM peak allowing buses to stop in-lane and bypass congested areas. During off-peak times these lanes are available for parking.

To evaluate transit service in the study area, corridor travel times during the AM and PM peaks were developed using Remix software and the March 2020 Metro service network. Remix's travel time calculation is frequency based and includes time waiting for a bus, which is equal to half the headway. Study transit pathways were selected by reviewing key transit corridors in the study area, known travel patterns and key destinations. Since 15th Avenue W/NW forms a primary transit spine through Ballard and Interbay, connectivity on, to, and from this roadway was considered. The corridors and existing times are found in **Table 7**Error! Reference source not found. below.

Table 7. Existing PM Peak Direction Transit Travel Time

From	To	AM Travel Time	PM Travel Time
15th Avenue NW & NW Market Street	Downtown Seattle (3rd Avenue & Union Street)	45 minutes	45 minutes
15th Avenue NW & NW Market Street	W Prospect Street (Helix Pedestrian Bridge)	20 minutes	10 minutes
15th Avenue NW & NW Market Street	W Emerson Street & Gilman Avenue W	30 minutes	30 minutes
15th Avenue W and W Emerson Street	W Nickerson Street & 3rd Avenue W	20 minutes	20 minutes
Magnolia Village (W McGraw Street & 32nd Avenue W)	Downtown Seattle (3rd Avenue & Union Street)	60 minutes	45 minutes
Magnolia Village (W McGraw Street & 32nd Avenue W)	Magnolia Bridge (W Galer Street Flyover)	30 minutes	45 minutes
Magnolia Bridge (W Galer Street Flyover)	W Dravus Street & 20th Avenue W/Thorndyke Avenue W	30 minutes	10 minutes
Magnolia Bridge (W Galer Street Flyover)	SODO Busway & Spokane Street	45 minutes	45 minutes

Future Conditions

The future roadway transportation network in the BIRT study area includes implementation of WSBLE project, which will construct light rail through Interbay to Ballard and provide direct rail connections to Seattle Center, South Lake Union, Downtown Seattle, and points south. Three Sound Transit light rail stations are anticipated in the study area, which will provide direct bus transfer opportunities to light rail and may be designed to accommodate bus layover.

As a result of the WSBLE project, King County Metro anticipates major changes to the bus network that restructures service to enhance bus connections to light rail and other regional centers.

The baseline analysis in this section uses the 2040 METRO CONNECTS network and is also consistent with Network Scenario 1, the Magnolia Bridge one-to-one replacement since no changes to the transit environment would be made in this scenario. The future baseline transit/Scenario 1 network is shown in **Figure 29**. The Armory Way bridge option (Network Scenario 2) assumes all transit using the Magnolia Bridge in the baseline/Scenario 1 network would shift to Armory Way and use W Thorndyke Avenue to access the various transit pathways. The transit network assumed for Scenario 2 is found in **Figure 30**.

While SDOT does not include specific transit improvements within the study area in the *Transit Master Plan* (2016), NW Market Street, NW Leary Way, and 15th Avenue NW/W, are considered Priority Transit Corridors for Capital Investments, with NW Market Street and NW Leary Way identified as future RapidRide corridors. The *Transit Master Plan* identifies elements of RapidRide BRT service, including transit signal priority, enhanced passenger facilities, dedicated transit lanes, and enhanced fare collection systems to be implemented on Transit-Plus Multimodal corridors. Planning is currently underway for the Routes 44 Transit-Plus Multimodal Corridor project which will improve transit speed and reliability and passenger facilities to support existing transit service as well as future RapidRide service on the NW Market Street corridor to be implemented in 2023. Planning is also currently underway for the Route 40 Transit-Plus Multimodal Corridor project, which operates on 24th Avenue NW, NW Leary Way, and N 36th Street in the project area and will provide similar benefits to Route 44. Both SDOT and King County Metro have a standard "kit of parts" for transit facilities that would be implemented on new or enhanced transit routes.

WSBLE Station Utilization

Of the three planned Sound Transit light rail stations to be built as part of the WSBLE project in the study area, Ballard Station will likely have the highest number of transit transfers and pickups/drop-offs. By 2042, riders are expected to access these stations predominately through a mix of walking, biking, or transit transfer, with some riders being picked-up or dropped off. This highlights the importance of pedestrian, bicycle, and transit access for riders.

The Interbay and Smith Cove light rail stations are expected to see less ridership compared to Ballard Station. Sound Transit's forecasts anticipate about one-third as many riders will access light rail service at the Interbay station. Most riders are expected to arrive via buses that serve and provide access to the Magnolia and Queen Anne neighborhoods. At the Smith Cove Station, ridership would be slightly lower than at the Interbay station, with the majority of riders accessing the station on foot.

Figure 29: 2042 Baseline/Scenario 1 Transit Network

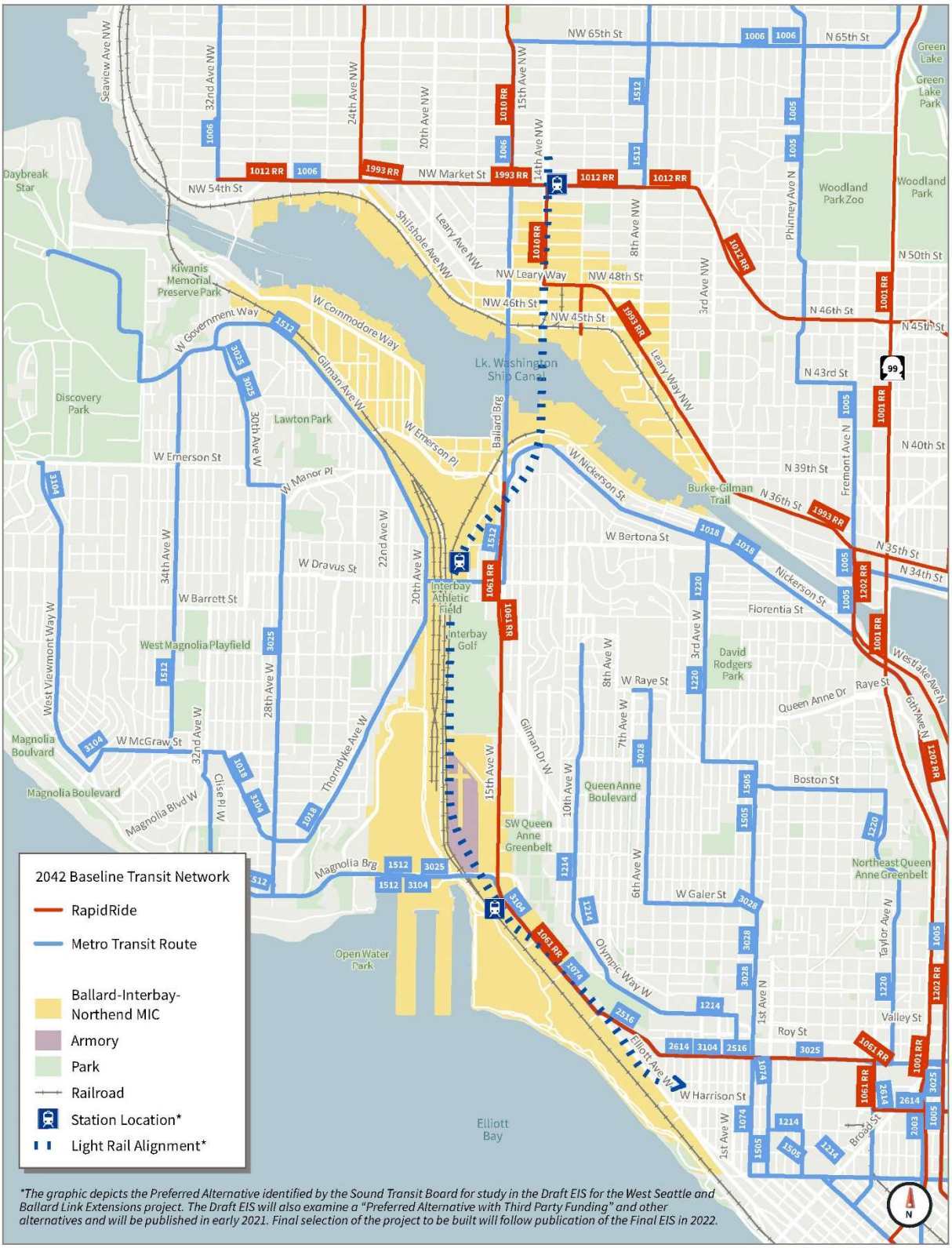


Figure 30: 2042 Network Scenario 2 Transit Network

Future Transit Travel Times to Key Destinations

The following corridors were evaluated for transit travel time in Remix using the METRO CONNECTS 2040 network that includes WSBLE implementation transit network during the AM and PM peak periods. The baseline network and Magnolia Bridge replacement (Scenario 1) networks are identical and assumed to have the same transit travel times due to Scenario 1 being a one-to-one replacement of the existing bridge. Scenario 2, which reflects a new bridge on Armory Way that connects to 20th Avenue W and Thorndyke Avenue W (replacing the existing Magnolia Bridge), assumes that all transit routes that had an alignment over the Magnolia Bridge would be rerouted via Armory Way and Thorndyke Avenue W. Routes maintain their 2042 METRO CONNECTS pathway at Thorndyke Avenue W.

Travel times include average wait times using scheduled transit arrival times for existing conditions and estimated transit frequency for the future scenarios. Origin/destination follows typical commute patterns of southbound in the AM and northbound in the PM. Since Remix software does not consider the roadway or intersection delay into travel time calculations, this analysis provides high-level travel time estimates primarily driven by route distance and speed. The 2040 METRO CONNECTS Remix network was provided by King County Metro and includes assumptions about future route runtimes and headways.

Table 8. 2042 Baseline/Scenario 1 and Scenario 2 Transit Travel Time Comparison

From	To	Baseline/ Scenario 1 AM Travel Time	Scenario 2 AM Travel Time	Baseline/ Scenario 1 PM Travel Time	Scenario 2 PM Travel Time
15th Avenue NW & NW Market Street	Downtown Seattle (3rd Avenue & Union Street)	30 minutes	30 minutes	30 minutes	30 minutes
15th Avenue NW & NW Market Street	W Prospect Street (Helix Pedestrian Bridge)	20 minutes	20 minutes	20 minutes	20 minutes
15th Avenue NW & NW Market Street	W Emerson Street & Gilman Avenue W	20 minutes	20 minutes	20 minutes	20 minutes
15th Avenue W and W Emerson Street	W Nickerson Street & 3rd Avenue W	20 minutes	20 minutes	20 minutes	20 minutes
Magnolia Village (W McGraw Street & 32nd Avenue W)	Downtown Seattle (3rd Avenue & Union Street)	45 minutes	45 minutes	45 minutes	45 minutes
Magnolia Village (W McGraw Street & 32nd Avenue W)	Magnolia Bridge (W Galer Street Flyover)	20 minutes	20 minutes	20 minutes	***30 minutes***
Magnolia Bridge (W Galer Street Flyover)	W Dravus Street & 20th Avenue W/Thorndyke Avenue W	20 minutes	20 minutes	20 minutes	20 minutes
Magnolia Bridge (W Galer Street Flyover)	SODO Busway & Spokane Street	45 minutes	45 minutes	***30 minutes***	***30 minutes***

Source: Remix, 2020.

The 2042 Baseline transit network shows an overall improvement in transit travel time, likely due to implementation of WSBLE and the restructure of the bus network to provide efficient transfers to WSBLE stations and direct connections to downtown Seattle. Other findings include:

- Travel between Ballard and downtown Seattle decreases from 45 minutes to 30 minutes in both the AM and PM peaks.
- Travel to/from Magnolia Bridge to downtown Seattle also decrease from 60 minute in the AM to 45 minutes in the PM.
- There are minimal changes to transit travel time as a result of the Armory Way bridge, with a 15-minute increase in travel time from Magnolia Bridge to the Galer Street Flyover due to transit taking a pathway further north compared to the current Magnolia Bridge routing.
- Only minimal difference in travel time are present between the future baseline and Scenario 2 network alternatives. Additional transit delay may be present at new intersections and roadways as a result of Scenario 2, including at 15th Avenue W & Armory Way, and at new intersections along Thorndyke Avenue W where a majority of transit routes are relocated.

Opportunities and Potential Projects

Based on projects and priorities in the Transit Master Plan, METRO CONNECTS, RapidRide C and D Line Improvements Speed and Reliability Study, and concepts developed through review of transit analysis, the following areas of opportunity and potential projects were identified. These concepts are shown in **Figure 31**. Specific projects to enhance transit speed and reliability and passenger facilities will be included in a project list being developed as part of this BIRT study.

Figure 31: Transit Areas of Opportunity and Potential Projects

Appendix A: Intersection Level of Service

Figure 32: Existing and 2042 Baseline Intersection Level of Service

Figure 33: Existing, Baseline, Scenario 1 & 2 AM Intersection Level of Service

Figure 34: Existing, Baseline, Scenario 1 & 2 PM Intersection Level of Service

Table 9. Intersection Level of Service for Existing Conditions and Scenarios 1 & 2

ID	Intersection	Control Type	Existing Conditions				Baseline Conditions				Magnolia 1-1 Alternative					Armory Way Alternative				
			AM Peak		PM Peak		AM Peak		PM Peak		Magnolia 1-1 Control Type	AM Peak		PM Peak		Armory Way Control Type	AM Peak		PM Peak	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
1	NW Market Street/17th Ave. NW	Signal	11.8	B	13.3	B	17	B	20	B	Signal	16.8	B	19.8	B	Signal	16.8	B	19.8	B
2	NW Market Street/15th Ave. NW	Signal	49.8	D	58.7	E	176	F	118	F	Signal	176.2	F	117.7	F	Signal	153.8	F	109.5	F
3	NW Leary Way/17th Ave. NW	TWSC	2.6	A	3.3	A	6	A	6	A	TWSC	4.1	A	6.3	A	TWSC	4.1	A	6.3	A
4	NW Leary Way /15th Ave. NW SB Ramp	Signal	13.9	B	13.7	B	35	D	19	B	Signal	12.2	B	15.0	B	Signal	12.2	B	15.0	B
5	NW Leary Way /15th Ave. NW NB Ramp	Signal	16.9	B	25.9	C	43	D	44	D	Signal	19.2	B	14.8	B	Signal	19.2	B	14.8	B
6	NW Leary Way /14th Ave. NW	Signal	13.2	B	10.5	B	15	B	15	B	Signal	24.7	C	36.4	D	Signal	24.7	C	36.4	D
7	Shilshole Ave. NW/17th Ave. NW	TWSC	4.3	A	3.6	A	4	A	4	A	Signal	3.2	A	12.7	B	Signal	3.2	A	12.7	B
8	Shilshole Ave. NW/NW 46th St.	TWSC	0.1	A	0.3	A	0	A	0	A	TWSC	0.1	A	0.5	A	TWSC	0.1	A	0.5	A
9	NW 46th St/14th Ave. NW	AWSC	18.3	B	28.3	C	20	B	33	C	AWSC	19.6	B	99.8	F	AWSC	19.6	B	99.8	F
10	Gilman Ave. NW/W. Emerson Pl.	AWSC	69.8	E	133.1	F	112	F	200	F	AWSC	111.7	F	199.5	F	AWSC	111.7	F	199.5	F
11	23rd Ave. NW/W. Emerson Pl.	TWSC	0	A	0	A	0	A	0	A	TWSC	0.0	A	0.0	A	TWSC	0.0	A	0.0	A
12	W. Emerson St./19th Ave. W	Signal	4	A	8.3	A	11	B	20	B	Signal	10.7	B	19.8	B	Signal	10.7	B	19.8	B
13	W. Emerson St./W. Nickerson St.	AWSC	12.1	B	16.4	B	13	B	26	C	Signal	7.2	A	17.7	B	Signal	7.2	A	17.7	B
14	W. Nickerson St./15th Ave. W Ramps	AWSC	17.7	C	26	C	35	E	26	C	Signal	24.1	C	18.0	B	Signal	24.1	C	18.0	B
15	W. Nickerson St./13th Ave. W	Signal	6.9	A	8.3	A	10	A	10	A	Signal	9.8	A	9.9	A	Signal	9.8	A	9.9	A
16	W. Dravus St./20th Ave. W	Signal	32.1	C	57.4	E	49	D	94	F	Signal	48.6	D	94.2	F	Signal	65.0	E	137.6	F
17	W. Dravus St./17th Ave. W	Signal	5.6	A	10	B	7	A	15	B	Signal	6.9	A	15.0	B	Signal	6.9	A	16.2	B
18	W. Dravus St./15th Ave. SB Ramps	Signal	21.9	C	28.4	C	80	F	52	D	Signal	80.4	F	52.2	D	Signal	84.6	F	59.5	E
19	W. Dravus St./15th Ave. NB Ramps	Signal	16.8	B	48.6	D	29	C	55	D	Signal	29.4	C	54.9	D	Signal	29.6	C	61.1	E
20	W. Dravus St./14th Ave. W	TWSC	1.3	A	1.3	A	3	A	3	A	TWSC	2.5	A	2.9	A	TWSC	2.5	A	2.9	A
21	Thorndyke Ave. W/20th Ave. W	TWSC	0.9	A	0.5	A	1	A	1	A	TWSC	0.9	A	1.0	A	TWSC	2.6	A	3.2	A
22	Thorndyke Ave. W/21st Ave. W	TWSC	0.9	A	0.4	A	1	A	2	A	TWSC	0.9	A	2.0	A	TWSC	0.6	A	2.0	A
23	Gilman Dr. W/15th Ave. W	Signal	17.4	B	24.5	C	80	F	108	F	Signal	80.0	F	107.7	F	Signal	66.5	E	107.6	F
24	W. Armory Wy./15th Ave. W	Signal	9	A	8.7	A	69	E	35	D	Signal	69.1	E	35.0	D	Signal	229.6	F	62.7	E
25	W. Howe St./15th Ave. W	Signal	12.4	B	18.8	B	85	F	63	E	Signal	85.1	F	62.8	E	Signal	164.9	F	129.6	F
26	W. Blaine St./Thorndyke Ave. W	TWSC	2.2	A	1.1	A	2	A	1	A	TWSC	2.0	A	1.1	A	TWSC	75.4	E	47.7	D
27	W. Galer St./Thorndyke Ave. W	TWSC	5.5	A	1	A	8	A	2	A	TWSC	7.7	A	2.0	A	TWSC	24.7	C	14.1	B
28	23rd Ave. NW/Magnolia Bridge EB on-ramp	TWSC	0.4	A	0.4	A	0	A	0	A	TWSC	0.4	A	0.4	A	Does Not Exist	Not applicable for Alternative			
29	Terminal 91 Gate/Magnolia Bridge WB off-ramp	TWSC	6	A	6.9	A	7	A	8	A	TWSC	6.5	A	7.5	A	Does Not Exist	Not applicable for Alternative			
30	W. Garfield St.-Magnolia Bridge/15th Ave. W	Signal	12.3	B	9.0	A	40.1	D	47.5	D	Signal	40.1	D	47.5	D	Signal	59.3	E	118.5	F
31	W. Galer St. Flyover/Alaskan Way W	Signal	15.6	B	30.0	C	473.4	F	600.5	F	Signal	473.4	F	600.5	F	Signal	806.9	F	413.9	F
32	W. Galer Street/Alaskan Way W	AWSC	7.7	A	7.7	A	666.1	F	304.0	F	AWSC	666.1	F	304.0	F	AWSC	666.1	F	223.0	F
33	15th & W Galer St	Signal	7.5	A	4.9	A	12.7	B	25.0	C	Signal	12.7	B	25.0	C	Signal	7.4	A	82.5	F
34	W. Galer Flyover&Elliott Ave. W/15th	Signal	8.3	A	18.2	B	47.5	D	136.1	F	Signal	47.5	D	136.1	F	Signal	35.3	D	131.0	F
35	Alaskan Way W & T91 Entry	Does Not Exist	Not applicable for Alternative				Not applicable for Scenario				Does Not Exist	Not applicable for Alternative				Signal	2.2	A	7.8	A
36	Alaskan Way W & Magnolia Flyover	Does Not Exist	Not applicable for Alternative				Not applicable for Alternative				Does Not Exist	Not applicable for Alternative				TWSC	96.8	F	7.5	A
37	Thorndyke Ave W & Armory Bridge	Does Not Exist	Not applicable for Alternative				Not applicable for Scenario				Does Not Exist	Not applicable for Alternative				Signal	48.0	D	35.0	D
38	Emerson & North 15th Ramps	Does Not Exist	Not applicable for Alternative				Not applicable for Scenario				Signal	35.3	D	30.4	C	Signal	35.3	D	30.4	C
39	NW Leary Way & SB 15th Ave On Ramp	Does Not Exist	Not applicable for Alternative				Not applicable for Alternative				Signal	15.4	B	11.1	B	Signal	15.4	B	11.1	B
40	NB 15th Ave Off Ramp & 14th Ave NW	Does Not Exist	Not applicable for Alternative				Not applicable for Scenario				Signal	28.9	C	27.5	C	Signal	28.9	C	27.5	C

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