BURKE-GILMAN TRAIL MISSING LINK PROJECT

Seattle Department of Transportation

Final Environmental Impact Statement

May 2017

Seattle
Department of
Transportation

May 25, 2017

Dear Interested Tribes, Organizations, and Members of the Public:

The Seattle Department of Transportation (SDOT) proposes to complete the Burke-Gilman Trail, a regional, multi-use trail that runs east from Golden Gardens Park in Seattle and connects to the Sammamish River Trail in Bothell. The trail is continuous except for a 1.4-mile segment through the Ballard neighborhood known as the Missing Link. Currently, the trail ends at 30th Avenue NW by the Ballard Locks on the west and begins again at the intersection of 11th Avenue NW and NW 45th Street on the east.

SDOT is acting as lead agency under the Washington State Environmental Policy Act (SEPA). On June 16, 2016 SDOT issued a Draft Environmental Impact Statement (EIS) that evaluated four alternatives for completing the Missing Link known as Shilshole South, Shilshole North, Ballard Avenue, and Leary. After consideration of the public comments on the Draft EIS, further analysis of the potential impacts, and discussions with several key stakeholders, SDOT selected a Preferred Alternative, which would be a combination of the Shilshole North and Shilshole South alternatives. Beginning at the Ballard Locks, the Preferred Alternative would travel east along the south side of NW 54th St and NW Market St, turn south along the west side of 24th Ave NW, head east along the south side of Shilshole Ave NW, then continue east along the south side of NW 45th St, where it would connect with the existing Burke-Gilman Trail at 11th Ave NW.

Completing the Missing Link would create a safe, direct, and defined multi-use trail for persons of all abilities, for a variety of transportation and recreational activities. It would improve predictability for motorized and nonmotorized users along the project alignment and maintain truck and freight access to the industrial and water-dependent businesses within the Ballard Interbay Northend Manufacturing and Industrial Center. In addition, the Preferred Alternative would provide connections to the proposed nonmotorized networks shown in Seattle's Pedestrian Master Plan and Bicycle Master Plan.

SDOT has prepared the Final EIS to inform the public and to assist decision makers in understanding the potential environmental effects—both positive and negative—associated with the project both during and after construction and in relation to other projects in the vicinity.

The Final EIS has been prepared and is being circulated in compliance with SEPA. No action will be taken based on this document for at least seven days in accordance with SEPA and the City of Seattle Municipal Code. Thank you for your continued interest in this project.

Sincerely,

Scott Kubly,
Director

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FACT SHEET

Project Name

Burke-Gilman Trail Missing Link Project

Proposed Action

The Burke-Gilman Trail (BGT) is a regional trail that runs east from Golden Gardens Park in Seattle and connects to the Sammamish River Trail in Bothell, except for a missing segment through the Ballard neighborhood. Currently, the regional trail ends at 30th Ave NW by the Hiram M. Chittenden (Ballard) Locks on the west, and begins again at the intersection of 11th Ave NW and NW 45th St on the east. The Seattle Department of Transportation (SDOT) proposes to connect these two segments of the BGT with a marked, dedicated route that would serve all users of the multi-use trail. The proposed project to complete the regional facility is referred to as the Missing Link.

Project Proponent and SEPA Lead Agency

Seattle Department of Transportation (SDOT)

SEPA Responsible Official

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Date of Issue of the Final Environmental Impact Statement

May 25, 2017

Document Availability and Cost

The Final Environmental Impact Statement (FEIS) is available online at:
http://www.seattle.gov/transportation/BGT_Ballard.htm.

Printed copies of the FEIS are available for review at no charge at the following locations:

Seattle Department of Construction and Inspections Public Resources Center
700 5th Ave, Suite 2000
Seattle, WA 98124

Seattle Public Library, Central Library
1000 4th Ave
Seattle, WA 98104

Ballard Library and Ballard Neighborhood Customer Service Center
5614 and 5604 22nd Ave NW
Seattle, WA 98107

Seattle Public Library, University Branch
5009 Roosevelt Way NE
Seattle, WA, 98105

Seattle Public Library, Fremont Branch
731 N 35th Street
Seattle, WA 98103

Seattle Public Library, Wallingford Branch
1501 N 45th Street
Seattle, WA 98103

Seattle Public Library, Greenwood Branch
8016 Greenwood Ave N
Seattle, WA 98103

Seattle Public Library, Magnolia Branch
2801 34th Ave W
Seattle, WA 98199

Seattle Public Library, Queen Anne Branch
400 W Garfield Street
Seattle, WA 98119

University of Washington Suzzallo Library
University of Washington Campus

Printed copies of the Executive Summary are available to the public at no charge. Printed copies of the FEIS, comment responses, and technical appendices are available for purchase by calling (206) 684-5000 or emailing BGT_MissingLink_Info@seattle.gov. Prices for printed volumes are:

FEIS (printed copy): $50

Comments and Responses (printed copy): $50

Technical Appendices (printed copy): $50

Executive Summary (printed copy): Free

The Executive Summary is available in braille free of charge by contacting SDOT at (206) 684-5000.

Permits, Licenses, and Approvals Likely Required for Proposal

- State Environmental Policy Act (SEPA)
- Seattle Shoreline Master Program Review
- National Pollutant Discharge Elimination System (NPDES) Construction Stormwater General Permit

Authors and Contributors

A list of authors and contributors is provided in Chapter 13 of the FEIS.

Location of Background Materials

Background materials used in the preparation of this FEIS are listed in Chapter 12, References. Several documents are available online at the project website: http://www.seattle.gov/transportation/BGT_Ballard.htm.

Environmental Review

SDOT published the DEIS on June 16, 216. A 45-day comments period was open until August 1, 2016 and included public meetings on July 14, 2016 and July 16, 2016. Based on the analysis in the DEIS, with input from the public comments and meetings with area businesses and interest groups, SDOT developed the Preferred Alternative, which combines components previously analyzed in the Build Alternatives. Volume 2 of the FEIS contains the responses to the comments. Final design and permitting are expected to be completed by early 2018, with construction beginning shortly thereafter. The project is anticipated to be complete by 2019.

TABLE OF CONTENTS

LIST OF APPENDICES

VOLUME 2 (BOUND SEPARATELY)

TECHNICAL APPENDICES – VOLUME 3 (BOUND SEPARATELY)

LIST OF FIGURES

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
ADA	Americans with Disabilities Act
ASTM	American Society for Testing and Materials
BGT	Burke-Gilman Trail
BINMIC	Ballard-Interbay Northend Manufacturing and Industrial Center
BMPs	best management practices
BTR	Ballard Terminal Railroad Company (formerly known as Seattle Lake Shore and Eastern Railroad Grade)
C1	Commercial
CAP	Climate Action Plan
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
CH4	methane
City	City of Seattle
CM	Conservancy Management
CN	Conservancy Navigation
CO	carbon monoxide
CO_2	carbon dioxide
Corps	U.S. Army Corps of Engineers
CORRACTS	Corrective Action Sites
CSO	Combined Sewer Overflow
DAHP	Department of Archaeology and Historic Preservation
DEIS	Draft Environmental Impact Statement
DPS	Distinct Population Segment
Ecology	Washington State Department of Ecology
EDR	Environmental Data Resources
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ERNS	Emergency Response Notification System
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
fbs	feet below ground surface
FEIS	Final Environmental Impact Statement

GHG	greenhouse gas
GIS	geographic information system
GMA	Growth Management Act
IB	Industrial Buffer
IC	Industrial Commercial
IDP	Inadvertent Discovery Plan
IG2	General Industrial 2
LOS	Level of Service
LR3	Low-Rise 3 (Multifamily)
mph	miles per hour
N2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NACTO	National Association of City Transportation Officials
NC2	Neighborhood Commercial 2
NC3	Neighborhood Commercial 3
NMFS	National Marine Fisheries Service
NO2	nitrogen dioxide
NPL	National Priorities List
NRHP	National Register of Historic Places
P1	Pedestrian Overlay
PM	particulate matter
ppb	parts per billion
ppm	parts per million
PSCAA	Puget Sound Clean Air Agency
PSE	Puget Sound Energy
PSRC	Puget Sound Regional Council
RCO	Washington State Recreation and Conservation Office
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
SCL	Seattle City Light
SDCI	Seattle Department of Construction and Inspection
SDOT	Seattle Department of Transportation
SEPA	State Environmental Policy Act
SFIA	Sports and Fitness Industry Association
Ship Canal	Lake Washington Ship Canal

SIP	State Implementation Plan
SLS&E RR	Seattle Lake Shore and Eastern Railroad Grade (currently known as Ballard Terminal Railroad)
SMC	Seattle Municipal Code
SMP	Shoreline Master Program
SOV	Single-Occupancy Vehicle
SPU	Seattle Public Utilities
SWPPP	Storm Water Pollution Prevention Plan
$\mu g/m^3$	micrograms per cubic meter
USDOT	U.S. Department of Transportation
UI	Urban Industrial
USFWS	U.S. Fish and Wildlife Service
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources
WISAARD	Washington Information System for Architectural and Archaeological Records Data

GLOSSARY

Term	*Definition*
Best Management Practices (BMPs)	A method that can be used to minimize the amount of pollution entering surface waters. BMPs may include schedules of compliance, operation and maintenance procedures, and treatment requirements.
Bike Box	A bike box is a painted green space on the road with a white bicycle symbol inside. The bike box creates space before the intersection so that people on bicycles can cross the intersection ahead of traffic. This makes bicycles more visible and predictable to approaching drivers.
Build Alternative	An alternative to develop a multi-use trail to connect the existing segments of the Burke-Gilman Trail through the Ballard neighborhood.
Critical Habitat	Critical habitat is defined as specific geographical areas that contain physical or biological features essential to conservation of a species.
Crustal Fault	Faults formed by the deformation of the earth's crust.
Curb Radius (curb radii)	Curb radius is the radius defined by two sidewalks on perpendicular streets that come together at a corner. Curb radii directly impact vehicle turning speeds and pedestrian crossing distances.
Dissolved Oxygen	A measure of the amount of oxygen in the water that is available to be used by aquatic organisms.
Distinct Population Segment (DPS)	A distinct population segment is a vertebrate population or group of populations that is discrete from other populations of the species and significant in relation to the entire species. The federal Endangered Species Act provides for listing species, subspecies, or distinct population segments of vertebrate species.
Elevated Trail	Trail is elevated such that vehicles can pass underneath.
Endangered Species	A species that is in danger of extinction within the foreseeable future throughout all, or a significant portion, of its range.
Ethnographic	The study and systematic recording of human cultures.
Evolutionarily Significant Unit (ESU)	An evolutionarily significant unit is a Pacific salmon population or group of populations that is substantially reproductively isolated from other conspecific populations and that represents an important component of the evolutionary legacy of the species.
Fecal Coliform	A type of bacteria found in the intestinal tracts of mammals. The presence of high numbers of fecal coliform bacteria in a water body can indicate the recent release of untreated wastewater and/or the presence of animal feces. These organisms may also indicate the presence of pathogens that are harmful to humans.
Glacial Till	Unstratified material deposited by a glacier, consisting of clay, silt, sand, gravel, and boulders.

Term	*Definition*
Heritage Tree	Heritage trees are a tree or group of trees given special designation by the Heritage Tree Program, co-sponsored by Plant Amnesty and the Seattle Department of Transportation. Trees can be nominated as an individual or a collection, but must have the owner's approval and meet criteria for health in addition to being selected according to one of the following categories. Specimen: A tree of exceptional size, form, or rarity. Historic: A tree recognized by virtue of its age, its association with or contribution to a historic structure or district, or its association with a noted person or historic event. Landmark: Trees that are landmarks of a community. Collection: Trees in a notable grove, avenue, or other planting.
Holocene	An epoch of time, approximately 8,000 years ago to the present time.
Impervious Surfaces	Constructed surfaces such as pavement, driveways, roads, and rooftops that do not allow rainfall to soak into the ground. Instead, water runs off of these surfaces and can enter water bodies such as streams and wetlands either directly, or by being discharged from stormwater detention ponds or other facilities constructed to manage runoff.
Intraslab	Subduction occurring within the same geologic unit.
Level of Service (LOS)	An estimate of the quality and performance of transportation facility operations in a community. The degree of congestion and delay is rated ranging from the letter “A” for the least amount of congestion, to the letter “F” for the highest amount of congestion. LOS D or better is considered acceptable for most jurisdictions. At LOS E, intersections operate at capacity.
Liquefaction	During an earthquake, saturated cohesionless soils (e.g., sands) lose frictional forces and act more like a liquid than a solid.
Midden	Archaeological deposits consisting of refuse from human activities, usually composed of a mixture of soil, charcoal, and various food remains such as bone, shell, and carbonized plant remains; may also contain human remains.
Multi-Use Trail	A multi-use trail allows for two-way, off-street pedestrian, and bicycle use. Wheelchairs, joggers, skaters, and other nonmotorized users are also welcome.
Neighborhood Greenway	A designated residential street generally off of main arterials with low volumes of cars going slowly enough so that people who walk or ride bicycles feel safe and comfortable. They include pavement markings, signs, and improved crossings at main streets.
Outwash	Sand and gravel deposited by the meltwater streams of a glacier.
Peak Hour	The hour of the day when the highest traffic volumes occur at an intersection or roadway segment. The specific peak hour varies from intersection to intersection but generally occurs for a single hour between 7 and 9 AM for the AM peak hour, and 4 and 6 PM for the PM peak hour.
Pleistocene	An epoch of time, beginning approximately two to three million years ago until the start of the Holocene (approximately 8,000 years ago).

Term	*Definition*
Primary Constituent Element	A physical or biological feature essential to the conservation of a species for which its designated or proposed critical habitat is based on, such as space for individual and population growth, and for normal behavior; food, water, air, light, minerals, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, rearing of offspring, germination, or seed dispersal; and habitats that are protected from disturbance or are representative of the species' historic geographic and ecological distribution.
Projectile Point	Chipped stone artifacts used to tip arrows, dart points, or spears.
Protected Bicycle Lanes	A protected bicycle lane combines the user experience of a multi-use trail with a conventional bicycle lane. They have different forms, but all share common elements — they provide space that is used for bicycles and are separated from motor vehicle travel lanes, parking lanes, and sidewalks.
Salmonid	General term for salmon, trout, and steelhead.
Seiche	An oscillation of a body of water in an enclosed or semi-enclosed basin, caused by local changes in atmospheric pressure, and aided by winds, tidal changes, and sometimes earthquakes.
Sharrow	Shared lane markings or "sharrows" guide bicyclists to the best place on the street to ride and help motorists expect to see and share the lane with bicyclists.
Shoreline Management Master Program	A shoreline plan created by a local government in compliance with the Washington State Shoreline Management Act. The plan designates what types of uses may be allowed along different portions of the shorelines within the community.
Smolts	Young salmon or sea trout about 2 years old that are at the stage of development when they assumes the silvery color of the adult and are ready to migrate to the sea.
State Sensitive Species	Any wildlife species native to Washington that is vulnerable or declining and is likely to become endangered or threatened throughout a significant portion of its range within the state without cooperative management or removal of threats.
State Species of Concern	Includes species listed as state endangered, state threatened, state sensitive, or state candidate, as well as species listed or proposed for listing by the United States Fish and Wildlife Service or National Oceanic and Atmospheric Administration Fisheries.
Subduction Zone	The long narrow belt where one lithospheric plate descends beneath another.
Subsidence	Sinking or downward settling of the earth's surface.
Threatened Species	A species that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.
Wetlands	Those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.
Woonerf	A street where pedestrians and bicyclists have priority over motorists. Traffic volumes and speeds are low, less of the public right-of-way is dedicated to vehicles, and curbs may be eliminated.

CHAPTER 1: PROJECT HISTORY AND ALTERNATIVES

1.1 Project Background and History

Changes from the Draft EIS

Chapter 1 includes a description of the newly developed Preferred Alternative, which was not analyzed in the DEIS. It also includes a revised description of Roadway Design and Safety Considerations, and summarizes the comments received on the DEIS.

The Burke-Gilman Trail (BGT) is a regional trail that runs east from Golden Gardens Park in Seattle and connects to the Sammamish River Trail in Bothell, except for a missing segment through the Ballard neighborhood. Currently, the regional trail ends at 30th Ave NW by the Hiram M. Chittenden (Ballard) Locks on the west, and begins again at the intersection of 11th Ave NW and NW 45th St on the east. The Seattle Department of Transportation (SDOT) proposes to connect these two segments of the BGT with a marked, dedicated route that would serve all users of the multi-use trail. The proposed project to complete the regional facility is referred to as the Missing Link.

Completing this section of the BGT has been discussed and analyzed since the late 1980s. In the early 1990s, the City of Seattle (City) included the extension of the BGT in its comprehensive plan. By the late 1990s, the Seattle City Council passed a resolution outlining the guiding principles for extending the trail and developed an operating agreement between the Ballard Terminal Railroad (BTR) and the City to preserve the rail line in City ownership while continuing rail service to area businesses. The City Council adopted an ordinance, the Ballard Terminal Railroad Franchise Agreement, which granted BTR the right, privilege, and authority to construct and operate the railway in the railroad right-of-way. In the early 2000s, the City evaluated alternative routes for the trail. In 2003, the Seattle City Council adopted a resolution identifying Shilshole Ave NW as the preferred alignment for the Missing Link, with interim portions of the route to be located along Ballard Ave NW and NW Market St. In 2007, the City adopted the Bicycle Master Plan, which called for completing the trail. Environmental documentation was prepared for the Missing Link beginning in 2008 and was challenged multiple times. In 2012, after the third appeal to the City's Hearing Examiner over the project's environmental determination, the Hearing Examiner required SDOT to develop an environmental impact statement (EIS) related to traffic hazards on the Shilshole Ave NW segment of the project. As a result of the ruling, SDOT decided to prepare an EIS for the entire project and to include an evaluation of alternative routes. SDOT began preparation of an EIS in 2013. Figure 1-1 provides a general timeline of the Missing Link project history.

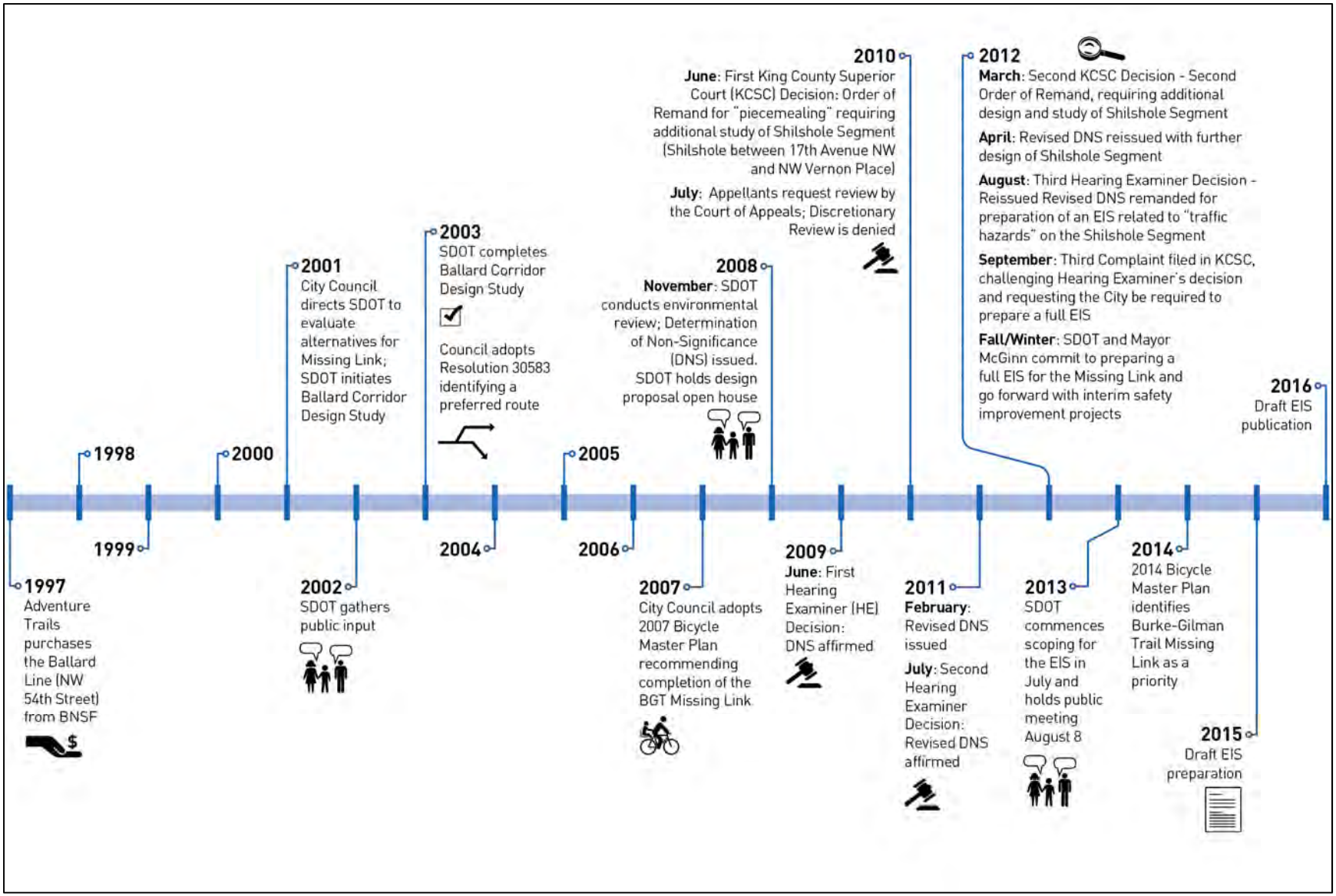


Figure 1-1. Missing Link Project History Timeline

1.2 Objectives

The BGT currently serves a large portion of Seattle and the region as a highly used nonmotorized transportation and recreational facility. The City has identified a need for recreational and commuter users of the Burke-Gilman Trail to have a safe, direct, and defined way to traverse through the Ballard neighborhood from either end of the existing trail (SDOT, 2007, 2009, 2015). There are a number of barriers between the existing trail ends for people walking and biking. Some streets lack sidewalks or other demarcated areas for pedestrians, and intersection and railroad crossings are substandard for bicycles. Many people have commented during public meetings and open houses that they do not feel comfortable riding bicycles or walking in the roadway, and some activities such as skateboarding are not allowed on city streets. Traffic surveys have shown that the lack of a direct and defined route between trail ends results in people dispersing along various streets through Ballard, which in turn increases the opportunity for conflicts between vehicles and nonmotorized activities (SDOT, 2014, 2015).

Therefore, the primary objective of the proposed project is to connect the roughly 1.4-mile gap between the existing segments of the BGT through the Ballard neighborhood. The project is intended to create a safe, direct, and defined multi-use trail for persons of all abilities, for a variety of transportation and recreational activities, and to improve predictability for motorized and nonmotorized users along the project alignment. Another objective of the project is to provide connections to the proposed nonmotorized networks shown in the Pedestrian Master Plan (SDOT, 2009) and Seattle Bicycle Master Plan (SDOT, 2014), while maintaining truck and freight facilities and access that support industrial and water-dependent land uses within the shoreline district and the Ballard-Interbay Northend Manufacturing and Industrial Center (BINMIC).

1.3 SEPA Process

This Final EIS (FEIS) has been prepared consistent with the State Environmental Policy Act (SEPA) (Washington Administrative Code [WAC] 197-11 and Seattle Municipal Code [SMC] 25.05). It is an analysis designed to help elected officials, community leaders, and the public understand the full range of environmental impacts that could result from the proposal. The City, as the SEPA lead agency, is responsible for fulfilling SEPA's procedural requirements. The FEIS describes potential adverse impacts of each alternative and describes proposed measures to reduce potential adverse impacts. SDOT received approximately 4,100 public comments on the Draft EIS (DEIS), which are included with their responses in Volume 2 of the FEIS. Since the issuance of the DEIS, the City has selected a Preferred Alternative that best meets the project's objective, which is fully analyzed in this FEIS.

The intent and purpose of this FEIS is to satisfy the procedural requirements of SEPA (Revised Code of Washington [RCW] 43.21c and City Ordinance 114057). This is a project-level EIS that encompasses all of the regulatory, transactional, and other actions necessary to complete the Missing Link. This document is not an authorization for an action, nor does it constitute a decision or a recommendation for an action.

1.3.1 **Scoping**

SDOT held its scoping process between July 17 and August 16, 2013, and held an open house on August 8, 2013 at Ballard High School. The focus of the open house was to receive comments related to alternative trail locations and the elements of the environment that should be evaluated in the EIS. Scoping is described in more detail in the *Burke-Gilman Trail Missing Link Environmental Impact Statement Public Scoping Meeting Comments Summary* available on the City website (SDOT, 2015).

All of the trail location information obtained as part of the scoping process was incorporated into the alternative development and screening process, as described in Section 1.4.1 of the DEIS.

1.4 Alternative Development

1.4.1 Screening

SDOT received a number of suggestions during scoping in 2013 for potential routes to complete the Missing Link. SDOT mapped all possible route segments identified in the public scoping period, along with several additional segments suggested by SDOT staff and consultants. Overall routes through the study area were broken into smaller segments for review, and included a street block or number of blocks that would likely remain intact as part of a larger route. Segments were added in addition to those suggested by the public, including street blocks that could be used to connect streets in a reasonable way.

Engineers and planners from SDOT, in conjunction with their consultants (engineers, transportation planners, environmental planners, trail designers, and scientists), evaluated 55 route segments using the screening criteria listed below in a charrette-style workshop held in March 2015.

Screening criteria were developed by SDOT and their consulting team to narrow down the possible alternative segments and remove unworkable or infeasible segments from further consideration. The criteria included factors critical to the development of a safe, multi-use trail that would be similar in design and feel to the remainder of the BGT system. The screening criteria included the following factors:

- Directness of route,
- Number and types of trail crossings (driveways and intersections),
- Street and arterial classification,
- Adjacent land uses, and
- Right-of-way width.

At the workshop, each route segment was evaluated to create reasonable alignments that best meet the project objective. Using the screening criteria, the number of route segments was reduced to 31 segments. Segments that were eliminated either did not meet the criteria or did not provide a reasonable connection where another segment better met the criteria and/or provided a more direct or safe connection. The remaining segments were combined by the team to create a range of trail alignments through the study area that incorporated a broad range of options. The route segments were connected into three feasible alternative routes and seven route segments that would allow potential links to “mix and match” route segments.

Once the general alignments were determined, the route was further refined. To reduce the number of intersection crossings, the trail was located on the side of the street that resulted in fewer intersection crossings. In general, this meant that the trail would be located on the south side of east-west trending streets and on the west side of north-south trending streets.

Several team workshops were held over the next 3 months as the routes were being developed to refine the trail details and crossings. The trail alignments were named for the general east-west trending street on which they are located: the Shilshole South Alternative, the Ballard Avenue Alternative, and the Leary Alternative.

Following review of the three alternatives in June 2015, SDOT decided to include a fourth alternative, along the north side of Shilshole Ave NW, called the Shilshole North Alternative, because this alignment meets the screening criteria and does not result in more intersection crossings than the Ballard Avenue or Leary Alternatives. Ultimately, after issuance and review of the DEIS, SDOT developed an additional Build Alternative, identified as the Preferred Alternative in this FEIS.

This FEIS evaluates the five Build Alternatives described above, along with the No Build Alternative. Refer to Section 1.6 and Figure 1-2 for descriptions and depictions of the alternative alignments and connector segments.

1.4.2 Development and Selection of the Preferred Alternative

As described in the DEIS, all four Build Alternatives that SDOT evaluated would meet the project objectives to provide a safe, direct, and defined multi-use trail for persons of all ages and ability, improve predictability for users along the project alignment, and maintain truck and freight facilities and access that support industrial and water-dependent uses in the area. However, several factors unique to each alternative could make some alternatives better suited to meeting the project objectives than others and could result in different potential adverse impacts to the natural and built environment. Upon further evaluation of the merits of each alternative, SDOT determined that the Shilshole South Alternative best meets the project objectives, but with some modifications to that route.

SDOT began the process of selecting a Preferred Alternative after review of the public comments on the DEIS. Approximately 80% of the public comments received on the DEIS expressed a preference for the Shilshole South Alternative. However, SDOT also received a substantial number of comments related to concerns over the project's potential conflicts with and impacts to adjacent commercial and industrial businesses. Based on those comments, SDOT made the decision to analyze motor vehicle volumes and movement at several additional driveways and roadway intersections and to conduct additional parking studies during night and weekend time periods.

After re-examining the driveway volumes and vehicle movements, SDOT determined that, starting from the Ballard Locks, it would be preferable for the trail to run along NW 54th St to NW Market St, rather than along the unimproved NW 54th St right-of-way all the way to Shilshole Ave NW. Locating the trail along the unimproved NW 54th St right-of-way would exacerbate a pinch point between vehicles needing to access properties south of the roadway, the Ballard Terminal Railroad tracks, and business access garages that open immediately into the public right-of-way. In addition, the trail would need barriers or fences on either side to prevent motor vehicles from driving along the trail due to the otherwise narrow roadway. In contrast, SDOT determined that an alignment along NW Market St, west of 24th Ave NW, would allow for a more pleasurable trail user experience with minimal diversion from the desired line of travel, without the need for physical barriers on either side of the trail. Further, the trail would take advantage of and help activate the new developments occurring along NW Market St, west of 24th Ave NW, and provide an easier access point to the Burke-Gilman Trail for people coming from the north.

Figure 1-2. Proposed Alternatives

From the intersection of 24th Ave NW and Shilshole Ave NW, SDOT determined that between the options of continuing on NW Market St to Leary Way or Ballard Ave NW, or turning onto Shilshole Ave NW, Shilshole Ave NW would be the most preferable alignment, as it would provide the most direct route to the trail's terminus at 11th Ave NW and NW 45th St. SDOT determined that the Leary Alternative was less preferable because of the number of high-volume roadway intersection crossings and transportation and transit impacts, and that the Ballard Avenue Alternative was less preferable because of similar concerns over the number of roadway intersection crossings in addition to the adverse impacts to the Ballard Farmers Market and Ballard Avenue Landmark District. SDOT then considered whether it would be best to locate the trail on the north or south side of Shilshole Ave NW. At this point in its deliberations, SDOT, in partnership with the City's Office of Economic Development, initiated discussions with transportation and trail experts, bicycle and trail advocacy groups, and representatives from Ballard maritime, industrial, and commercial businesses, about which alignments—either NW Market St or NW 54th St and either along the north or south side of Shilshole Ave NW—would work best for trail users and businesses along the route.

Ultimately SDOT decided that the Preferred Alternative is the NW Market St and Shilshole South alignment, as it best meets the project objectives. While an alignment along the north side of Shilshole Ave NW could provide more direct access into the Ballard Urban Hub neighborhood as trail users would not need to cross Shilshole Ave NW, there are far fewer roadway intersection crossings and fewer conflicts with business operations on the south side of roadway. In addition, there is a wider area of public right-of-way on the south side of Shilshole Ave NW that, combined with a general shift of the trail alignment toward the north, allows more room for business operations and for truck and freight movement in and out of driveways. For a comparison of the potential traffic hazards associated with each of the Build Alternatives, please see Section 1.8.

1.5 No Build Alternative

Under the No Build Alternative, no new multi-use trail would be constructed to connect the existing segments of the regional Burke-Gilman Trail. Trail users would continue to use the existing surface streets and sidewalks to travel between the existing trail segments, a distance of approximately 1.4 miles. Currently, trail users tend to use the most direct route, which is along Shilshole Ave NW. Pedestrians may opt for a street with sidewalks such as Ballard Ave NW or NW Leary Way. Shilshole Ave NW is used by passenger vehicles in addition to large commercial vehicles and trucks traveling to the adjacent industrial areas. There are no sidewalks on the south side of the street and sporadic sidewalks on the north side of the street. Unregulated parking occurs on both sides of the street. The No Build Alternative serves as the baseline condition against which the Build Alternatives are compared over time to their 2040 design year. The year 2040 was used as the timeline to analyze the impacts of the project. Over that time period, population and employment growth is expected to continue in the Ballard neighborhood, leading to an increase in traffic congestion, parking demand, and the number of people walking and biking.

1.6 Build Alternatives

1.6.1 Preferred Alternative

The Preferred Alternative (illustrated in Figure 1-3) is a combination of components of the previously analyzed Build Alternatives. Except for one minor route connection (as described below), the Preferred Alternative does not contain any route segments or components that were not analyzed in the DEIS. The

Preferred Alternative is most similar to the Shilshole South Alternative, but its westernmost portion contains elements of both the Leary and Shilshole North Alternatives. The Preferred Alternative does not share any segments or components of the Ballard Avenue Alternative.

There would be changes to parking areas, travel and motor vehicle lanes, as well as intersection configurations on both sides of the streets along the Preferred Alternative. The trail would accommodate users on a newly paved, grade-separated surface for most of its length. Route specifics are described below.

Beginning at the existing western trail end (at the Ballard Locks), the trail would continue east along the south side of NW 54th St until it turns into NW Market St. The trail would continue along the south side of NW Market St, until the intersection with 24th Ave NW. Up to this point, the Preferred Alternative follows the same route as both the Shilshole North and Leary Alternatives.

At the intersection of NW Market St and 24th Ave NW, the Preferred Alternative would head south on the west side of 24th Ave NW for approximately 125 feet before the intersection with the south side of Shilshole Ave NW.

The Preferred Alternative would then cross 24th Ave NW and proceed along the south side of Shilshole Ave NW, continuing onto the south side of NW 45th St to 11th Ave NW, and the eastern terminus of the trail. This section of the Preferred Alternative route is identical to the Shilshole South Alternative.

From the existing western trail end at the Ballard Locks, the trail would be north of the BTR tracks until just past 17th Ave NW, at which point the trail would cross to the south of the tracks. A signal would be installed at the intersection of Shilshole Ave NW and 17th Ave NW. The signal would facilitate nonmotorized user crossings of Shilshole Ave NW and allow for better traffic flow between Shilshole Ave NW and 17th Ave NW, which would provide a benefit to traffic mobility and trail users.

The trail width would vary somewhat throughout the corridor due to existing conditions and constraints, but would generally be between 10 and 12 feet wide. Based on the design concepts, the typical right-of-way on Shilshole Ave NW for this alternative would include a barrier or buffer zone adjacent to the railroad tracks, a multi-use trail, a barrier or buffer zone adjacent to the vehicle travel lanes, two vehicle travel lanes, and preservation or addition of parking areas where feasible (Figure 1-3). See Chapter 7, Transportation, for additional detail on this and all other Build Alternatives.

This route was addressed in the DEIS except for the approximately 125-foot section on the west side of 24th Ave NW. The west side of 24th Ave NW has better connectivity and directness of route than the east side of 24th Ave NW, which was evaluated as part of the Shilshole North Alternative.

1.6.2 **Shilshole South Alternative**

Under the Shilshole South Alternative, the multi-use trail would be primarily routed along the south side of Shilshole Ave NW (Figure 1-2). There would be changes to parking, lanes, and intersection configurations on both sides of the street along this alternative alignment. The trail would accommodate users on a newly paved surface for most of its length.

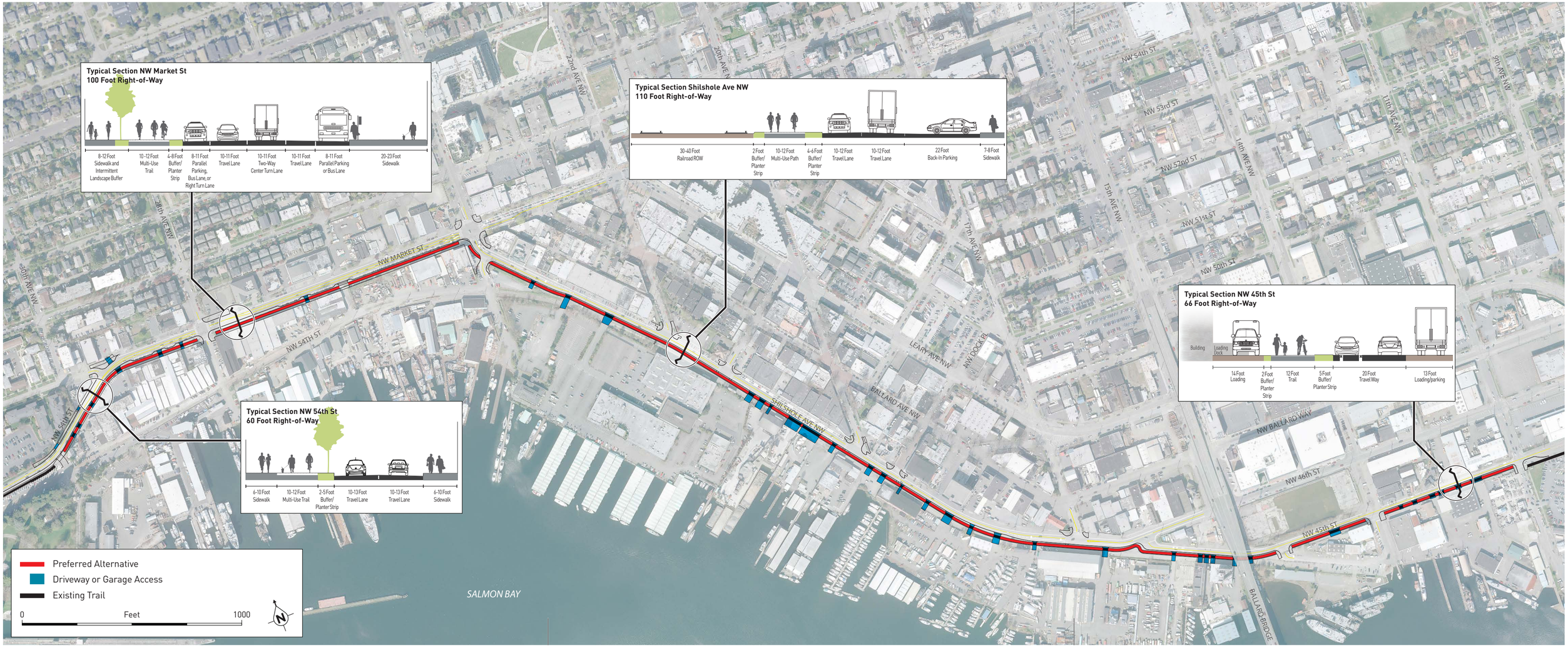


Figure 1-3. Preferred Alternative

Beginning at the existing western trail end at the Ballard Locks, the trail would continue east along the north side of the unimproved NW 54th St right-of-way until the intersection with Shilshole Ave NW, just east of 24th Ave NW. The trail would then proceed along the south side of Shilshole Ave NW, continuing onto the south side of NW 45th St to the eastern project end at 11th Ave NW. From the existing western trail end at the Ballard Locks, the trail would be north of the BTR tracks until just before 17th Ave NW, at which point the trail would cross to the south of the tracks. A signal would be installed at the intersection of Shilshole Ave NW and 17th Ave NW for trail users crossing Shilshole Ave NW to access 17th Ave NW.

The trail width would vary somewhat throughout the corridor due to existing conditions and constraints, but would generally be between 10 and 12 feet wide, with one short segment that narrows to 8 feet wide. Based on the design concepts, the typical right-of-way on Shilshole Ave NW for this alternative would include a barrier or buffer zone adjacent to the railroad tracks and vehicle travel lanes, a multi-use trail, two vehicle travel lanes, and preservation of parking areas where feasible. A detailed map showing this alternative was presented in the DEIS. See also Chapter 7, Transportation, for additional detail on this and for all other Build Alternatives.

1.6.3 **Shilshole North Alternative**

Under the Shilshole North Alternative, the multi-use trail would be primarily routed along the north side of Shilshole Ave NW (Figure 1-2). Beginning at the existing western trail end at the Ballard Locks, the trail would continue east along the south side of NW 54th St until it turns into NW Market St. The trail would continue along the south side of NW Market St, until it crosses 24th Ave NW and turns south on the east side of 24th Ave NW. The trail would then proceed east along the north side of Shilshole Ave NW to the intersection with NW 46th St. A signal would be installed at the intersection of Shilshole Ave NW and 17th Ave NW for trail users crossing 17th Ave NW. It would continue along the north side of NW 46th St underneath the Ballard Bridge to 11th Ave NW. At this point the trail would turn south along the east side of 11th Ave NW until it connects to the eastern end of the existing trail at NW 45th St.

There would be changes to parking, vehicle travel lanes, and intersection configurations on both sides of the streets in this alternative. The typical right-of-way on NW Market St would include sidewalks on both sides of the street, the multi-use trail, a buffer zone, parallel parking or bus zone on both sides of the street, two vehicle travel lanes, and center turn lane. The typical right-of-way on Shilshole Ave NW for this alternative would include a barrier or buffer zone and informal parking adjacent to the railroad tracks, two vehicle travel lanes, parallel parking area, buffer area, multi-use trail, and sidewalk. The existing gravel shoulder on the south side of Shilshole Ave NW would be maintained. These elements would vary along the trail due to the existing road configuration and structures. A detailed map showing this alternative was presented in the DEIS. See also Chapter 7, Transportation, for additional detail on this and for all other Build Alternatives.

1.6.4 **Ballard Avenue Alternative**

Under the Ballard Avenue Alternative, the multi-use trail would be primarily routed along the south side of Ballard Ave NW (Figure 1-2). Beginning at the existing western trail end at the Ballard Locks, the trail would continue east along the north side of the unimproved NW 54th St right-of-way until 28th Ave NW. At this point the trail would turn north along the east side of 28th Ave NW until it reaches NW 56th St. The trail would then turn east along the south side of NW 56th St to the intersection with 22nd Ave NW. At 24th Ave NW and NW 56th St, a new pedestrian-activated signal would be installed to facilitate the trail crossing of 24th Ave NW. The trail would turn south along the west side of 22nd Ave NW, cross NW Market St, and proceed south to Ballard Ave NW. At this point the trail would turn southeast along the south side of Ballard Ave NW and continue east on the south side of NW Ballard Way to the intersection with 15th Ave NW. The trail would then turn south onto the one-way road on the west side of 15th Ave

NW, which could potentially be converted to trail only use (no vehicles). The trail would cross to the south side of NW 46th St at a newly signalized intersection and proceed east across 11th Ave NW. It would then turn south along the east side of 11th Ave NW to the eastern trail end at NW 45th St.

There would be changes to parking and vehicle travel lane configurations on all streets traversed by this alternative. The typical right-of-way on Ballard Ave would include pedestrian sidewalks on both sides of the street, buffer zone, two vehicle travel lanes, and parallel parking area on the north side of the street. These elements would vary along the trail due to the existing road configurations and structures. A detailed map showing this alternative was presented in the DEIS. See also Chapter 7, Transportation, for additional detail on this and for all other Build Alternatives.

1.6.5 **Leary Alternative**

Under the Leary Alternative, the multi-use trail would be primarily routed along the south side of Leary Ave NW (Figure 1-2). Beginning at the existing western trail end at the Ballard Locks, the trail would continue east along the south side of NW 54th St until it turns into NW Market St. The trail would continue east along the south side of NW Market St, crossing 22nd Ave NW. At 22nd Ave NW, the trail would turn southeast on the south side of Leary Ave NW. The trail would continue east along the south side of Leary Ave NW, which becomes NW Leary Way, to 11th Ave NW. At this point, the trail would turn south along the east side of 11th Ave NW to the current trail end at NW 45th St.

There would be changes to parking, vehicle travel lanes, and intersection configurations on both sides of the street along this alternative. The typical right-of-way on Leary Ave NW would include buffer zones on both sides of the street, a multi-use trail, parking areas on both sides of the street, sidewalks on both sides of the street, two vehicle travel lanes, and one two-way center left turn lane. The typical right-of-way on NW Market St would include a sidewalk, the multi-use trail, a buffer zone, two vehicle travel lanes, center turn lane, and parking areas on both sides of the street. These elements would vary along the trail length due to the existing road configuration and structures. A detailed map showing this alternative was presented in the DEIS. See also Chapter 7, Transportation, for additional detail on this and for all other Build Alternatives.

1.6.6 **Connector Segments**

The alternatives above are conceptual routes designed to provide distinct alternatives for review in the DEIS. There are a number of possibilities to connect segments of the routes, and six segments were identified in the DEIS as the most likely connectors (Figure 1-2). These segments could be used as connections between portions of the previously identified alternative routes and could be on either side of the road; however, none of these connectors were selected as part of the Preferred Alternative.

- Ballard Avenue NW;
- NW Vernon Place;
- 20th Avenue NW;
- 17th Avenue NW;
- 15th Avenue NW; and
- 14th Avenue NW.

If NW Vernon Pl is used as a connector segment, then a signal at NW Vernon Pl and Shilshole Ave NW may also be warranted, depending on whether the trail would continue on the north or south side of Shilshole Ave NW.

1.7 Features Common to All Build Alternatives

1.7.1 Roadway Design and Safety Considerations

Although safety itself is not an element of the environment required to be analyzed under SEPA, a focus of this FEIS is the analysis of potential "traffic hazard" impacts, as well as design treatments and other measures that may be taken to mitigate those potential impacts. Regardless of any relation to SEPA, safety is a key component of this project (and all SDOT projects), and therefore is described throughout the FEIS.

The SDOT design process relies on City standards and guidelines, such as the City of Seattle's Standard Plans for Municipal Construction and Right-of-Way Improvements Manual (SDOT, 2012), which have been developed through research and adaptation of national publications. In addition to City standards, SDOT consistently follows national guidelines developed by the American Association of State Highway and Transportation Officials (AASHTO), National Association of City Transportation Officials (NACTO), and Federal Highway Administration (FHWA). The final construction documents rely on a milestone schedule that allows for a thorough quality control process where the design is vetted through several SDOT divisions and City of Seattle departments, whose expertise is applicable to the project. These reviews occur at multiple checkpoints during design.

Given the City's diverse mobility needs, which include motorized and nonmotorized users, it is common for multiple modes of transportation to interact with each other at roadway intersections, driveway crossings, and along shared roads. Designing to increase predictability between modes of travel is a priority of any project and standard practice. While these interactions may introduce potential conflicts, they are not inherently traffic hazards. In fact, pedestrian and bicycle facilities are typically considered categorically exempt under SEPA (WAC 197-11-800(2)(d)(ix); SMC 25.05.800.B.4.i), meaning that no environmental analysis of potential adverse impacts would be required. However, this EIS is being completed for the reasons explained above in Section 1.1.

Roadway designs would vary for each alternative based on factors such as intersection geometry, vehicle volumes, nonmotorized users, and types of vehicles. This section describes roadway modifications, intersection treatments, driveway design, and parking modifications that could be incorporated during the final design phase of the project to address safety, access, nonmotorized users, and vehicle types. Similar concepts can be found throughout the city and in design documents such as the Urban Bikeway Design Guide (NACTO, 2015) and Guide for Development of Bicycle Facilities (AASHTO, 2012). These features are common to all Build Alternatives, but the location and other specifics would vary by alternative. Chapter 7, Transportation, provides additional detail related to these design considerations.

Potential roadway design and safety modifications are shown on Figures 1-4 to 1-6. These figures show design treatments such as pavement markings, buffers, changes to curb radii, and perpendicular intersections that can be used at an intersection as well as a mixing zone (area where there is heavier nonmotorized traffic). The figures also show roadway design treatments that could be used at driveways, which include pavement markings, buffers, mountable curbing, and alternative pavements.

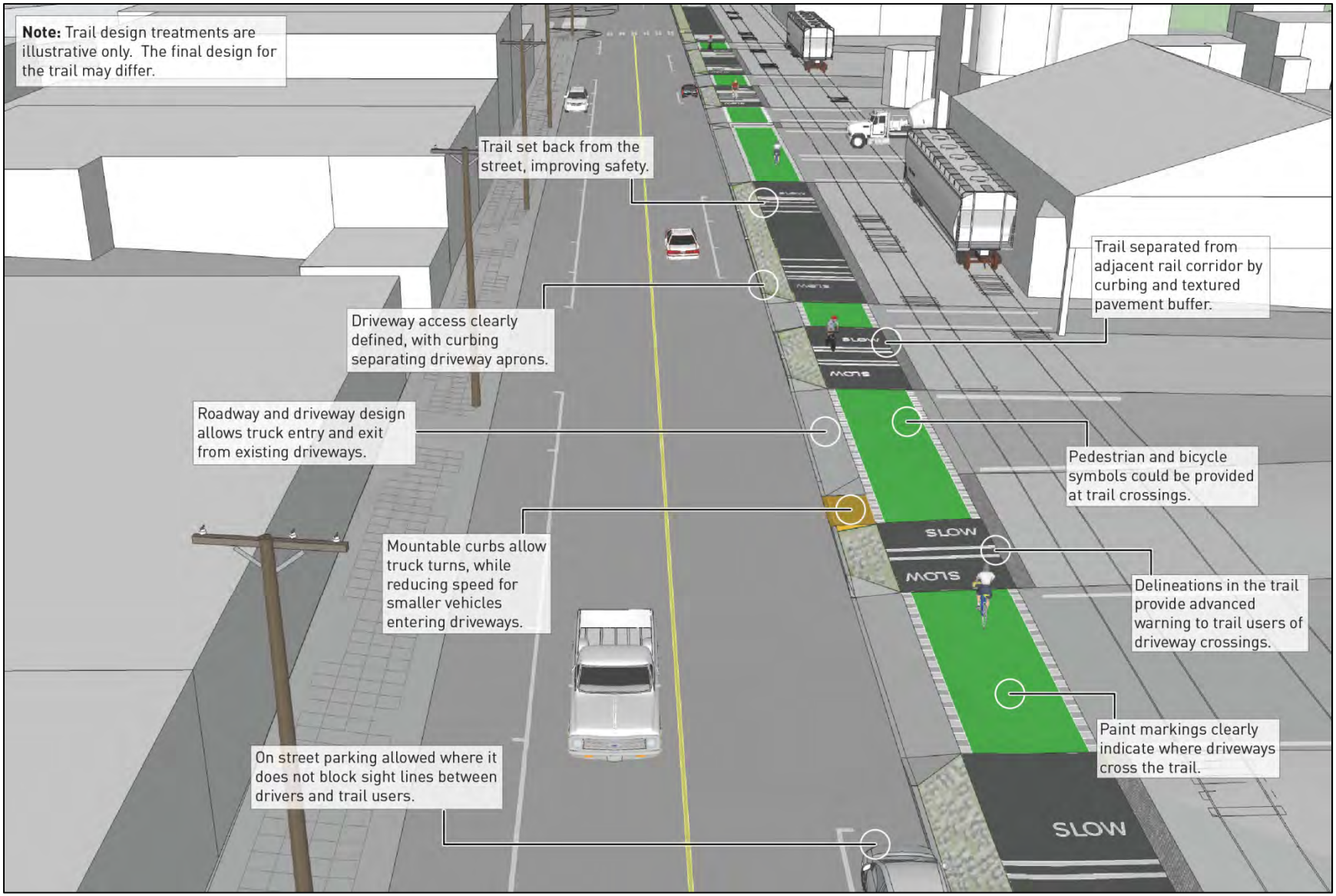


Figure 1-4. Potential Roadway Design and Safety Modifications (Shilshole Ave NW, at Salmon Bay Sand and Gravel)

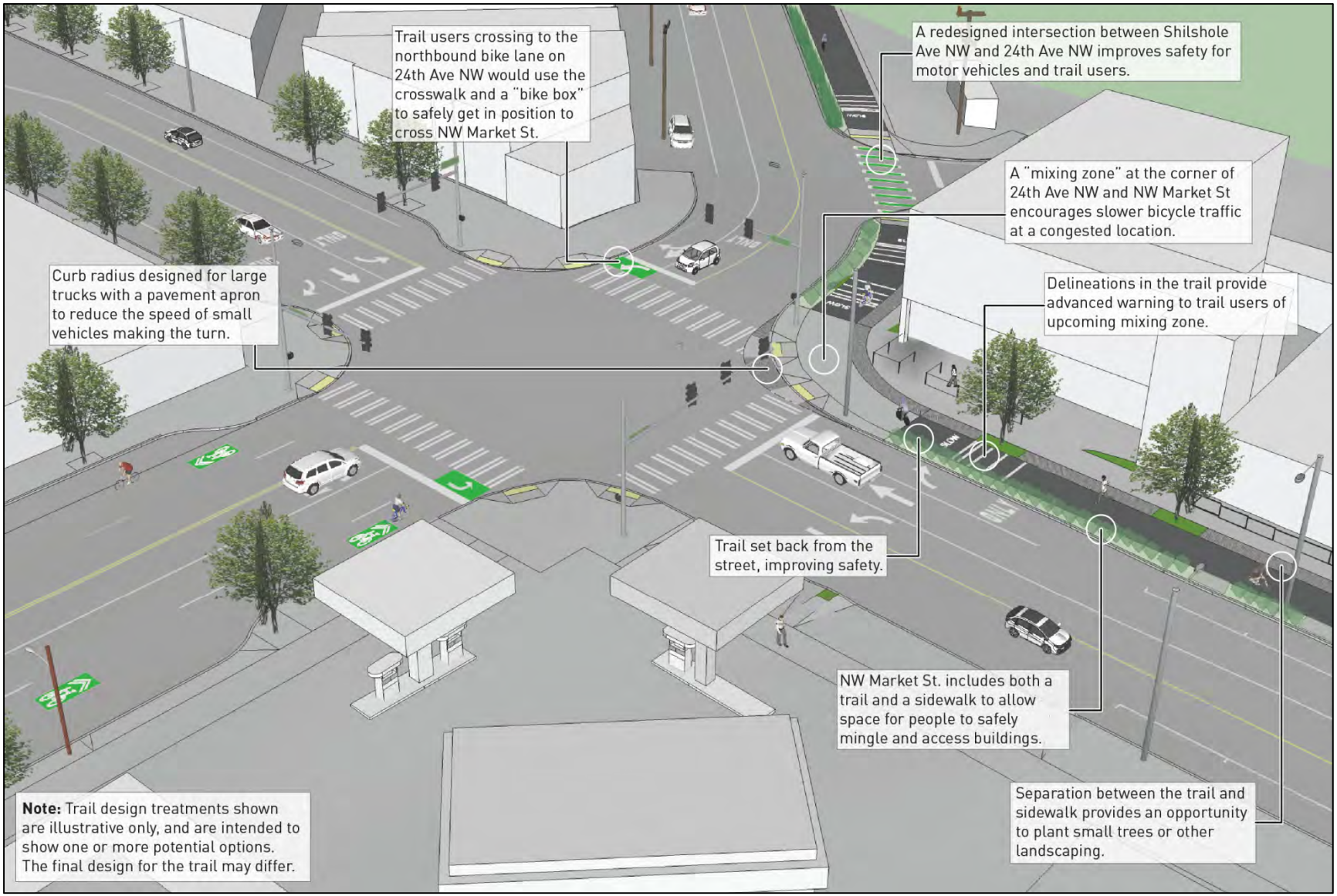


Figure 1-5. Potential Roadway Design and Safety Modifications (NW Market St and 24th Ave NW)

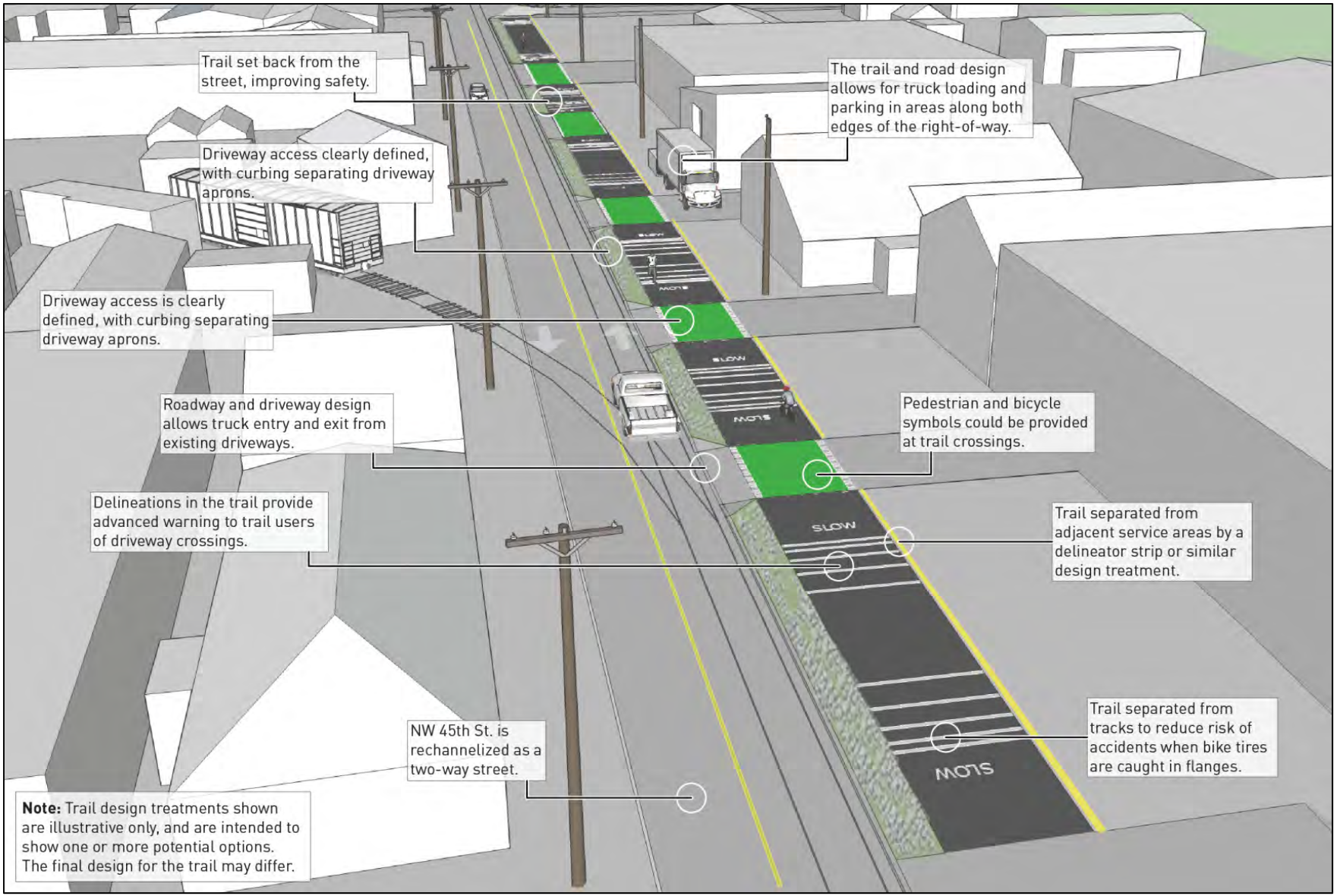


Figure 1-6. Potential Roadway Design and Safety Modifications (NW 45th Street)

Roadway Design

Adding a trail to the street system would require roadway modifications for vehicles to co-exist with nonmotorized users under any of the Build Alternatives. These changes could include geometric changes to create perpendicular intersections, changes to roadway lane configurations, alterations of curb radii, and design details that provide sight lines between vehicles and nonmotorized users:

- Perpendicular Intersections–Modification of diagonal streets to create perpendicular intersections would be included in the designs wherever feasible. Several streets along the alternative alignments intersect at diagonals rather than at a preferred perpendicular angle. Adjusting the geometry of the intersections would slow vehicles down as they are turning through the intersection, allow crosswalks to be shorter, and provide more consistent sight distance for all users. Figure 1-7 depicts a perpendicular intersection configuration.

- Lane Configurations–Lane configurations would be modified to create additional space within the roadway for the multi-use trail where necessary. These changes could include the removal of parking or vehicle lanes as well as the removal or addition of intersection or center turn lanes.

- Curb Radii–Curb radii would be modified to accommodate the turning requirements for different vehicles such as large freight trucks. Different intersections may have different types of vehicles that typically use the street, including passenger vehicles, single unit trucks (delivery-style trucks), buses, emergency vehicles, or semi-trucks. Appropriate curb radii would be chosen to accommodate the differing vehicles and roadway geometry at each location. In general, smaller radii are preferred to slow vehicles making turning movements while at the same time accommodating truck movements where needed. Figure 1-8 illustrates a variety of features, including curb radii.

- Sight Lines–Sight lines are important for safety and would be considered throughout the corridor. Trees, vegetation, and other obstructions would be cleared from intersections and from the back of sidewalks to avoid obstructing sight lines. Parking would also be restricted near driveways and intersections to preserve sight lines. Where possible, the trail would be shifted to allow greater sight distances around buildings adjacent to the property lines. However, because of the developed nature of the study area, sight lines may not meet industry standards in all locations, depending on the alternative.

- Driveways–In addition to pavement and painting elements, driveway locations, heights, and widths would also be considered for modifications. Driveways could be narrowed such that the current use is maintained. A narrower width would provide a more defined location for vehicles and would be matched with the turning movement

Refining the Analysis

To supplement the analysis presented in the DEIS and inform the development of the Preferred Alternative, additional ***intersection and driveway data*** were collected in the study area in November and December 2016; the new data were analyzed to provide more information on potential transportation and freight impacts. The traffic volume data included PM peak hour turning movements at driveways, as well as turning movements for the PM peak hour at additional study area intersections. Similarly, an ***AutoTURN analysis*** (a vehicle swept path software that analyzes the ability of large trucks to maneuver driveway and roadway configurations) was completed to determine if the design of the Build Alternatives would affect freight access to businesses in the study area. Results of this new analysis are presented in Appendix A of the FEIS.

requirements of each driveway. A narrower driveway would shorten and define trail user and vehicle crossing locations. In some cases, it might be appropriate to move a driveway to provide more separation between adjacent driveways. This would provide space between driveways for a refuge area for trail users. In some locations, it could be possible to close driveways where multiple driveways access one parking area. This consolidation would remove a conflict area. Last, where multiple access points are in close proximity to each other, it may make the most sense to merge driveways into one large driveway, rather than multiple, separate ones that could pose difficulties for large vehicles entering or exiting. Access would be maintained for all properties.

- Alternative Pavement – Another application of alternative pavement is for vehicles in the street. This could be the use of stamped concrete or concrete scoring to create rough patterns that are visual and tactile warnings for drivers. A typical application of this treatment is used to designate the different area for vehicle use where the pavement is smooth and rough pavement in areas where travel is undesirable. The rough pavement detracts vehicles from using that space, but would allow some truck turning movements. This treatment could be used on large radius intersections to slow vehicles through a smaller radius while also allowing large vehicles to turn and to provide the adequate sidewalk space outside of the turning roadway. The treatment could similarly be used for truck driveways at the trail crossings. It could also be used for raised crosswalks and driveway-style intersection treatments to provide additional clues to slow vehicles prior to crossing the trail.

Intersection Design

Intersections would be designed to more clearly identify crossings of the multi-use trail. These improvements could include the following:

- Curb Extensions or Curb Bulbs–Curb extensions or curb bulbs would be used at intersections, where feasible, where parallel parking and bus stops are located along the street. In these cases, the sidewalk is extended into the parking lane such that the curb is adjacent to the lane of travel. This design shortens the crossing length for pedestrians and provides additional space for curb ramps. Figure 1-9 provides an example of curb extensions.

- Pavement Markings–Pavement markings distinguish space for nonmotorized users. Pavement markings could include colored pavement such as white markings for crosswalks and bike symbols or green for bicycle lanes, similar to other locations in Seattle. These treatments would be used to demark where the BGT crosses streets or driveways, for “bike boxes” at intersections to provide safe zones for bicycles crossing paths with turning vehicles, and for other signed bicycle routes or greenways as they intersect the BGT. These enhanced pavement markings are a visual clue for both vehicle drivers and trail users that there is a potential conflict zone. Figures 1-7 and 1-8 illustrate varied pavement markings.

- Raised Crosswalks–Raised crosswalks would be used at roadway intersections and driveways, where feasible, as a traffic calming measure to slow vehicles down in the vicinity of the crossing and to have a significant visual clue of the trail crossing. The roadway pavement would be raised 3 to 6 inches within the crosswalk and, if warranted, would be coupled with a stop sign or signal-controlled intersection. The roadway would typically be enhanced with additional markings and signage for the raised crosswalk and could include alternative pavement treatments for the crossing. Figure 1-10 illustrates a raised crosswalk.

- Driveway-Style Entrances–Intersections could be converted to driveway-style entrances, where warranted. This design concept was recently completed on Bell St in downtown Seattle. This design feature would make the trail continuous across an intersection. Curbs and gutters would also be modified to be continuous across the intersection, with the curb lowered to create a driveway-style approach to enter the street. This design creates a condition for a vehicle driver that signifies they are crossing a pedestrian feature where the typical action would be to yield to nonmotorized users prior to crossing and entering the street. Figure 1-11 illustrates a driveway-style intersection.

- Signalized Intersections–Signalized intersections would be used to clearly direct both nonmotorized trail users and vehicles. Existing signalized intersections in the corridor would be maintained and additional signals may be added to congested intersections, as necessary, to address safety concerns and improve traffic flow. All signalized intersections would include pedestrian-activated signals. These signals could include leading-pedestrian walk or all-way walk phases where pedestrians could cross diagonally through intersections. They could also include bicycle signals that would allow bicycle movement through an intersection separate from motor vehicle travel. Signalized intersections in the corridor may include No-Right-On-Red restrictions to eliminate right turn conflicts with nonmotorized users.

- Trail Crossing Warning Devices–Several possible design features could be used to warn both trail users and drivers of upcoming trail crossings. Road or driveway crossings of the trail could include rapid flashing beacons or flashing amber lights at mid-block trail crossings to alert vehicle drivers to trail users crossing the road. In some cases, barrier arms could be employed at crossings. Signage will be placed to alert both drivers and trail users of impending crossings.

- Medians–Medians could be used either to improve the street crossing for pedestrians or to restrict left turns across the trail.

- Barriers, Fences, and Buffers–In some locations, barriers, fences, or buffers would be used to separate nonmotorized trail users from moving vehicular traffic or the railroad. Figures 1-7 through 1-11 illustrate various buffer possibilities, including non-vegetated and vegetated options.

- Alternative Pavement–Alternative pavement types would be used to warn pedestrians and bicyclists of upcoming driveways and intersections. An example of alternative pavement treatments is inserting concrete strips within the asphalt trail. The strips could be colored concrete or could have texture added to increase awareness. It could also include using concrete for crosswalks in addition to pavement striping. This treatment is used to alert trail users in advance of a crossing to raise their awareness of an upcoming conflict area.

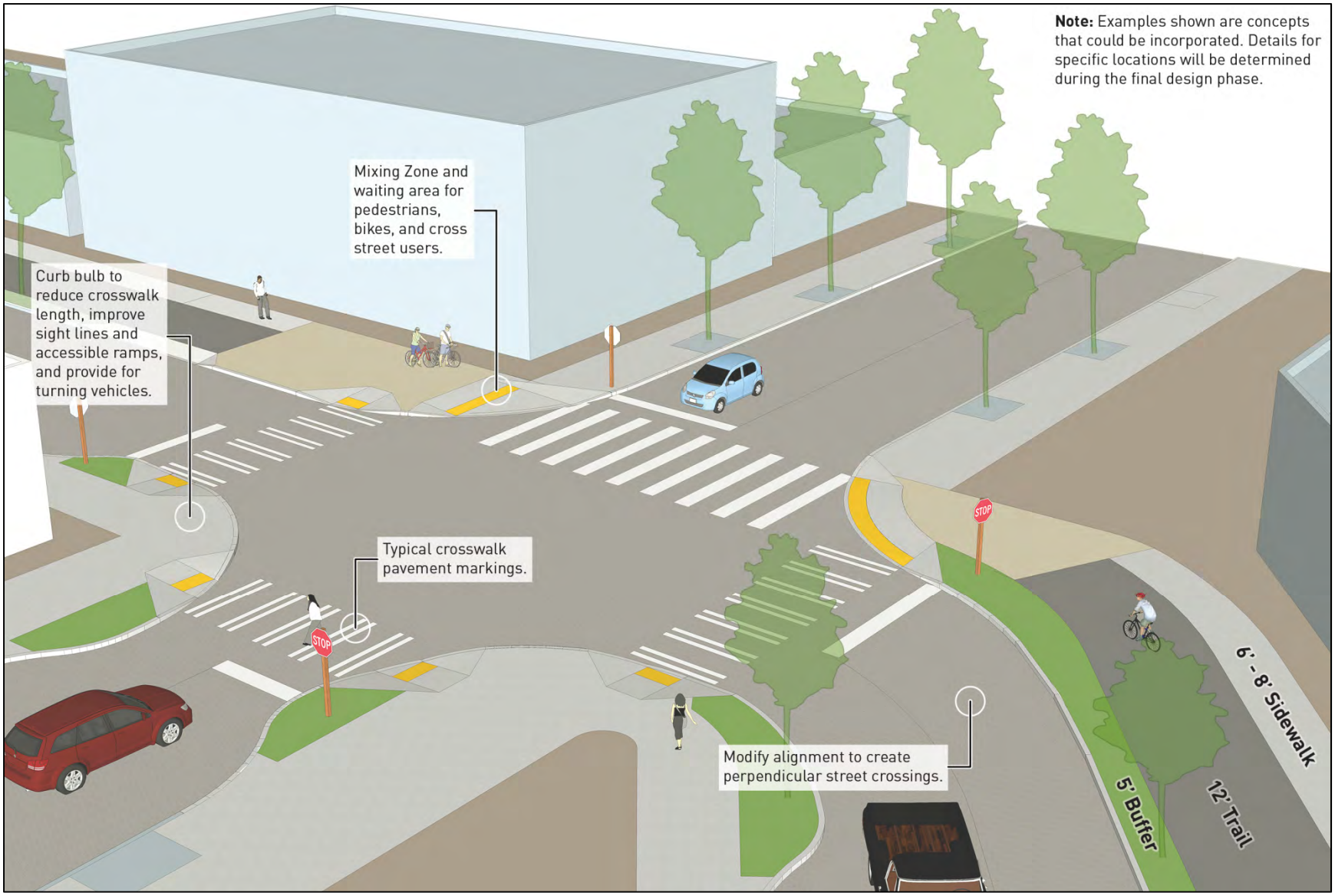


Figure 1-7. Intersection Design Options: Perpendicular Intersection

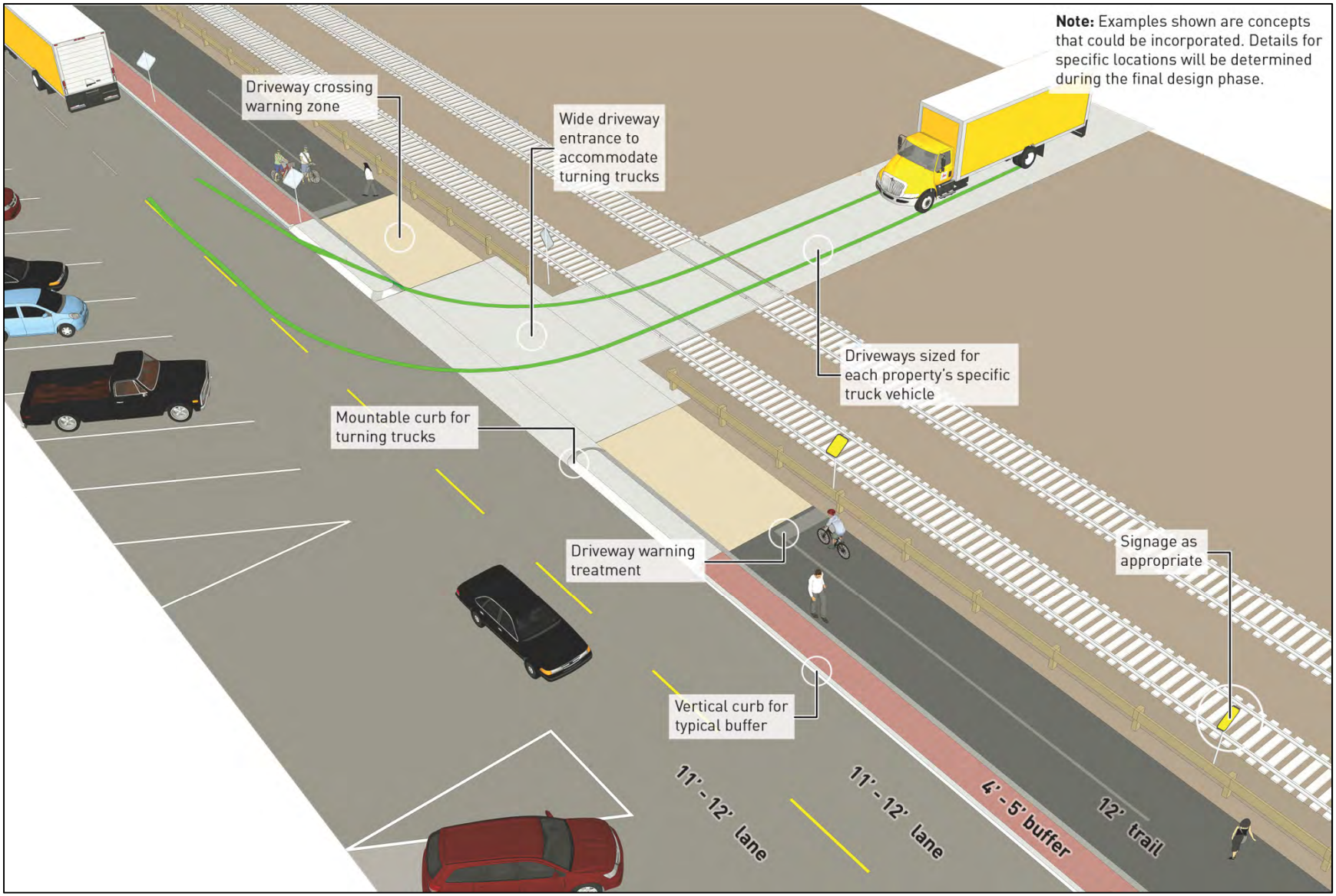


Figure 1-8. Intersection Design Options: Curb Radii Modification

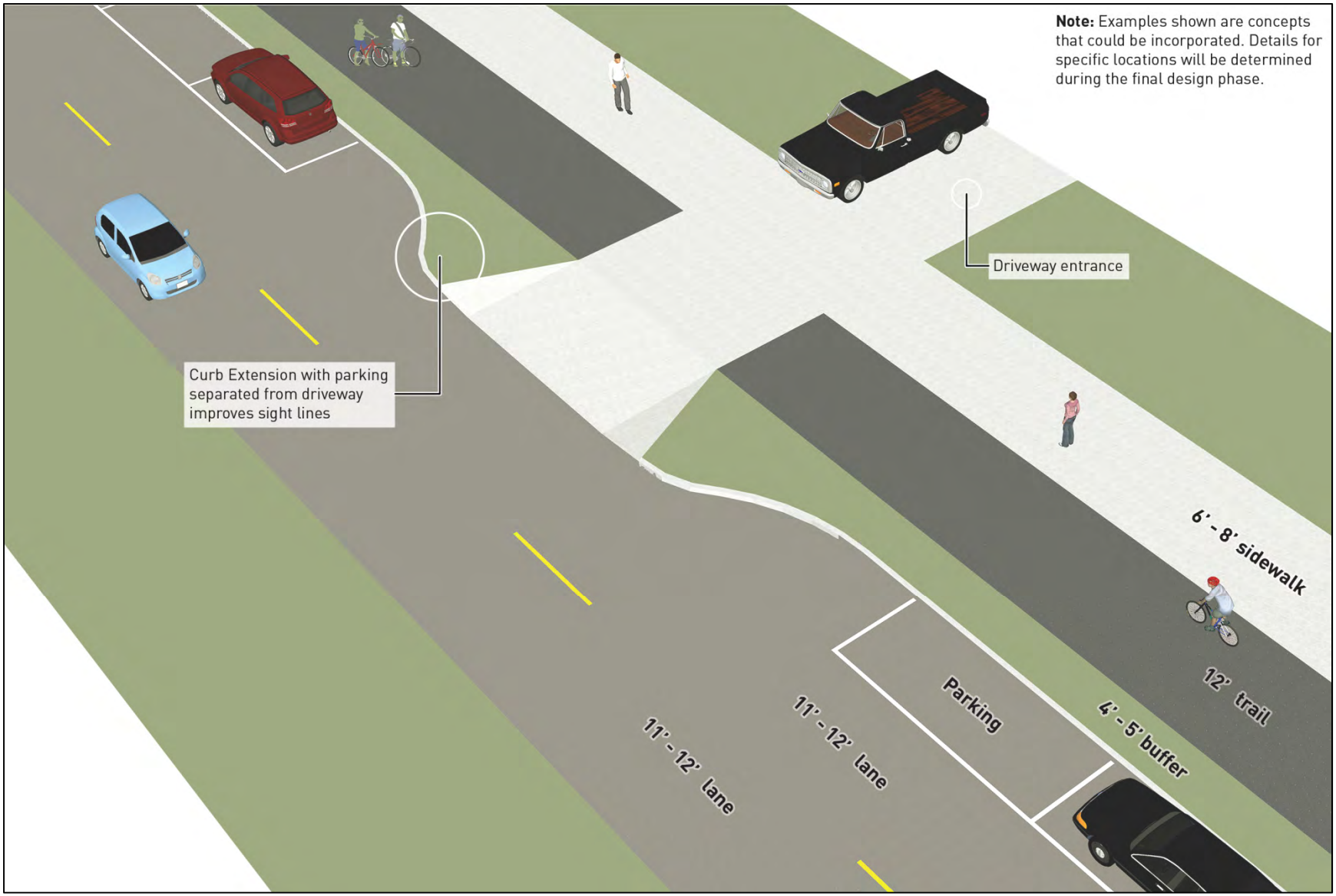


Figure 1-9. Intersection Design Options: Curb Extension

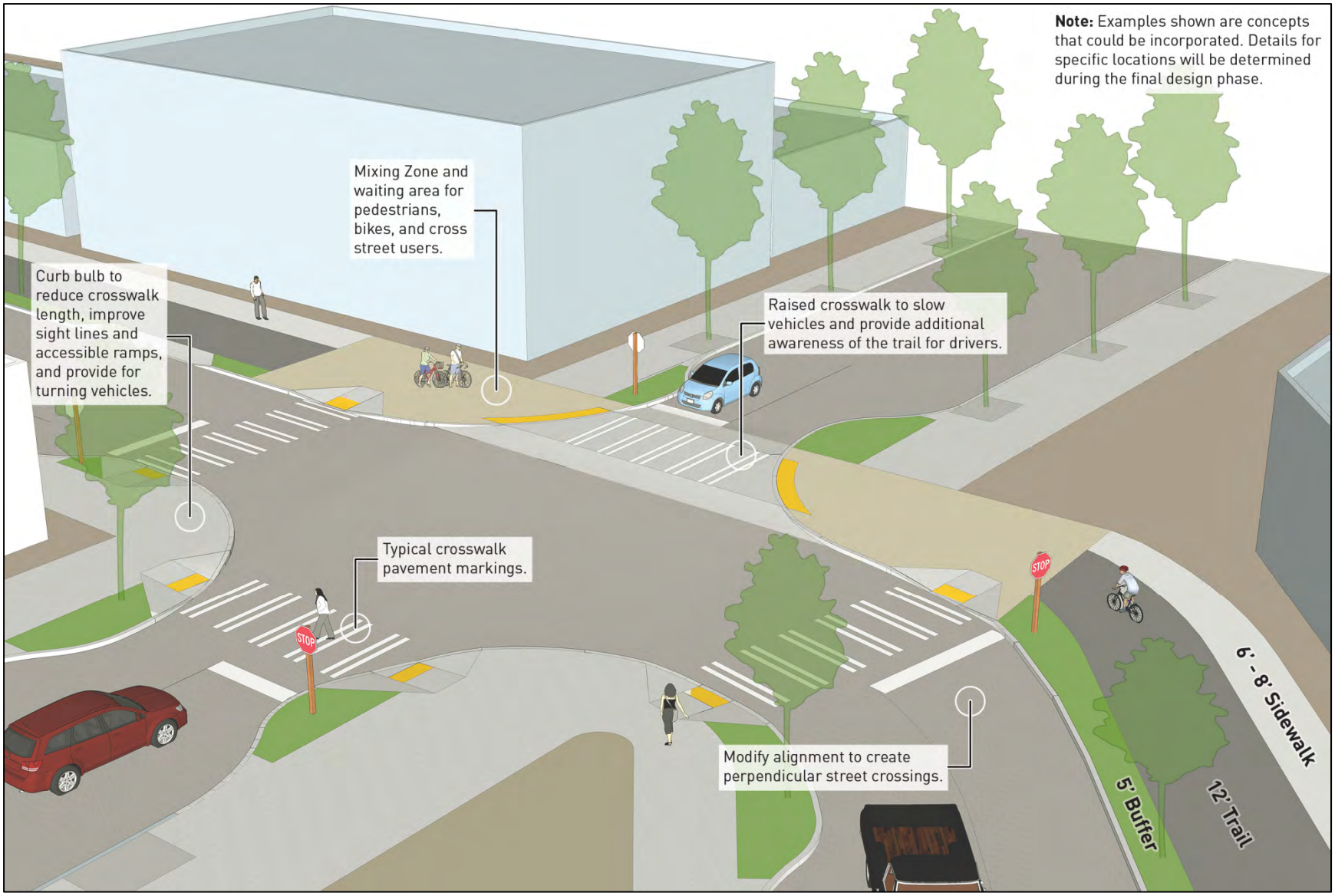


Figure 1-10. Intersection Design Options: Raised Crosswalk

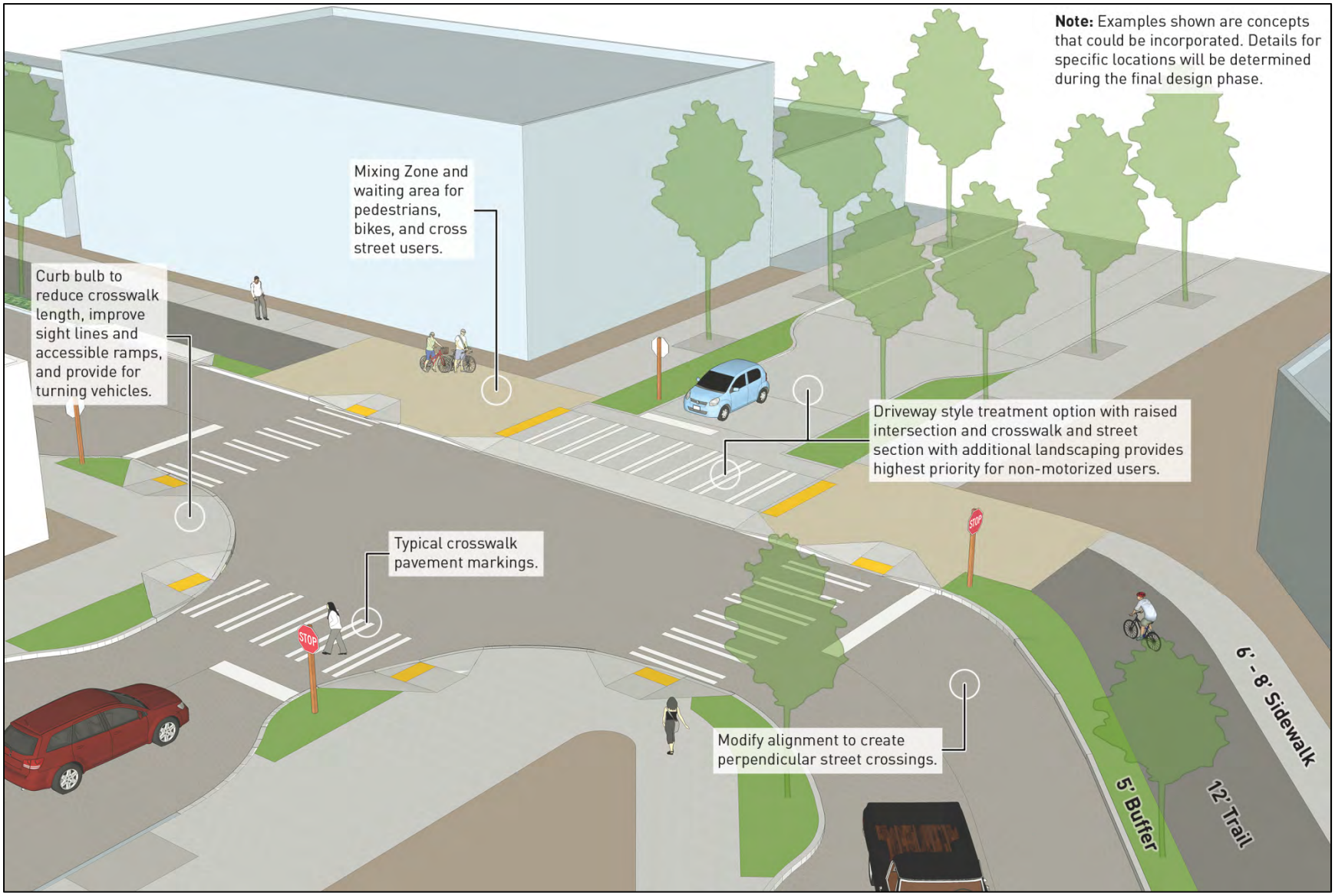


Figure 1-11. Intersection Design Options: Driveway Style Intersection

Driveway Design

Driveways that cross or intersect with the multi-use trail would also be evaluated for possible design changes. Design changes could include many of the intersection elements described above, including curb bulbs, pavement markings, and restricted parking. Driveways and loading zones could be reconfigured so that parked vehicles would not block the trail. Some driveways may be eliminated, relocated, or consolidated in the case of multiple driveways at a single property. Additional detail is provided in Chapter 7, Transportation, by Build Alternative related to possible driveway design changes.

Access Modifications

Parking in some private lots may be affected due to changes to property access from the multi-use trail. For example, striping in parking lots may need to be modified to prevent vehicles from blocking the trail when parked, which may reduce the number of parking spaces in some lots.

1.7.2 Stormwater Management

Stormwater management would conform with the City of Seattle Stormwater Manual (City of Seattle, 2016) and Seattle Municipal Code (SMC 22.800). Stormwater management varies widely by alternative alignment and would be part of the future design of the project. Additional description is provided in Chapter 6, Utilities.

1.7.3 Construction Methods

This section describes the construction methods that the City currently anticipates using for the Build Alternatives. Because of the dynamic nature of construction, the sequencing, extent, and timing of construction activities would vary to some degree from what are described here. However, this description represents a reasonable scenario that allows an understanding of the range of potential methods that could be used as the project is built.

Overall construction of any of the Build Alternatives would last 12 to 18 months. The duration would vary depending on the extent of utility relocations, storm drainage improvements, and existing roadway reconfigurations including bus stop relocations. Construction would likely occur in segments, and one segment would be completed before moving on to the next segment to minimize the construction duration at any given location.

Construction Activities

Construction of any of the Build Alternatives would consist of, but not be limited to, the following general activities:

- Demolition, including removal of pavement, curbs, sidewalks, driveways, trees, signs, bus shelters, fencing, or other features located in the new trail area.
- Construction of new roadway elements including pavement, curbs and gutters, sidewalks, driveways, trees, bus shelters, fencing, signs, and buffer elements. Buffer elements include such things as paving, landscaping, barriers, fencing, and signage.
- Utility relocations, ranging from moving fire hydrants, stormwater catch basins, and overhead utility and power poles to the installation of new drainage facilities.
- Rail relocation could occur in some of the alternatives.

Construction Staging

Construction staging and scheduling are typically determined by the contractor; however, the City would specify some restrictions that the contractor must adhere to. Demolition would likely be limited to a certain length of the trail; as such, the contractor would not be allowed to demolish the work space along the entire length of the trail at one time. Rather, the project would be constructed in multiple smaller segments.

The project would generally use areas within or near the project footprint for construction staging and storing materials and equipment, including vacant lots, parking lots, and unused rights-of-way. Temporary construction offices (such as trailers) could also use these areas. Alternatively, construction offices may be located in a rented office space. All staging areas would be restored to their pre-construction condition or better.

Construction Timing and Road Closures

As noted above, depending on the alternative and specific design features selected, construction would likely occur over a 12- to 18-month duration. Construction work would primarily occur during typical daylight weekday work hours. However, night and/or weekend work could be scheduled for construction at high-volume intersections and driveways and would comply with all applicable permit conditions for work during non-weekday timeframes.

Throughout construction, the City would maintain access to private property to the maximum extent feasible, and would notify property owners in advance of activities that might temporarily limit access. If properties have multiple access points, one driveway could be closed while the other remains open. Pedestrian access would also be maintained, such that commercial businesses remain open and residential and industrial properties are accessible. Temporary pedestrian access would be Americans with Disabilities Act (ADA) compliant. Options include temporary asphalt paths, steel plates, fabricated timber walkway with handrails, or a cordoned section of the roadway. Specific methods would be determined by the contractor, subject to review and approval by SDOT.

Construction activities could result in the temporary removal of on-street parking and restrictions in travel lanes, such as full lane closures or flagger-controlled travel through the construction zone. Clearly signed detour routes would be provided around construction areas.

Construction Sequencing

The sequence of construction activities is typically determined by the contractor in consultation with, and with concurrence from, the City.

Worker Access and Parking

The contractor would establish a job site office, which could be located in existing office space within the project vicinity or elsewhere along the route in a trailer. While a limited number of construction workers would park at the job site, other construction workers may be required to park away from the construction site to preserve parking for local businesses and customers to the greatest extent feasible.

Construction Traffic and Haul Routes

Construction would generate traffic to transport materials and equipment to the work site and to remove demolition debris and excess soil. The contractor would require access to the site for heavy vehicles (such as dump trucks and concrete trucks), light vehicles (such as pickup trucks), and heavy equipment (such as excavators and compactors). Construction materials would be transported by truck. The contractor would determine the best construction methods as permitted by the City and in conformance with the project

construction plans and specifications. The exact number of truck trips per day during construction cannot yet be determined because project design is not complete. However, preliminary estimates indicate that the highest number would be approximately 20 round-trip truck trips per work day during a paving operation, spread uniformly throughout the day. City streets that could be used as haul routes include Shilshole Ave NW, NW 46t^{h} St, NW Leary Way/Leary Ave NW, and 15th Ave NW.

Rail Relocation

Along Shilshole Ave NW and NW 45th St, existing tracks would be relocated to provide for the trail design under the Preferred and Shilshole South Alternatives. Where possible, the relocated tracks would be constructed prior to removing the existing tracks such that rail operations could be maintained during construction. Exceptions to this would be required where connecting the relocated tracks to the existing tracks. This transition work is anticipated to have a duration of a few days to two weeks. These closures would be coordinated in advance with the railroad operator.

1.8 Potential Traffic Hazards by Alternative Segment

To better compare and understand the differences among the alternatives as analyzed in the DEIS, and to inform the development of the Preferred Alternative presented in the FEIS, SDOT examined the key roadway design and safety considerations described in Section 1.7. In particular, SDOT examined driveways, intersections, sight line concerns, traffic/roadway changes, and nonmotorized considerations. For this new analysis, which was not presented in the DEIS, the alternative routes were grouped by broad geographical segment within the study area to reflect the broad land uses in these segments. The three segments examined are illustrated in Figure 1-12 and include the following:

- The west segment (between Ballard Locks and 24th Ave NW);
- The central segment (between 24th Ave NW and 15th Ave NW); and
- The east segment (between 15th Ave NW and 11th Ave NW).

The intent of this analysis by segment was to elucidate and differentiate impacts that were not clear when evaluating each of the alternative routes as a whole. This process allowed SDOT decision makers to make an informed decision when weighing options for selection of the Preferred Alternative. Results of the examination of potential traffic hazards by segment are summarized in Table 1-1.

Figure 1-12. West, Central, and East Segments of the Study Area

Table 1-1. Potential Traffic Hazards by Alternative Segment

Element	*Preferred Alternative*	*Shilshole South Alternative*	*Shilshole North Alternative*	*Ballard Avenue Alternative*	*Leary Alternative*
West Segment (between Ballard Locks and 24th Ave NW)					
Driveways	• Crosses about 8 driveways/loading zones along this segment • Driveways are primarily commercial/retail driveways • Driveways are organized and delineated	• Crosses about 7 driveways/loading zones along this segment • Driveways are primarily industrial driveways • Driveways are organized and delineated • Large trucks backing into industrial driveways at multiple locations	• Crosses about 8 driveways/loading zones along this segment • Driveways are primarily commercial/retail driveways • Driveways are organized and delineated	• Crosses about 7 driveways/loading zones along this segment • Driveway are primarily residential driveways with some commercial/ retail driveways • Driveways are organized and delineated	• Crosses about 8 driveways/loading zones along this segment • Driveways are primarily commercial/retail driveways • Driveways are organized and delineated
Intersections	• The Missing Link would cross 1 signalized intersection approach and 1 unsignalized intersection approach	• The Missing Link would cross 2 unsignalized intersection approaches	• The Missing Link would cross 2 signalized intersection approaches and 1 unsignalized intersection approach	• The Missing Link would cross 2 signalized intersection approaches and 2 unsignalized intersection approach	• The Missing Link would cross 2 signalized intersection approaches and 1 unsignalized intersection approach
Sight Line Concerns	• Buildings constructed up to property lines, but trail is buffered from property lines by sidewalk	• Buildings constructed up to property lines adjacent to portions of the trail • Storage of industrial materials encroaching on right-of-way on NW 54th St	• Buildings constructed up to property lines, but trail is buffered from property lines by sidewalk	• Buildings set back from property lines adjacent to portions of the trail	• Buildings constructed up to property lines, but trail is buffered from property lines by sidewalk
Traffic/Roadway Changes	• Left-turn pocket relocated from Ballard Locks driveway to signalized intersection at 32nd Ave NW • NW 54th St/NW Market St reduced by one lane in each direction	• Two-way traffic reoriented into one-way operations in narrow right-of-way along unimproved NW 54th St right-of-way • Railroad tracks along unimproved NW 54th St right-of-way may be removed or relocated to allow additional right-of-way space for the trail	• NW 54th St/NW Market Street reduced by one lane in each direction	• Intersection at 24th Ave NW and NW 56th St signalized	• NW 54th St/NW Market St reduced by one lane in each direction

Element	*Preferred Alternative*	*Shilshole South Alternative*	*Shilshole North Alternative*	*Ballard Avenue Alternative*	*Leary Alternative*
Nonmotorized	• Mixing zone of pedestrians, trail users, and business functions (sidewalk café) at 24th Ave NW/NW Market St intersection • Some trail design components could create obstacles for trail users	• Heavy industrial nature, building orientation, and special truck movements on unimproved NW 54th St right-of-way affect nonmotorized experience • Some trail design components could create obstacles for trail users	• Mixing zone of pedestrians, trail users, and business functions (sidewalk café) at 24th Ave NW/NW Market St intersection • Some trail design components could create obstacles for trail users	• Some trail design components could create obstacles for trail users	• Mixing zone of pedestrians, trail users, and business functions (sidewalk café) at 24th Ave NW/NW Market St intersection • Some trail design components could create obstacles for trail users
Central Segment (between 24th Ave NW and 15th Ave NW)					
Driveways	• Crosses about 23 driveways/loading zones along this segment • Driveways are primarily industrial • Driveways are organized and delineated • Areas with multiple driveways within close proximity, such as near Salmon Bay Sand and Gravel and Covich Williams	• Crosses about 23 driveways/loading zones along this segment • Driveways are primarily industrial • Driveways are organized and delineated • Areas with multiple and wide driveways within close proximity, such as near Salmon Bay Sand and Gravel and Covich Williams	• Crosses about 37 driveways/loading zones along this segment • Driveways are commercial/retail and industrial • Driveways are organized and delineated • Areas with multiple driveways within close proximity, such as Salmon Bay Sand and Gravel	• Crosses about 28 driveways/loading zones along this segment • Driveways are primarily commercial/retail and industrial. • Driveways are organized and delineated • Areas with multiple driveways within close proximity, such as Ballard Hardware and Ballard Sheet Metal Works	• Crosses about 14 driveways/loading zones along this segment • Driveways are primarily commercial/retail • Driveways are organized and delineated
Intersections	• There is 1 crossing of an unsignalized intersection approach	• There is 1 crossing of an unsignalized intersection approach	• There are 1 crossing of a signalized intersection approach and 5 crossings of an unsignalized intersection approach	• There are 1 crossing of a signalized intersection approach, 1 crossing of a rapid flashing beacon, and 6 crossings of an unsignalized intersection approach	• There are 2 crossings of a signalized intersection approach and 6 crossings of an unsignalized intersection approach

Element	*Preferred Alternative*	*Shilshole South Alternative*	*Shilshole North Alternative*	*Ballard Avenue Alternative*	*Leary Alternative*
Sight Line Concerns	• Buildings set back from property lines except near Ballard Mill Marina. Trail has been buffered in this area by relocating rail line adjacent to property lines.	• Buildings set back from property line except near Ballard Mill Marina. Trail placement is constricted by existing rail line and is adjacent to buildings in this area.	• Buildings constructed up to property lines, but trail is buffered from property lines by sidewalk	• Buildings constructed up to property lines, but trail is buffered from property lines by sidewalk	• Buildings constructed up to property lines, but trail is buffered from property lines by sidewalk
Traffic/Roadway Changes	• Intersection of 17th Ave NW and Shilshole Ave NW signalized • Railroad tracks removed or relocated closer to property frontages between Hatton Marine driveway (about 600 feet west of 17th Ave NW) to just east of Ballard Bridge to allow additional right-of-way space for the trail	• Intersection of 17th Ave NW and Shilshole Ave NW signalized • Railroad tracks may be removed or relocated to allow additional right-of-way space for the trail	• Intersection of 17th Ave NW and Shilshole Ave NW signalized	• Rapid flashing beacon installed at 15th Ave NW and NW 46th St	• NW Leary Way/ Leary Ave NW reduced by one lane in each direction
Nonmotorized	• Trail crossing with active rail line • Some trail design components could create obstacles for trail users	• Trail crossing with active rail line • Some trail design components could create obstacles for trail users	• Some trail design components could create obstacles for trail users	• Potential user conflicts with Ballard Farmers Market • Some trail design components could create obstacles for trail users	• Sidewalk reduced by about 12 feet on NW Market (between 24th Ave NW and 22nd Ave NW) to add the BGT Missing Link in heavy pedestrian, transit, and commercial/retail corridor • Some trail design components could create obstacles for trail users

Element	*Preferred Alternative*	*Shilshole South Alternative*	*Shilshole North Alternative*	*Ballard Avenue Alternative*	*Leary Alternative*
East Segment (Between 15th Ave NW and 11th Ave NW)					
Driveways	• Crosses about 8 driveways/loading zones along this segment • Driveways are primarily industrial • Driveways are organized and delineated	• Crosses about 7 driveways/loading zones along this segment • Driveways are primarily industrial • Driveways are organized and delineated	• Crosses about 9 driveways/loading zones along this segment • Driveways are commercial/retail and industrial • Driveways are organized and delineated • Crossing with heavy traffic volume driveway (Ballard Blocks)	• Crosses about 6 driveways/loading zones along this segment • Driveways are primarily industrial • Driveways are organized and delineated	• Crosses about 7 driveways/loading zones along this segment • Driveways are commercial/retail • Driveways are organized and delineated
Intersections	• There are 3 crossings of an unsignalized intersection approach	• There are 3 crossings of an unsignalized intersection approach	• There are 2 crossings of a signalized intersection approach and 3 crossings of an unsignalized intersection approach	• There is 1 crossing of a signalized intersection approach and 2 crossings of an unsignalized intersection approach	• There are 4 crossings of a signalized intersection approach, and 2 crossings of an unsignalized intersection approach
Sight Line Concerns	• Buildings constructed up to property lines, but trail is buffered from property lines by parking	• Buildings constructed up to property lines, but trail is buffered from property lines by parking	• Buildings constructed up to property lines, but trail is buffered from property lines by sidewalk	• Buildings constructed up to property lines, but trail is buffered from property lines by sidewalk	• Buildings set back from property lines, but trail is buffered from property lines by sidewalk
Traffic/Roadway Changes	• NW 45th St restored to two-way traffic • Railroad tracks along NW 45th St would be removed or relocated to allow additional right-of-way space for the trail	• NW 45th St restored to two-way traffic • Railroad tracks along NW 45th St would be removed or relocated to allow additional right-of-way space for the trail	• NW 45th St restored to two-way traffic	• NW 45th St restored to two-way traffic	• NW 45th St restored to two-way traffic
Nonmotorized	• Some trail design components could create obstacles for trail users	• Some trail design components could create obstacles for trail users	• Some trail design components could create obstacles for trail users • Trail crossing with inactive rail line	• Some trail design components could create obstacles for trail users • Trail crossing with inactive rail line	• Some trail design components could create obstacles for trail users • Trail crossing with inactive rail line

1.9 Alternatives Considered but Not Included

1.9.1 Facility Types

The project would create a safe, direct, and defined multi-use trail for persons of all abilities, improve predictability for both motorized and nonmotorized users, and maintain truck and freight facilities and access along the project alignment. A number of different facility types were initially considered by SDOT, but were removed from further consideration because they did not fully meet the project objectives. The facility types described below would not maintain the same look and feel as the remainder of the BGT, nor would they provide an adequate level of comfort for users of varying abilities and activities. The facilities considered, along with the reasons for no further consideration, are described below. These alternatives did not meet the project objective of a multi-use trail through the study area.

Protected Bicycle Lanes

A protected bicycle lane may have different forms, including cycle tracks, but they are designed exclusively to keep bicycles separated from motor vehicle travel lanes, parking lanes, and sidewalks. A protected bicycle lane does not provide accommodations for pedestrians or other nonmotorized users of all abilities. Pedestrians and other nonmotorized users would have to use an adjacent sidewalk. This type of facility does not meet the project objective of completing the multi-use trail through the study area. It would not maintain the feel of the existing trail on either side of the Missing Link, and would put people running or skating onto a sidewalk, which introduces potential conflicts with people gathering or milling about on sidewalks, or entering or exiting buildings.

Elevated Trail

During public scoping, it was suggested that the trail be elevated such that vehicles can pass underneath, thereby reducing any potential conflict with industrial uses and truck traffic (particularly along Shilshole Ave NW). This alternative was eliminated from further consideration as there is insufficient space to construct a facility that would meet fire code and ADA requirements due to existing development. Additionally, the ramps (at a 5% maximum grade) needed to access an elevated trail would be a minimum of 75 feet long and would require additional right-of-way, greatly reducing the advantages of elevating the trail in proportion to making it accessible to users. Furthermore, the cost estimate to construct an elevated structure of sufficient length to avoid potential conflicts along Shilshole Ave NW or other segments would be 400 to 500% higher than an at-grade structure.

Sharrow

Shared lane markings or “sharrows” guide bicyclists to the safest place on the street to ride and help motorists expect to see and share the lane with bicyclists. Sharrows do not fulfill the objective of the project to develop a multi-use trail for persons of all abilities. Similar to protected bicycle lanes, it meets the needs of some people bicycling, but does not provide accommodations for people walking or jogging, or people not comfortable riding in streets, unprotected from adjacent motor vehicle traffic.

Woonerf

A woonerf is a street where pedestrians and bicyclists have priority over motorists. Originally a Dutch concept, woonerfs are gaining popularity in the United States. Traffic volumes and speeds are low, approximately 5 miles per hour (mph), a minimal amount of public right–of–way is dedicated to vehicles,

and curbs may be eliminated. Traffic volumes and speeds within the study area are too high for this type of facility to be appropriate within the Missing Link corridor, and it was removed from further consideration.

1.10 Comments and Reponses on the DEIS

SDOT published the DEIS on June 16, 2016. A 45-day comments period was open until August 1, 2016 and included public meetings on July 14, 2016 and July 16, 2016. In response to public comment and meetings with area businesses and interest groups, SDOT developed the Preferred Alternative, which combines components previously analyzed in the Build Alternatives. This FEIS contains the responses to the comments in Volume 2.

1.10.1 Public Comment Summary

Comments received on the DEIS included oral testimonies received at the July public meetings, emails, and mailed comment letters. Approximately 270 people attended the public meetings. A total of approximately 4,400 comments (including oral comments) were received during the 45-day public comment period, excluding duplicates. In addition to unique letters or emails, survey form letters were used by the Olympic Athletic Club/Farmers Market group and Cascade Bicycle Club soliciting preference of alternative from approximately 3,400 people. In addition, an email form letter was received by approximately 360 people; these comments were identical or substantively similar, as some commenters customized the template with personal experiences or unique concerns. Figure 1-13 lists the types of comment letters received.

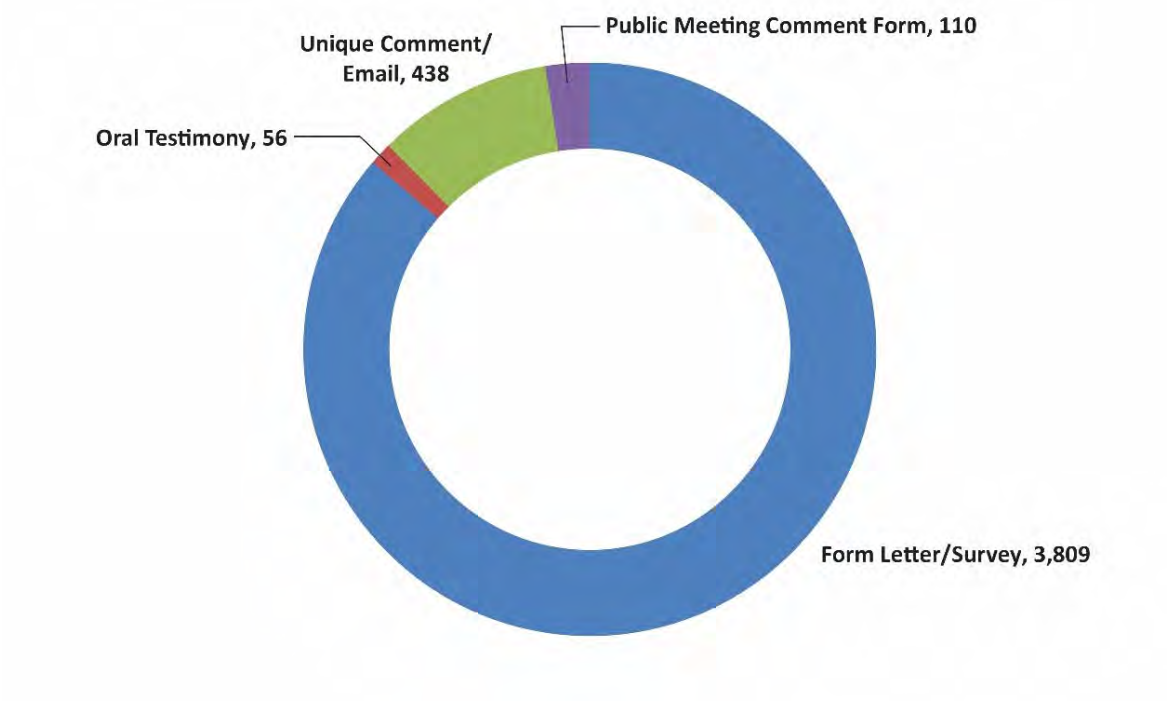


Figure 1-13. Number and Type of Comment Letters Received

1.10.2 **Preferred Route**

The majority of commenters expressed a preference for route. Of all the comments received, 77% preferred the Shilshole South Alternative; 2% each for either the Shilshole North or either Shilshole Alternative; 5% for the Leary Alternative; and 1% for the Ballard Avenue Alternative (as shown in Figure 1-14). A total of 4% expressed a preference for a hybrid alternative, the No Build Alternative, or something other. Approximately 9% of the commenters expressed no preference.

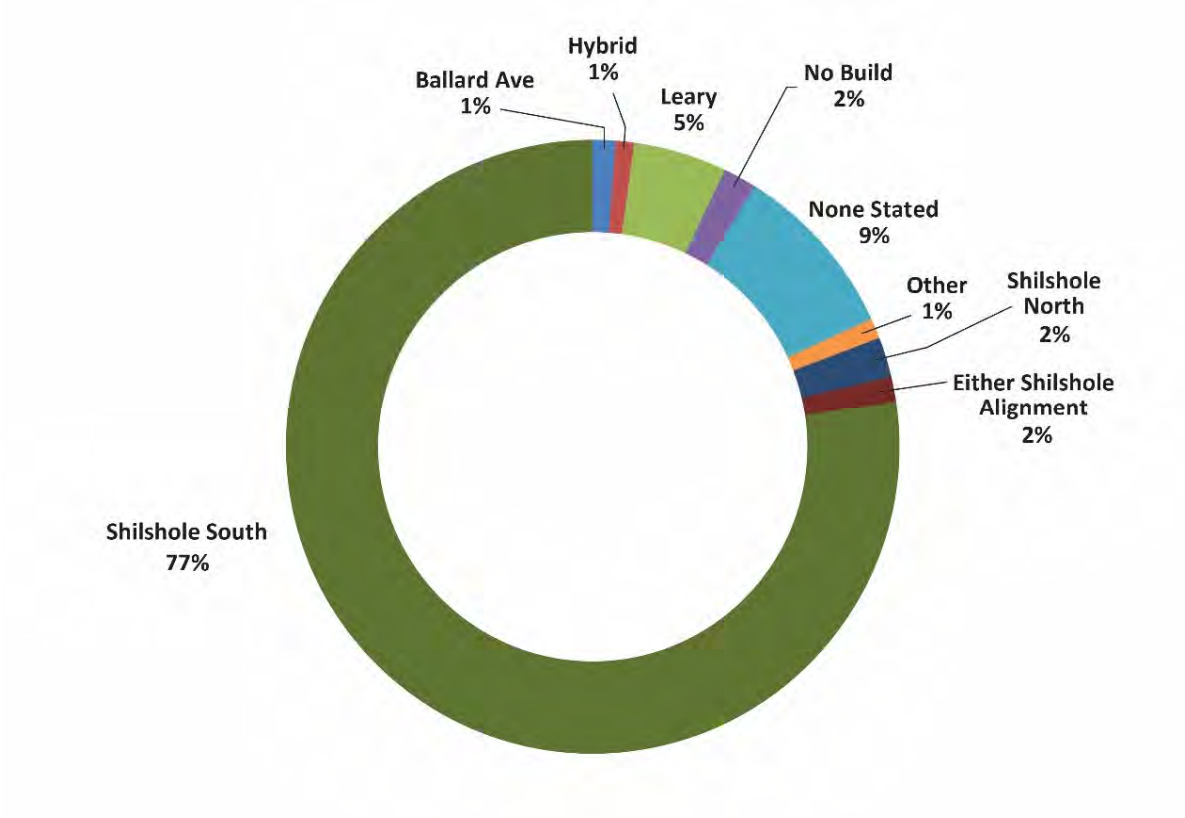


Figure 1-14. Route Preference

1.10.3 **Project Concerns**

Regardless of support or opposition to the project, the most common concerns expressed were related to maintaining the Farmers Market, followed by safety. Trail design, maintaining the industrial corridor, and directness of route were also common concerns noted. Figure 1-15 shows the most common comment topics made in the comment letters. (Note: Many comment letters addressed multiple topics.)

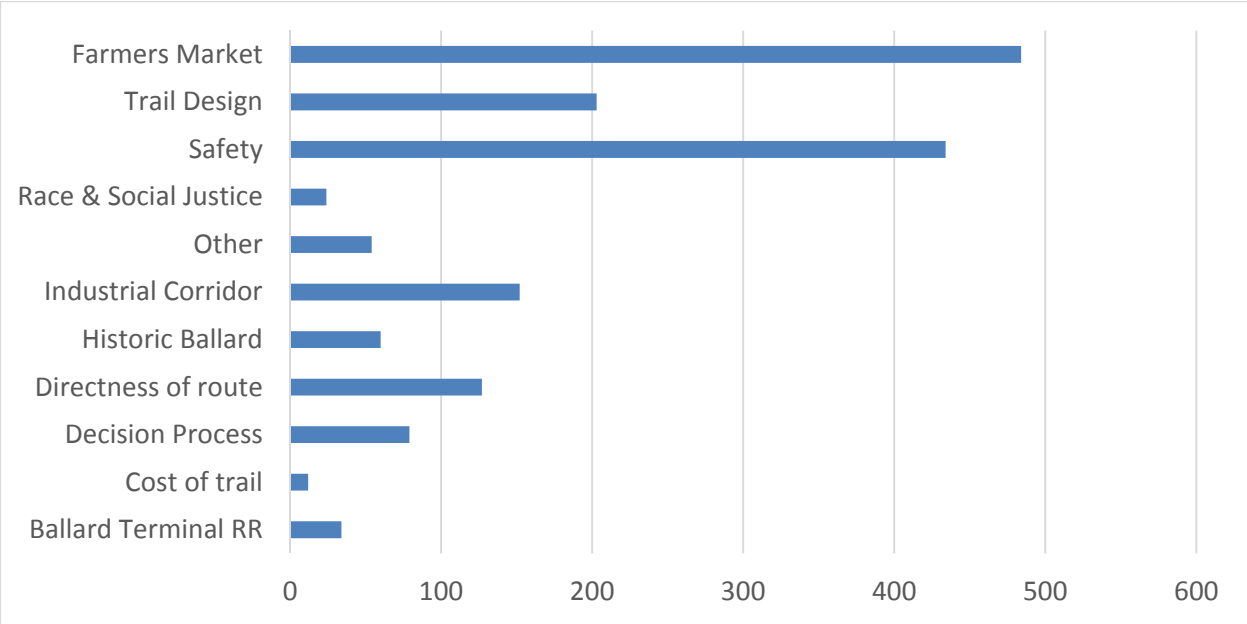


Figure 1-15. Counts of Leading Concerns Raised in the Comment Letters

1.11 Next Steps

SDOT will continue working with property owners, businesses, residents, and other interested parties throughout the design phase of the project and through construction. It is anticipated that the design will be complete by early 2018, and construction of the trail would begin in spring 2018.

CHAPTER 2: GEOLOGY, SOILS, AND HAZARDOUS MATERIALS

2.1 Introduction

Changes from the DEIS

Chapter 2 includes analysis of the newly developed Preferred Alternative, which was not included in the DEIS. No other substantive revisions were made to this chapter, relative to the DEIS.

In this section, the regional and local geologic setting is described for the study area, including an overview of the geologic hazards that could be encountered. In addition, environmental databases were reviewed to evaluate the study area for sites that currently store hazardous materials or have had a documented release to the subsurface.

The following data sources were reviewed:

- Various past geotechnical investigations for multiple sites in the study area;
- King County Hazard Vulnerability Analysis (King County, 2009);
- Hazardous Materials Discipline Report for the study area (Environmental Data Resources [EDR], 2015); and
- Seattle Department of Planning and Development geographic information system (GIS) (City of Seattle, 2015).

2.2 Affected Environment

2.2.1 Regional Setting

The study area is located in the central portion of the Puget Sound basin. This is an elongated, north-south trending depression in western Washington, between the Olympic Mountain Range to the west and the Cascade Mountain Range to the east. The regional topography is characterized by a series of north-south trending ridges separated by deep troughs that are now Puget Sound, Elliott Bay, Lake Washington, and Lake Sammamish.

The regional topography was formed by the movement of glaciers over thousands of years. The glaciers were up to several thousand feet thick, and soils that were present beneath them are generally very hard and compacted as a result of the weight of the glaciers. More recently, erosional processes and landform changes resulting from human development have modified the regional topography. Geology in the region generally includes recent surficial soils over a thick sequence of glacially consolidated soils and then bedrock. Subsurface conditions may vary greatly and unpredictably over short distances due to changes in depositional history and urban development. Today, the topography of the region is characterized by rolling hills interrupted by troughs that were carved by the ice sheet and later occupied by large freshwater lakes and rivers (Liesch et al., 1963; Galster and Laprade, 1991; Troost and Stein, 1995; Yount et al., 1993).

2.2.2 Geology

The project is located along the north shore of Salmon Bay in a glacially exposed and eroded trough that is filled with glacial till, outwash, and lacustrine (lake) sediments. These glacial sediments were deposited directly by the glacial ice and by glacial meltwater and can be well over 1,000 feet thick in areas. As the glaciers retreated, glacial meltwater accumulated in lowland troughs, forming large bodies of deep fresh water, such as the pre-historic Glacial Lake Russell and Glacial Lake Bretz. The study area was under water within these large glacial lakes while they existed.

Increased contribution of glacial meltwater into the oceans at the end of the Pleistocene caused sea level to rise around the world until the land rebounded from the weight of the glacial ice. As a result of rebound, relative sea level in the Puget Lowland dropped below the modern shoreline during the early Holocene, about 11,000 years ago, exposing the study area (Dragovich et al., 1994). During historical times, deposition of industrial fill was commonplace along the Salmon Bay shoreline in the 1890s. Canal spoils were later placed along the shoreline during construction of the Lake Washington Ship Canal (Ship Canal). As a result, the wetlands along the coast were filled and the Salmon Bay shoreline was extended south of its original position.

Numerous previous geotechnical investigations have occurred within the study area, and the logs of 38 borings from 25 previously completed geotechnical investigations were reviewed to identify the underlying materials.[1] The boreholes from these investigations show that there is between 1 and approximately 17 feet of mixed clayey, gravelly, silty, sandy fill immediately beneath the study area. The fill is reportedly thickest along the Shilshole North and Shilshole South Alternatives within the area of the historical shoreline. Table 2-1 details the thickness of the fill along each alternative at various cross-streets.

Table 2-1. Estimated Fill Thickness in Feet from East to West Along Each Alternative Corridor

	Alternative			
Location	*Preferred Alternative*	*Shilshole South and Shilshole North*	*Ballard Avenue*	*Leary*
11th Ave NW	8.5	8.5	9	12
14th Ave NW	15	15	7.5	9.5
15th Ave NW	17	17	6	5
17th Ave NW	15.5	15.5	6	3
20th Ave NW	14.5	14.5	9.5	7
22nd Ave NW	7	7	3.5	9.5
24th Ave NW	7	7	1	7.5
26th Ave NW	13	13	11	8
28th Avenue NW	8	8	10.5	10.5
30th Avenue NW	8.5	8.5	N/A	9.5

[1] Aspect Consulting, 2002; Associated Earth Sciences, Inc., 2000; Converse Consultants NW, 1994a, 1994b; Converse, Davis and Associates, Inc., 1975; Dames and Moore, 1968, 1971, 1980; Dodds GeoSciences, Inc., 2003; Fowler, 2000; Geotech Consultants, Inc., 1998, 2004; Huckabay, 1979; Mann, 1989; Metropolitan Engineers, 1968; Rice, 1989; Seattle Department of Engineering, 1995; Seattle Public Utilities Materials Laboratory, 1969, 1970, 1972, 2002; Shannon & Wilson, Inc., 1973, 1999; Terra Associates, Inc., 2003; Tobin, 1999.

According to the borelogs, the fill includes debris such as brick, metal, and wood. The findings of these geotechnical investigations suggest that two former dump sites existed in the area, one near 11th Ave NW and NW 46th St, and the other near 28th Ave NW and NW Market St.

The fill is reportedly underlain by silty and organic-rich Holocene-aged alluvium or weathered gravelly, silty, and sandy glacial till. Where present, the Holocene-aged sand, silt, and peat beds derived from intertidal deposition are found between an average of 9.5 and 14 feet below ground surface (fbs). Holocene-aged deposits were most commonly encountered at the east and west ends of the project. Pleistocene till deposits were logged below the fill and Holocene-aged sand, silt, and peat beds across the study area.

2.2.3 Geologic Hazards

A consideration for the construction and operation of the alternatives would be the potential to encounter geologic hazards, erosion, seismicity, and settlement due to soft or unstable soils.

Erosion Hazards

Erosion hazards occur where soils may experience severe to very severe erosion from construction activities, or through changes in surficial conditions that expose soils to new erosive forces. Erosive forces can come from precipitation, changes in drainage patterns, removal of vegetation, wind, or wave action. Certain types of soil, such as silts, are generally more prone to erosion hazards.

Seismic Hazards

The Puget Sound basin is located within a seismically active area dominated by the Cascadia subduction zone, which forms the boundary between two tectonic plates: the North American plate and the Juan de Fuca plate. The project vicinity has been subject to earthquakes in the historic past and will undoubtedly undergo shaking again in the future.

Earthquakes in the Puget Sound region result from one of three sources:

- The Cascadia subduction zone off the coast of Washington,
- The deep intraslab subduction zone located approximately 20 to 40 miles below the Puget Sound area, or
- Shallow crustal faults.

The closest active crustal source is the Seattle Fault Zone, which runs roughly east-west approximately 6 miles south of the study area. A fault is considered active when it has shown evidence of displacement within the last 11,000 years. An earthquake on the Seattle Fault poses the greatest risk to the Seattle urban region (City of Seattle, 2017).

Deep quakes are the most common large earthquakes that have occurred in the Puget Sound region. Quakes larger than magnitude 6.0 occurred in 1909, 1939, 1946, 1949, 1965, and 2001 (City of Seattle, 2017). However, shallow quakes are the type expected on the Seattle Fault Zone, which can create more damage than deep quakes because of the proximity to the epicenter. However, damage from earthquakes depends on many factors including distance to epicenter, soil and bedrock properties, and duration of shaking.

Seismic hazards include the primary effects of earthquakes, such as ground displacement from fault rupture and ground shaking, as well as secondary effects including liquefaction, settlement, tsunamis, and seiche waves.

Earthquake-Induced Ground Rupture/ Ground Shaking. Earthquake-induced ground rupture is defined as the physical displacement of surface deposits in response to an earthquake's seismic waves. The magnitude, sense, and nature of fault rupture can vary for different faults or even along different strands of the same fault. Strong ground shaking from a major earthquake can produce a range of intensities experienced at any one location. Ground shaking may affect areas hundreds of miles distant from the earthquake's epicenter. The ground shaking can result in slope failure, settlement, soil liquefaction, tsunamis, or seiches, all of which pose a risk to the public.

Liquefaction. Liquefaction is of particular concern because it has often been the cause of damage to structures during past earthquakes. Liquefaction occurs where soil consistency is primarily loose and granular and located below the water table. Saturated loose soils within 50 feet of the ground surface are at most risk of liquefaction. The consequences of liquefaction include loss in the strength and settlement of the soil. The loss of strength can result in lateral spreading, bearing failures, or flotation of buried vaults and pipes.

Tsunamis/Seiche Waves. Tsunamis or seiches are possible secondary effects from seismic events. Tsunamis, often incorrectly described as tidal waves, are sea waves usually caused by displacement of the ocean floor. Typically generated by seismic or volcanic activity or by underwater landslides, a tsunami consists of a series of high-energy waves that radiate outward like pond ripples from the area in which the generating event occurred. For the Puget Sound region, either a large subduction zone quake off the coast or along the Seattle Fault could produce a tsunami. However, while a tsunami generated by a distant or Cascadia subduction earthquake could result in much damage to the coast, the impact in King County would not be as great. In the case of a subduction zone quake, a tsunami would travel from the coast through the Strait of Juan de Fuca into Puget Sound, and then south to Seattle. As a result, primary concerns lie with a tsunami or seiche generated by a land movement originating on the Seattle Fault (King County, 2009).

Seiche waves consist of a series of standing waves of an enclosed body or partially enclosed body of water caused by earthquake shaking, similar to what could be described as sloshing action. Seiche waves can affect harbors, bays, lakes, rivers, and canals. Both Puget Sound and Lake Washington could experience a seiche, as they did in 1891, 1949, and 1964. The "sloshing" effect of a seiche could damage facilities close to the water.

Other Hazards

Soft soil conditions can also be a form of geologic hazard, causing subsidence or settlement over the short or long term. Soft soils have low strengths and are compressible. Without appropriate design consideration, soft soils can lead to embankment failures during construction or long-term settlement after construction if left unaddressed. The presence of soft soils or soils that are not suitable to support new loadings (i.e., placement of fill or concrete) can only be determined on a site-specific basis through observation and laboratory testing of subsurface materials.

2.2.4 Hazardous Materials Sites

Each Build Alternative, including the Preferred Alternative, would include earthwork activities to relocate utilities, remove existing concrete and asphalt, construct railway crossings and stormwater drainage

controls, and reconstruct driveways as well for the installation of other improvements. These include traffic controls, warning signs, and signals.

The study area has historically been used for industrial and commercial purposes since at least the late 1800s and is currently heavily developed for commercial, retail, and industrial use. Hazardous materials use is commonly associated with these types of land uses; with the long history, there is concern for past industrial and commercial land uses to have released hazardous materials and/or wastes to the subsurface.

A regulatory database review by EDR was conducted for the areas surrounding the entire study area. The EDR report was done in accordance with the U.S. Environmental Protection Agency's (EPA) Standards and Practices for All Appropriate Inquiries (40 Code of Federal Regulations [CFR] Part 312) and the American Society for Testing and Materials (ASTM) Standard Practice for Environmental Site Assessments (E 1527-13).

The databases reviewed and the number of sites included (see Appendix B for explanation of all databases reviewed):

- Federal National Priorities List (NPL) – 0;
- Federal Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) list – 0;
- Federal CERCLIS NFRAP – 6;
- Federal Resource Conservation and Recovery Act (RCRA) Corrective Action Sites (CORRACTS) Facilities List – 0;
- Federal RCRA non-CORRACTS TSD Facilities List – 0;
- Federal RCRA Generators List – 17;
- Federal Institutional Controls/Engineering Controls Registries – 0;
- Federal Emergency Response Notification System (ERNS) List – 238;
- State- and Tribal-Equivalent NPL – 7;
- State- and Tribal-Equivalent CERCLIS – 35;
- State and Tribal Landfill and/or Solid Waste Disposal Sites – 0;
- State and Tribal Leaking Storage Tank Lists – 11;
- State and Tribal Registered Storage Tank Lists – 40;
- State and Tribal Institutional Controls/Engineering Controls Registries – 5;
- State and Tribal Voluntary Cleanup Sites – 50;
- State and Tribal Brownfield Sites – 1;

- Local Brownfield Lists – 2;
- Local Lists of Landfill/Solid Waste Disposal Sites – 2;
- Local Lists of Hazardous Waste/Contaminated Sites – 209;
- Local Land Records – 0;
- Records of Emergency Release Reports – 95;
- Other Ascertainable Records – 297;
- EDR High Risk Historical Records (e.g., gas stations, dry cleaners) – 182;
- Exclusive Recovered Government Archives – 39.

The area searched varied for these databases and ranged from a quarter mile up to 1 mile in accordance with ASTM E 1527-13. A total of 1,747 sites were identified within the 1-mile search area with 1,235 located either along the different alternative alignments or within one-eighth mile of the study area. These databases include sites that have identified releases of hazardous materials into the environment and sites that have identified the use of hazardous materials and not necessarily any known releases (e.g., the RCRA small and large generators list, solid waste disposal sites, and identified underground storage tank sites). Sites with known releases can be in varying stages of investigation and cleanup, from attempting to determine the lateral and vertical extent of contamination up to nearing completion of remediation.

2.3 Potential Impacts

2.3.1 No Build Alternative

Construction

Under the No Build Alternative, there would be no new construction activities and therefore no disturbance of soils that could lead to erosion or loss of topsoil.

Operation

Any existing geotechnical hazards, such as ground shaking or settlement of soils, would remain for existing structures and improvements. Otherwise, there would be no new trail improvements and therefore no new risks associated with any hazards that may be present within the study area.

2.3.2 Preferred Alternative

Each element of the Preferred Alternative was previously analyzed in the DEIS (except for an approximately 125-foot section on the west side of 24th Ave NW, as described in Chapter 1). The Preferred Alternative does not result in any newly identified geotechnical hazards. As such, the previously identified impacts and mitigation relating to construction and operation would still occur, as described below.

Construction

Earthwork activities during construction could encounter contaminated soils from past land uses that released hazardous materials to the subsurface. As described in Section 2.2, Affected Environment, the study area contains a large number of sites (1,235 somewhat evenly spread throughout the study area and immediate vicinity) associated with current hazardous materials use and past release incidents. The release sites can range from relatively minor incidents with little to no threat to human health or the environment, to more extensive sites affecting areas beyond site boundaries and requiring substantial remediation efforts. According to information obtained from the database search, many of the contaminated sites in the study area are associated with leaking underground storage tanks (former automobile service stations), dry cleaning operations, industrial manufacturing, and mechanical maintenance facilities (EDR, 2015). No federal NPL sites (also referred to as Superfund) were identified in the database search (EDR, 2015).

In general, releases affect areas localized to the source (e.g., the underground storage tank) and typically only affect soils within a limited area. Many times, these affected subsurface soil areas are found within a site boundary but can extend off site. Incidents that represent large releases or small releases that occur slowly over long periods of time, such as a leaking underground storage tank, can adversely affect underlying groundwater. Depending on site-specific conditions, releases of water soluble hazardous materials (such as many solvents and gasoline) can migrate considerable distances from the source. For many of the identified release sites within the study area, the releases have been adequately investigated and have received the appropriate remediation such that no further threat to human health or the environment exists. Other cases are in various stages of characterization to define the lateral and horizontal extent of contamination or are in the process of remediation activities.

Therefore, based on the high volume of identified sites within the study area as well as the history of commercial and industrial land uses, there is a relatively high probability of encountering legacy contaminants during construction of the Preferred Alternative. If not managed appropriately, construction workers could be exposed to these contaminants in soil or groundwater through excavation or other ground-disturbing activities. However, a Soil Management Plan, as included in the mitigation measures below, would establish appropriate methods for the identification of suspect soils, handling requirements to limit exposure, as well as any follow-up that may be required to protect the workers or the public from any adverse effects.

Operation

Operation of the trail would have minimal impacts to soil and geology in the study area. Once construction is complete, the potential for erosion or contact with legacy contaminants would be largely eliminated through the replacement of any excavation with compacted soils or engineered fill and covering by asphalt.

Seismic activity is likely to occur during the life of the proposed improvements and could be substantial, resulting in significant damage to the region. Seismic activity can cause primary hazards such as ground shaking or secondary effects including liquefaction. Liquefaction of soils during an earthquake could result in vertical and lateral displacements of paved areas and subsurface utilities, potentially resulting in substantial damage or injury. The liquefaction potential along the alignment for the Preferred Alternative would be confirmed during the design stage through preliminary geotechnical investigations. Design of improvements and utilities to resist seismic forces and secondary effects such as liquefaction would be required. Liquefiable soils can be addressed through excavation and replacement with engineered fill, treatment of site soils, or use of flexible utility connections.

In general, proposed improvements would be relatively minor and not very susceptible to settlement or instability. Geotechnical investigations would identify underlying materials and their engineering properties. Soils unsuitable for use as structural fill, such as expansive soils or compressible soils, could require removal and off-site disposal. However, with implementation of geotechnical recommendations by a state-licensed geotechnical engineer, the engineering properties of the underlying soils would be identified and any hazards ameliorated such that subsurface soils are suitable for the overlying improvements enabling long-term stability.

2.3.3 Shilshole South, Shilshole North, Ballard Avenue, and Leary Alternatives

Construction

Potential impacts for these Build Alternatives would be similar to those described above for the Preferred Alternative. While the Shilshole South, Shilshole North, Ballard Avenue, and Leary Alternatives would disturb different locations than the Preferred Alternative, they would all still have a relatively high probability of encountering legacy contaminants. As described in Section 2.3.2 for the Preferred Alternative, the implementation of the mitigation measures below would reduce potential impacts to less than significant levels.

Operation

As described in Section 2.3.2 for the Preferred Alternative, all grading and construction would adhere to the specifications, procedures, and site conditions in the final design plans, which would comply with applicable seismic recommendations.

2.3.4 Connector Segments

Potential impacts for the connector segments would be similar to what is described in Section 2.3.2 for the Preferred Alternative. The connector segments would represent a reduced area of disturbance, and thus the erosion potential would be reduced as well as the likelihood of encountering legacy contaminants.

2.4 Avoidance, Minimization, and Mitigation Measures

2.4.1 Measures Common to All Alternatives

The following measures would be used to minimize impacts related to soils and hazardous materials:

- Have a Washington-licensed geotechnical engineer design the project facilities to withstand probable seismically induced ground shaking, as well as any other geotechnical hazards that may be present.

- All grading and construction would adhere to the specifications, procedures, and site conditions in the final design plans, which would comply with applicable seismic recommendations.

- Use construction best management practices (BMPs) as detailed in a Stormwater Pollution Prevention Plan (SWPPP) to minimize the potential for erosion; this may include the installation of silt fences, use of hay bales, or application of soil stabilization measures.

- Implement BMPs such as dedicated refueling areas, following manufacturer's specifications on hazardous materials storage and disposal, and having on-site spill response supplies to control accidental upset conditions.

- Prepare and implement a Soil Management Plan during all earthwork activities.

- Stop construction activities upon the discovery of potentially contaminated soils or groundwater (e.g., petroleum odor and/or discoloration) in order to isolate, cover, and sample the material to determine appropriate disposal in accordance with SDOT construction standards and applicable regulations.

- Dispose of contaminated materials at a licensed facility in accordance with transportation laws, the requirements of the receiving facility, and all other applicable regulations.

2.4.2 Specific Mitigation

There would be no specific mitigation measures for geology, soils, and hazardous materials associated with the different alternatives.

CHAPTER 3: FISH, WILDLIFE, AND VEGETATION

3.1 Introduction

In this section, fish and wildlife and their habitat are described, along with an evaluation of street trees. The study area includes the area where project construction activities and operation (such as noise and light, permanent loss of habitat, or permanent disturbance) could potentially affect fish, wildlife, or their habitat. The study area is approximately 500 feet from the project footprint for terrestrial species and birds and includes the Ship Canal for fish (Figure 3-1). Street trees along the roads for each alternative are also described.

Changes from the DEIS

Chapter 3 includes analysis of the newly developed Preferred Alternative, which was not included in the DEIS. It also includes some additional information on potential mitigation measures that would comply with City regulations. No other substantive revisions were made to this chapter, relative to the DEIS.

The following data sources have been reviewed:

- U.S. Fish and Wildlife Service (USFWS) Critical Habitat Mapper (USFWS, 2017);
- Washington Natural Heritage Program Database (Washington State Department of Natural Resources [WDNR], 2017);
- Priority Habitat and Species Database (Washington Department of Fish and Wildlife [WDFW], 2017a);
- SalmonScape (WDFW, 2017b);
- Washington State Species of Concern Lists (WDFW, 2017c); and
- Seattle Department of Construction and Inspections (SDCI) GIS (City of Seattle, 2017).

3.2 Affected Environment

3.2.1 Fish and Wildlife

The study area is highly urbanized and made up of residential, commercial, and industrial areas as well as the Ship Canal. Within the study area, small areas of upland vegetation provide habitat for urban-adapted wildlife such as crows, gulls, some songbirds, raccoons, and rodents. Bald eagles, waterfowl, great blue herons, and other aquatic birds (such as kingfishers) are also found along the Ship Canal. The Carl S. English, Jr. Botanical Garden, on the north side of the Ballard Locks, is the largest greenspace in the study area, with the largest concentration of urban-adapted wildlife in the study area.

Federally Threatened and Endangered Fish Species

The Endangered Species Act (ESA), administered by the National Marine Fisheries Service (NMFS) and the USFWS, aims to protect and recover imperiled species and the ecosystems on which they depend. The City of Seattle is not required to enter into consultation with these agencies as there is no federal nexus associated with the project at this time (no federal funds would be used, no federal permits or approvals are required, and the project does not occur on federal land). Nevertheless, the potential impacts of the project on ESA-listed species are considered.

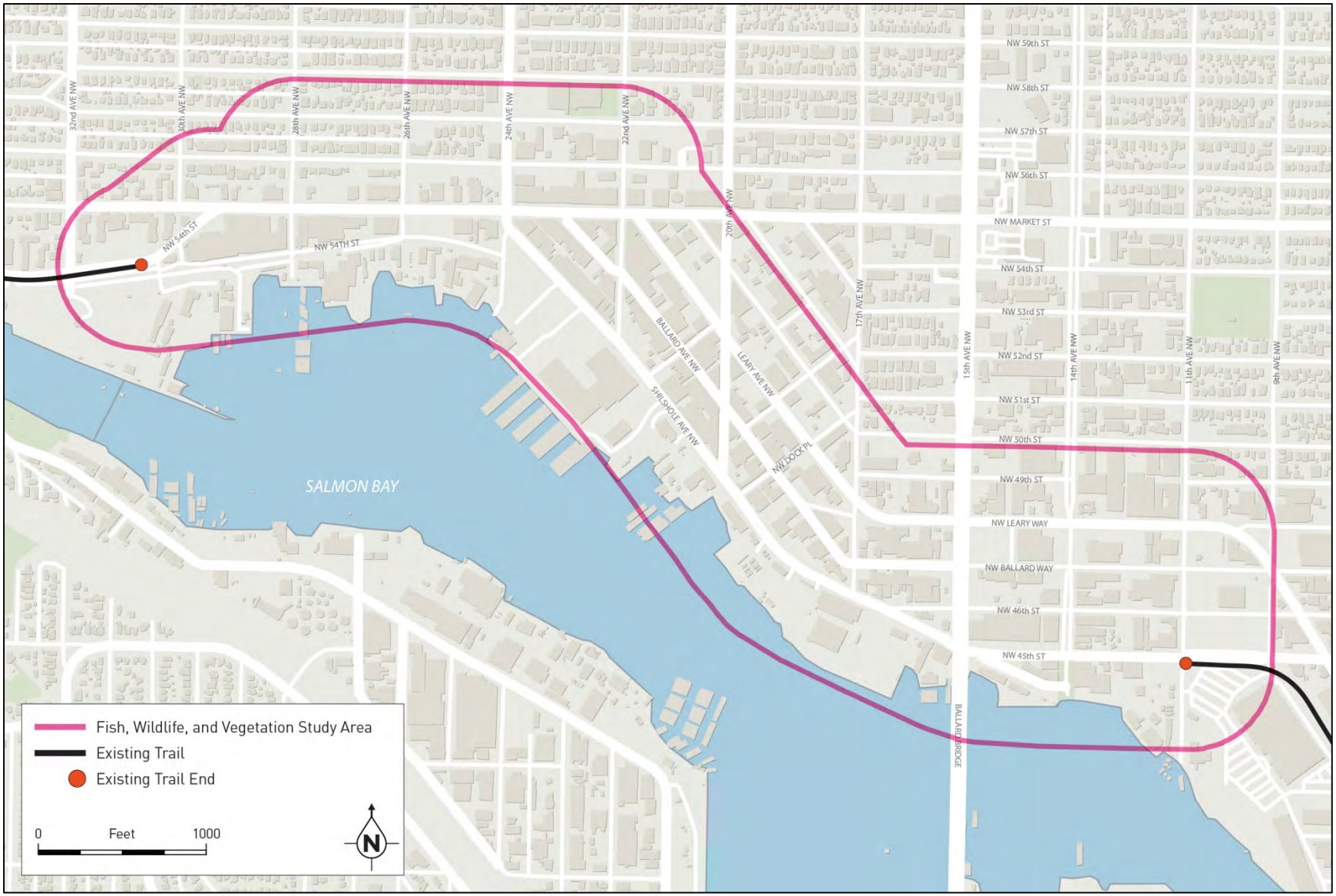


Figure 3-1. Fish, Wildlife, and Vegetation Study Area

Federally listed threatened and endangered species that potentially occur in the study area are listed in Table 3-1 (USFWS, 2017; WDFW, 2017c). No populations of threatened or endangered plant species are documented in the study area (WDNR, 2017).

Table 3-1. Federally Listed Species in the Study Area

Federally Listed Species	*Date Listed*	*Federal Status*[1]	*State Status*[1]	*Critical Habitat in Study Area*
Chinook salmon Puget Sound Evolutionarily Significant Unit (ESU)	1999	T	C	Yes
Steelhead Puget Sound Distinct Population Segment (DPS)	2007	T	none	No[2]
Bull trout Coastal-Puget Sound DPS	1999	T	C	Yes
Marbled murrelet	1992	T	T	No
Yellow-billed cuckoo	2014	T	C	No

[1] T = Threatened; C = Candidate.
[2] Critical habitat is proposed for this species in the study area.
Source: USFWS, 2017; WDFW, 2017c.

Chinook, steelhead, and bull trout are listed as threatened and can be found in the Ship Canal. The Ship Canal is designated as critical habitat for Chinook salmon and contains freshwater primary constituent elements for Chinook salmon. A primary constituent element is a physical or biological feature essential to the conservation of a species upon which its designated or proposed critical habitat is based. The Ship Canal is also designated critical habitat for bull trout. There is currently no critical habitat designated for steelhead.

Water from the Cedar River, Sammamish River, and Lake Washington flow through Lake Union into Puget Sound via the Ship Canal, and thus it is the only route for migrating salmonids. The Ship Canal is an urbanized, busy corridor with high recreational and commercial boat traffic. Habitat and cover are limited in the Ship Canal as it is almost completely armored and includes many bulkheads, docks, and piers with little riparian or upland vegetation (Seattle Public Utilities [SPU] and U.S. Army Corps of Engineers [Corps], 2008). Water quality is generally good due to the volume of water flowing through the Ship Canal. In the summer, however, temperatures can be high and dissolved oxygen levels low; fecal coliform bacteria and contaminants can also be elevated (Washington State Department of Ecology [Ecology], 2017).

Adult salmonids tend to migrate quickly through the Ship Canal, with an average passage time of 1 to 4 days depending on species (SPU and Corps, 2008; NMFS, 2005). Chinook salmon smolts usually take 1 to 4 weeks to pass through the Ship Canal (SPU and Corps, 2008). Steelhead smolts move through the Ballard Locks in hours or days. Adult out-migrating salmon, in particular Chinook salmon, often hold just upstream from the locks in a cool water refuge near the saltwater drain before going through the locks (SPU and Corps, 2008).

Bull trout have been found in marine waters of Shilshole Bay and the Ballard Locks, just downstream from the study area, and have been observed infrequently in the study area. From late spring through early fall, surface water temperatures in the Ship Canal are too warm for bull trout and probably limit their residence time (USFWS, 2004).

Federally Threatened and Endangered Wildlife

The marbled murrelet and the yellow-billed cuckoo are listed as threatened, but are unlikely to be found in the study area due to lack of suitable habitat. There is no critical habitat for either species in the study area.

Bald eagles are protected under the federal Bald and Golden Eagle Protection Act. There are no known bald eagle nests in the study area. However, bald eagles may be seen in the study area, in particular near the Ship Canal.

State Species of Concern

Washington State has regulations to protect species of concern (WAC 232-12-297). Other than the federally listed species described above, there are no state endangered, threatened, or sensitive species within the study area. A peregrine falcon (State sensitive) nest was reported just outside of the study area on the Ballard Bridge in 2011 (WDFW, 2017a).

Seattle Regulations

The City protects wildlife habitat through their Critical Areas Ordinance (SMC 25.09). The botanical garden, and approximately 500 feet surrounding the botanical garden, is a Fish and Wildlife Habitat Conservation Area under the Critical Areas Ordinance (City of Seattle, 2017). A great blue heron rookery on the south side of the Ballard Locks is protected by the City Director's Rule 5-2007. The rookery protected by this rule is outside of the study area, but herons may use habitat within the study area. Great blue herons have been recorded as breeding within the botanical garden (WDFW, 2017a). The great blue heron is a State monitor species.

3.2.2 Street Trees

Street trees along the rights-of-way throughout the study area may be affected by the project. Street trees in Seattle are regulated under SMC 15.43. Street trees are "trees located in public places which includes public right-of-way and the space above or beneath its surface, whether or not open or improved, including streets, avenues, ways, boulevards, drives, places, alleys, sidewalks, planting strips, squares, triangles, and plazas that are not privately owned" (SDOT, 2014). All other trees in Seattle are regulated under SMC 25.11. The City of Seattle also developed an Urban Forest Stewardship Plan (City of Seattle, 2013), which conveys the value placed in urban trees and provides guidance for protecting them. Street trees are an important component of the urban forest. Street trees also provide habitat for urban-adapted wildlife. SDOT has mapped many of the street trees throughout the city (SDOT, 2017). Figure 3-2 shows street trees along the alignments for the five Build Alternative (including trees on the opposite side of the road from the proposed alternatives) (SDOT, 2017).

Many of the street trees in the study area are large, but they are not designated as heritage trees (SDOT, 2014, 2017). Heritage trees are a tree or group of trees given special designation by the Heritage Tree program, co-sponsored by Plant Amnesty and SDOT.

Figure 3-2. Street Trees in the Study Area

Table 3-2 lists streets with street trees and the common names of species for each alternative. For the Preferred Alternative, there are no street trees along Shilshole Ave NW, but there are 27 mapped trees along NW Market St along the side of the street where the alternative is proposed. There are no street trees along the Shilshole South Alternative. For the Shilshole North Alternative, there are no street trees along Shilshole Ave NW, but there are 36 mapped trees on NW 46th St and NW Market St along the side of the street where the alternative is proposed. The Ballard Avenue Alternative includes street trees along many portions of the alignment, including all of Ballard Ave NW and much of NW 56th St. The Ballard Avenue Alternative has 61 mapped trees along the side of the road where the alignment is proposed. The Leary Alternative has 102 mapped street trees along the side of the roads where the alternative is proposed; these roads are NW Leary Way, Leary Ave NW, and NW Market St (Figure 3-2) (SDOT, 2017). These numbers are estimates based on existing data; a tree survey would be conducted by a certified arborist after an alternative is chosen.

Table 3-2 also lists the connector segments and species of street trees. Since either side of the connector segments could be used at this stage of the design, the side of the road where the trees are located is indicated in Table 3-2.

Table 3-2. Mapped Street Trees Along Alternative Alignments and Connector Segments

Alternative/Location	*Species*	*Side of the Road*	*Approx. Number of Trees*
Preferred Alternative			
NW 54th St	Beech	Northwest[1]	7
NW Market St	Wilfred Fox Whitebeam	South	27
NW Market St	Wilfred Fox Whitebeam, Freeman (red), Bowhall maples, Pyramidal European, Westminster Globe English Oak	North[1]	18
Shilshole South Alternative			
No street trees	n/a	n/a	0
Shilshole North Alternative			
NW 54th St	Beech	Northwest[1]	7
NW Market St	Wilfred Fox Whitebeam	South	27
NW Market St	Wilfred Fox Whitebeam, Freeman (red), Bowhall maples, Pyramidal European, Westminster Globe English Oak	North[1]	18
NW 46th St	Pacific Sunset maple	North	9
Ballard Avenue Alternative			
28th Ave NW	Snowcone Japanese Snowbell	East	4
NW 56th St	Black Cherry, Norway maple, Little Gem magnolia, Redspire pear, Blireiana Purpleleaf plum, Littleleaf Linden	South	16

Alternative/Location	*Species*	*Side of the Road*	*Approx. Number of Trees*
NW 56th St	Maple, birch, Kousa dogwood, cutleaf Hornbeam, sweetgum, Vanessa Parrotia, flowering plum, Camellia, Green Vase Zelkova, Red oak, Littleleaf Linden, Snowcone Japanese Snowbell	North[1]	18
22nd Ave NW	Armstrong Freeman (red) maple	West	6
22nd Ave NW	English maple, Littleleaf Linden, and Norway, Bowhall, Armstrong Freeman (red) maples	East[1]	12
Ballard Ave NW/ NW Ballard Way	Honey locust, Armstrong Freeman (red) maple, pin oak	Southwest	35
Ballard Ave NW/ NW Ballard Way	Honey locust, pin oak, red oak, Armstrong Freeman (red) maple	Northeast[1]	33
NW 46th St	Pacific Sunset maple	North[1]	9
Leary Alternative			
NW 54th St	Beech	Northwest[1]	7
NW Market St	Wilfred Fox Whitebeam, Emerald Queen Norway maple	South	30
NW Market St	Wilfred Fox Whitebeam, Pyramidal European, Westminster Globe English Oak, and Norway, Freeman (red), and Bowhall maples	North[1]	42
Leary Ave NW	Snowcone Japanese snowbell, Prospector Elm, Okame cherry, Norwegian Sunset, English, paperbark, and red maple	Southwest	33
Leary Ave NW	Norway maple, Allee Lacebark Elm, flowering plum, Emerald sunshine Elm, Okame cherry, red maple, Katsura tree	Northeast[1]	28
NW Leary Way	Norway and English maple, plum	South	29
NW Leary Way	English maple, London plane, white birch, plum	North[1]	13
11th Ave NW	Red maple, Redspire pear	East	10
Connector Segments			
Ballard Ave NW	Norway maple, Shumard red oak	Southwest	14
Ballard Ave NW	Red oak and Norway maple	Northeast	9
NW Vernon Pl	Pinoak and honey locust	Northwest	3
20th Ave NW	Oak, a coniferous tree	West	8
20th Ave NW	Pinoak, Shumard red oak, and red oak	East	9

Alternative/Location	*Species*	*Side of the Road*	*Approx. Number of Trees*
17th Ave NW	Plum trees	East	11
15th Ave NW	No street trees	n/a	0
14th Ave NW	Mixture – maples and Frontier Elm	West	11

[1] Opposite side of the street from proposed alternative alignment.

Source: SDOT, 2017.

3.3 Potential Impacts

3.3.1 No Build Alternative

Under the No Build Alternative, no construction activities would be associated with a trail and there would be no tree removal. Routine maintenance of street trees, streets, sidewalks, and existing bicycle and pedestrian facilities would occur. There would be no impacts to fish and wildlife, including threatened and endangered species, from the No Build Alternative. Impacts to street trees are not anticipated.

3.3.2 Impacts Common to All Build Alternatives

Construction

Fish and Wildlife. Similar construction techniques and equipment would be used for each Build Alternative, including the Preferred Alternative and connector segments, regardless of location. As with any construction project, there is a risk of spills of petroleum products or other fluids from construction activities, which have the potential to enter the Ship Canal and affect fish through stormwater facilities that drain directly to the Ship Canal. There is also a potential for dust and erosion from excavated areas. However, the likelihood of listed fish in the study area being affected by construction of the Missing Link is very small. There would be no in-water work associated with the construction of the Missing Link.

There would be no impacts to listed birds, as they are unlikely to be found in the study area. Urban-adapted wildlife, such as birds and rodents, may be temporarily disturbed by construction noise or activities and may temporarily leave the construction area. However, as habitat is minimal and these species are accustomed to a disturbed environment, the impacts would be minimal.

Street Trees. The exact configuration and number of trees that could be affected by the trail alignment is not known at this stage of design. Street trees listed in Table 3-2 and shown on Figure 3-2 may be affected by construction. Removal of street trees would be avoided where possible, and thus the number of trees removed would be small. A certified arborist would conduct a tree survey and assess the health of each tree and develop a tree protection plan for the Preferred Alternative. For the Build Alternatives, including the Preferred Alternative, the majority of construction would be the side of the road where the trail is proposed. In some cases, there would be work on the opposite side of the street to accommodate a new roadway configuration (Table 3-2). This may result in impacts to street trees across the street from the alternative alignments. This is most likely to occur at the following intersections: the northwest side of NW 54th St in the Preferred Alternative, Shilshole North Alternative, and Leary Alternative, and the north side of NW 56th St in the Ballard Avenue Alternative. Modifications to the opposite side of the street are not anticipated along the other streets.

For the connector segments, street trees may also need to be removed during construction. Figure 3-2 and Table 3-2 show where connector segments may affect street trees. Impacts from the construction of the Preferred Alternative, Shilshole North Alternative, Ballard Avenue Alternative, and Leary Alternative would be minor, but not significant. There would be no impacts to street trees from the Shilshole South Alternative because there are no trees along this alignment.

Operation

Fish and Wildlife. After the project is completed, there would be no impacts to fish and wildlife, including threatened or endangered species. There would be no changes to habitat for threatened fish species in the Ship Canal as a result of the project. The completed trail should attract users, and thus there would be more pedestrians and bicyclists along the completed corridor than there are currently. This may disturb urban-adapted species. There would be some additional landscaping and trees planted, which would provide refuge for urban-adapted species.

The completed trail would include stormwater drainage improvements that would comply with Seattle stormwater standards. In some cases, this may be an improvement over existing conditions. Any improvements would not make a measurable difference to water quality in the Ship Canal; however, it would contribute to reducing non-point source pollution.

Street Trees. There would be no impacts to street trees from the operation of the trail in any location.

3.4 Avoidance, Minimization, and Mitigation Measures

3.4.1 Measures Common to All Alternatives

Measures to avoid impacts from construction of the Missing Link would be the same for all Build Alternatives, including the Preferred Alternative. Disturbance or removal of vegetation and wildlife habitat would be avoided where possible. Construction BMPs would be used to avoid spills, and minimize dust or erosion throughout the construction period. A Stormwater Pollution Prevention Plan (SWPPP) would be developed specifically for the project. Removal of street trees would be avoided where possible, and replaced following the tree protection regulations (SMC 15.43 and SMC 25.11). Additionally, Executive Order 03-05 requires that trees removed on city property to be replaced at a two to one ratio. Trees would be protected during construction and in accordance with the tree protection regulations and the Street Tree Manual (SDOT, 2014). Street trees may also be added in areas where there currently are no street trees. In most cases new street trees would be smaller than existing conditions, and would take a number of years to grow to similar stature.

CHAPTER 4: LAND USE

4.1 Introduction

This chapter describes the affected environment in the study area and evaluates the project's compatibility with existing, allowed, and intended land uses and the federal, state, and local regulations, plans, and policies that guide and govern land use in the study area. Adopted policies and plans are generally not regulatory in nature, but rather provide guidance regarding the current and future management of land use and other resources. Policies are therefore important considerations for decision makers but generally are not binding requirements. Decision makers must also consider that complete consistency with one policy may mean some degree of inconsistency with another. In such cases, decision makers must weigh the degree of overall consistency with adopted plans in the final decision. For any alternative that is within the shoreline district, the City of Seattle (City) must make a finding that a proposal is consistent with the policies of the Shoreline Management Act, Ecology rules, and the local shoreline master program.

Changes from the DEIS

Chapter 4 includes an analysis of the newly developed Preferred Alternative, which was not included in the DEIS. The DEIS presented incorrect data on water-dependent and water-related uses; that information has been completely revised in the FEIS, including the narrative, table data, and figures. A separate Errata is included as Technical Appendix A (Volume 3) to correct the information presented in the DEIS. The FEIS also reflects additional information collected on transportation and parking resources in the study area. While these changes are substantive, they have not changed the conclusions of the analysis in the EIS.

Many comments on the project, and concerns over the years, have focused on how the project would affect adjacent land uses, particularly industrial uses clustered along the Salmon Bay shoreline, many of which are marine-related businesses. These concerns frequently focused on traffic and parking impacts, which are discussed in detail in Chapters 7 and 8 of the EIS. Concerns about the viability of industrial business come in the context of substantial growth and change in land use in the Ballard area in recent years; growth that brings with it pressures of higher density that also affects industrial neighbors. Listening to these concerns, SDOT determined that it was important to understand how project impacts might affect business viability. SDOT requested an assessment of economic considerations (ECONorthwest, 2016) to inform this land use analysis. While transportation and parking related impacts are discussed in this chapter, it is in the context of their potential effects on business viability. The focus of this chapter is on whether the project would cause changes in land use, and whether those changes, if any, would be consistent with the City's policies.

Where impacts are identified, measures to mitigate or minimize these impacts are described. In this evaluation, an alternative is considered to have the potential for significant adverse environmental impacts if it would likely cause the permanent loss of land uses that are priority (such as water-dependent, water-related, and industrial uses) under adopted City policies. Although economic considerations are not an element of the environment required to be evaluated in an EIS under SEPA, City code does require economic issues to be included in an EIS unless eliminated in the scoping process. SDOT chose to include additional analysis of the potential economic impacts of the Missing Link project in the EIS to assist in decision-making, since it was identified as an issue of concern.

4.2 Affected Environment

4.2.1 Study Area

The study area for the land use analysis is the area where construction or operation of the project could impact current and future land uses, including business operations and existing character. The study area is bounded by 32nd Ave NW to the west, NW 56th St/20th Ave NW/Leary Ave NW to the north, 8th Ave NW to the east, and Salmon Bay to the south (Figure 4-1). The study area includes properties on both sides of the street adjacent to each of the Build Alternatives and connector segments, areas providing access for those properties, and properties whose primary access may be affected by a proposed Build Alternative.

The team also considered the greater Ballard area when it was needed to provide context and assess the project's overall compatibility with community character, neighborhood plans, and policies for future growth.

A water-dependent use is a use that cannot exist in a location other than a waterfront, and is dependent on the water because of the intrinsic nature of its operations.

A water-related use is a use or portion of a use not intrinsically dependent on a waterfront location but whose economic viability is dependent on a location in the shoreline district.

These definitions of water-dependent and water-related uses apply only within the shoreline district (SMC 23.60A.944).

4.2.2 Land Uses

Land uses within the study area vary in type, intensity, and their relationship to other nearby uses and amenities (Figure 4-2). Commercial, industrial (including manufacturing), residential, parking, parks and open space, and transportation uses are present, as well as government buildings, a hospital, a training center, and other miscellaneous uses (labeled "other" on Figure 4-2) and vacant or unused parcels (labeled "vacant"). Parking that is accessory to a primary use is designated as the primary use it is associated with; for example, parking accessory to a commercial use is labeled as a commercial use. Stand-alone parking is designated "parking."

Because Ballard is experiencing rapid growth, land uses are dynamic as redevelopment and development occur. Growth pressure continually results in changes to form, type, intensity, and the presence of development in the study area. Parcels that have not maximized development potential, or that are designated as vacant at the time of analysis, may change uses or be developed as growth occurs and new land use preferences are adopted.

Existing uses, architecture, and age of structures contribute to the character of the study area. The southern portion of the study area is the historic center of Ballard where lumber, fishing, and shipbuilding industries developed in the late 1800s, dependent on Salmon Bay to transport raw and finished products. The waterfront industry provided employment opportunities for workers who settled neighborhoods to the north, and NW Market St provided a downtown commercial core (City of Seattle, 2016a). Although most of the activity in the lumber industry has been replaced, many other industrial, manufacturing, and commercial uses remain, particularly along Shilshole Ave NW. Within the shoreline district some of these uses are water-dependent, or support water-dependent uses with repair work or other related services and products.

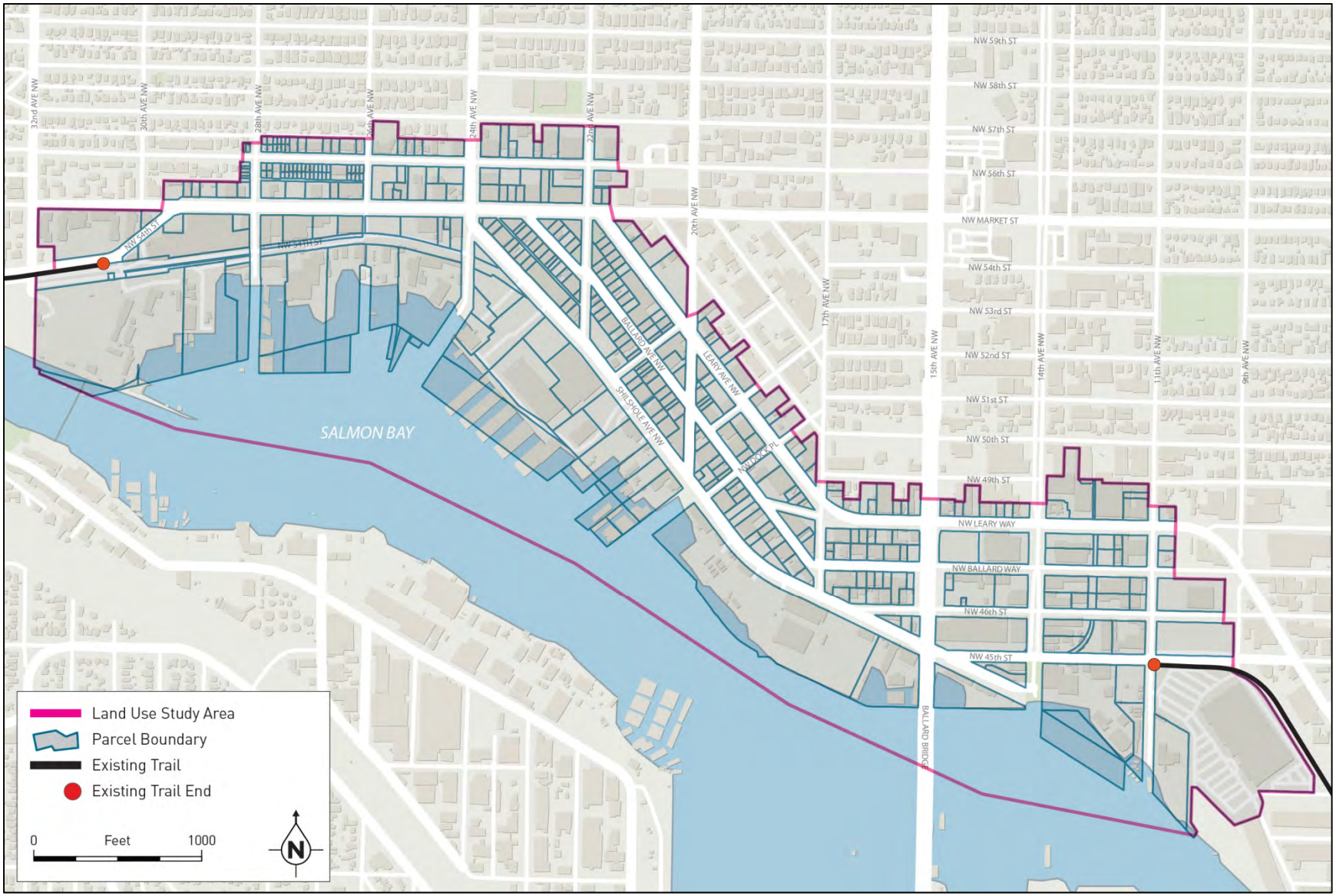


Figure 4-1. Land Use Study Area

Figure 4-2. Land Uses within the Study Area

The Ballard Terminal Railroad or BTR corridor extends from the Ballard Locks to NW 45th St. The BTR corridor is used for freight transport and provides vehicular access to several abutting parcels. Part of the corridor is used as a public parking area near the Ballard Locks. Uses adjacent to the railroad corridor extending east from the Ballard Locks are mostly industrial, along with commercial uses such as the Stimson Industrial Park offices, Salmon Bay Sand and Gravel, Covich Williams fuel dock, and Sagstad and Branchflower Marinas. Storage, parking, and other activities occur on some of the vacant railroad corridor parcels.

One of Ballard's defining features is the Ballard Avenue Landmark District, which has the same boundaries as the Ballard Avenue National Register of Historic Places (NRHP) district and is also known as "Old Ballard," located along Ballard Ave NW from NW Dock Pl to NW Market St (Figure 4-3). Buildings in the landmark district embody the distinctive characteristics of modest commercial architecture from the 1890s through the 1940s (City of Seattle, 2015b; SWCA, 2016). A variety of restaurants, shops, bars, salons, and other businesses, including some industrial and marine-related service and retail businesses, are located on Ballard Ave NW. Many of these uses are housed in historic buildings.

Near the west end of the study area on NW Market St, uses are mostly commercial along the north side of the street and industrial along the south side of the street; examples include storage, cafes, shops, and a lumberyard. Heading east, uses generally transition to mixed-use residential, and then to pedestrian-oriented commercial retail uses (restaurants, shops, bars, boutiques, etc.). Leary Ave NW near NW Market St contains mixed-use residential and commercial uses (cafes, health-related establishments, restaurants, etc.) and transitions to more concentrated industrial/manufacturing uses near the east end of the study area.

The Ballard Locks, Charles S. English, Jr. Botanical Garden, and the Ship Canal are major recreational attractions in the study area. The City also owns and operates a number of local parks and areas designated as shoreline street ends, which provide public shoreline access and views. In addition, special events like the weekly Ballard Farmers Market, the annual weekend-long SeafoodFest, and the Seventeenth of May Festival take place throughout the study area.

Pedestrian activity is relatively heavy along NW Market St and Leary Ave NW near 20th Ave NW, and along Ballard Ave NW, particularly in the Ballard Avenue Landmark District. This is partly attributed to nearby land uses. The area's concentration of commercial uses provides shopping, dining, and entertainment opportunities that can be accessed by foot by nearby residents living in mixed-use, multifamily, and single-family neighborhoods. The commercial opportunities and special events also attract shoppers from outside of the area. Frequent public transit that runs along NW Market St and Leary Ave NW allows visitors to walk to these destinations from transit stops. Parking is available for drivers in paid lots or on the street throughout the study area.

Existing public rights-of-way provide for freight, transportation, and recreational activity throughout the study area. Regular maintenance and improvements, as well as occasional reconfigurations of the right-of-way occur throughout the study area. Although the east and west trail ends are not currently connected, residential and commercial land uses within the study area create origination and destination points for trail users. Public transit usually provides bicycle racks, which promote multimodal trip opportunities to and from the area. In addition, recreational and commuter trail users traveling through the area to surrounding destinations use Shilshole Ave NW, as well as other rights-of-way within the study area, as the direct connection between the east and west trail ends.

Figure 4-3. Shoreline Environments, Critical Areas, and Ballard Avenue Landmark District

Today, the diversity of land uses and activity in Ballard reflect its past, before zoning regulations were established. Over the years, changes in market demand, population, the economy, and other factors have caused individual uses to persist, adapt, grow, relocate, or discontinue operations. Seattle's current zoning and planning policies support the continuation of long-established industrial uses, as a strong employment base integral to Ballard's historic identity, while also promoting needed capacity for residential and commercial growth in established areas in the northern portion of the study area (City of Seattle, 2016a). Industrial uses include manufacturing, warehousing, and marine uses, as well as water-dependent uses within the shoreline district.

Figure 4-4 displays the approximate square footage of land within the study area that is allocated to each major land use category, excluding rights-of-way. Industrial uses compose the greatest portion, approximately 40% of the total land area, with commercial uses composing approximately 33%, and residential uses accounting for about 8% of the total land area within the study area.

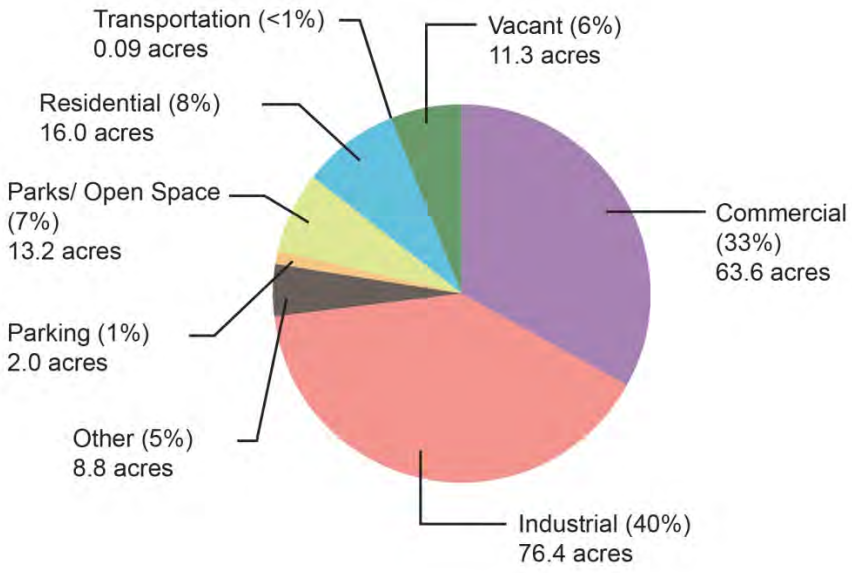


Figure 4-4. Land Area Occupied by Existing Land Uses within the Study Area

4.2.3 Regulatory Context

Land use and development in the study area are governed by the federal, state, regional, and local plans and regulations described in this section. The regulations are intended to ensure compatibility and predictability between existing and future land uses. In addition to the overview provided below, the Land Use Discipline Report (ESA, 2016) and Technical Appendix A: Updates and Errata to the Land Use Discipline Report in this FEIS, describe applicable plans and policies in more detail.

Federal and State Laws and Regulations

The study area is adjacent to Salmon Bay, which is under the jurisdiction of the Coastal Zone Management Act. The Washington State Shoreline Management Act is one of the regulations that meets the state's compliance requirements with the federal Coastal Zone Management Act. The Washington State Growth Management Act (GMA) also governs land use in the study area.

Local and Regional Plans and Regulations

The Puget Sound Regional Council's (PSRC's) VISION 2040 is the applicable regional plan relating to land use in the study area (PSRC, 2008).

The City's Comprehensive Plan, land use codes, and supplemental plans guide how and where development should occur. These guidelines support goals and objectives to manage growth, provide efficient and diverse transportation opportunities, maintain and improve economic development, encourage sustainable urban design, and protect environmental resources.

The DEIS evaluated land uses based on the 2005 Comprehensive Plan (City of Seattle, 2005), which was current at that time. In November 2016, after publication of the DEIS, the City adopted the Seattle 2035 Comprehensive Plan. For the FEIS, the Seattle 2035 Comprehensive Plan was reviewed for the goals and policies applicable to the Missing Link project that would differ from the 2005 Comprehensive Plan, which was last amended in 2015. Technical Appendix A: Updates and Errata to the Land Use Discipline Report in this FEIS includes a table that summarizes the differences between applicable goals and policies in the two Comprehensive Plans. The goals and policies that relate to the Missing Link project are generally either identical or substantially the same between the old and new plans, with a few exceptions. In some cases, the policy numbers have changed or the wording has changed slightly. Because the applicable goals and policies in the new plan are similar to the old plan, the evaluation in and conclusions of the Land Use Discipline Report (ESA, 2016) are still applicable. The analysis and conclusions presented in this FEIS are based on the review of the goals and policies in the new Seattle 2035 Comprehensive Plan.

Additionally, the SDOT Transportation Freight Mobility Strategic Action Plan (SDOT, 2005) was integrated into the Freight Master Plan (SDOT, 2016a).

The following City plans, policies, and regulations apply to the study area:

- City of Seattle 2035 Comprehensive Plan (City of Seattle, 2016b)
    - Urban Village Growth Strategy
    - Crown Hill/Ballard Neighborhood Plan
    - Ballard-Interbay Northend Manufacturing and Industrial Center (BINMIC) Neighborhood Plan
- Seattle Bicycle Master Plan (SDOT, 2014)
- City of Seattle Parks and Recreation 2011 Development Plan (City of Seattle, 2011)
- City of Seattle Climate Action Plan (City of Seattle, 2013)
- City of Seattle Ballard Urban Design and Transportation Framework Final Report (City of Seattle, 2016a)
- Seattle Pedestrian Master Plan (SDOT, 2017)
- Seattle Move Ballard Draft Plan (SDOT, 2016b)

- City of Seattle Freight Master Plan (SDOT, 2016a)
- City of Seattle Municipal Code (SMC) (City of Seattle, 2015a)
    - Land Use Code (SMC Title 23)
        - Zoning (SMC Title 23, Subtitle III)
        - Shoreline Master Program Code (SMC 23.60A)
    - Environmental Protection and Historic Preservation (SMC Title 25)
        - Regulations for Environmentally Critical Areas (SMC 25.09)
        - Ballard Avenue Landmark District (SMC 25.16)

4.2.4 **Zoning**

The City's Land Use Code implements the City's Comprehensive Plan and regulates land use in Seattle. The purpose of the Land Use Code is to allocate land uses in a compatible, efficient pattern with access to services and amenities and without major disruption to natural resources. The Land Use Code classifies land into different zoning designations, creating parameters for the types of allowed uses, as well as bulk and dimensional standards that determine intensity thresholds for allowed uses. The provisions are designed to provide adequate light, air, access, and open space; conserve the natural environment and historic resources; maintain a compatible scale within an area; minimize traffic congestion; and enhance the streetscape and pedestrian environment. As a multi-use facility, the Missing Link would provide transportation opportunities within the public right-of-way and opportunities for recreation in an open space network. Permits and approvals for allowed uses within any zoning designation may include conditions of approval to ensure that uses are compatible with and meet the intent of the Land Use Code.

The location, intensity, and nature of allowed uses on any parcel of land are determined by the parcel's zoning designation. Zoning in Seattle is regulated by SMC Title 23, Subtitle III – Land Use Code. As shown on Figure 4-5, zoning classifications in the study area include industrial, commercial, multifamily, and residential-commercial zones. Additionally, the Land Use Code identifies overlay designations. The P1 pedestrian overlay designation in the study area encourages intense pedestrian interest and activity at the street level.

4.2.5 **Urban Villages**

The Urban Village Element of the 2005 Comprehensive Plan and Urban Village Strategy of the Seattle 2035 Comprehensive Plan are to direct growth and character of the city's neighborhoods. A village designation recognizes the contributions that a particular area makes to the city and provides guidance regarding the intended function, character, intensity, type, and degree of growth anticipated for an area. Urban village designations supplement state and regional growth management plans. They provide tailored guidance for further developing Seattle's established, densely developed, and complex urban neighborhoods.

The definition of urban villages changed in the Seattle 2035 Comprehensive Plan (2016) from the 2005 Comprehensive Plan. The study area includes a portion of a hub urban village, the Ballard Hub Urban Village, one of the three types of urban villages designated in the Seattle 2035 Comprehensive Plan. The study area also includes a portion of a designated manufacturing/industrial center, the Ballard-Interbay

Northend Manufacturing and Industrial Center (BINMIC). The BINMIC covers the southern portion of the study area and areas adjacent to Salmon Bay. The Ballard Hub Urban Village covers the remainder of the study area (Figure 4-6).

Hub urban villages, such as the Ballard Hub Urban Village, are communities that provide a balance of housing and employment, generally at densities lower than those found in urban centers but higher than single-family neighborhoods.

Manufacturing/industrial centers, such as the BINMIC, provide siting opportunities for industrial activity and development, and are an important regional resource. Many non-industrial uses are discouraged or prohibited in industrial areas.

4.2.6 **Shorelines**

The Shoreline Master Program (SMP) implements the Shoreline Goals and Policies of the Comprehensive Plan and includes the regulations codified in SMC 23.60A—Seattle Shoreline Master Program Regulations. The SMP guides and regulates the development of city shorelines in order to protect shoreline ecosystems; encourage water-dependent uses; provide for maximum public use and enjoyment of the shorelines; and preserve, enhance, and increase views of and access to the water. The shoreline district includes Elliott Bay, Lake Washington, Puget Sound, the Ship Canal (which includes Salmon Bay), Lake Union, the Duwamish River, Green Lake, associated wetlands, and all land within 200 feet of these water bodies.

Portions of the study area along Shilshole Ave NW and near NW 54th St are within 200 feet of the Ship Canal (Salmon Bay) (Figure 4-3). All property within the shoreline district is subject both to the standards of the applicable zone and to the requirements imposed by the SMP (as well as requirements imposed by other applicable codes).

The SMP designates “shoreline environments” within the shoreline district. Like zoning designations, each shoreline environment has unique, allowable uses and development standards, based on existing and aspirational uses, character, and function. Of Seattle’s 11 shoreline environments, three are present in the study area: Urban Industrial (UI), Conservancy Management (CM), and Conservancy Navigation (CN). For further discussion, see the Land Use Discipline Report (ESA, 2016). Reconfiguration of the existing right-of-way for the Missing Link would be allowed within the shoreline district under the SMP.

One of the purposes of the SMP is to encourage water-oriented uses within the shoreline district. Priority uses are those designated as water-oriented uses, including water-dependent, water-related, and water-enjoyment uses within the shoreline district. A water-dependent use is a use that cannot exist in a location other than a waterfront location, and is dependent on the water because of the intrinsic nature of its operations. A water-related use is a use or portion of a use not intrinsically dependent on a waterfront location but whose economic viability is dependent on a location in the shoreline district.

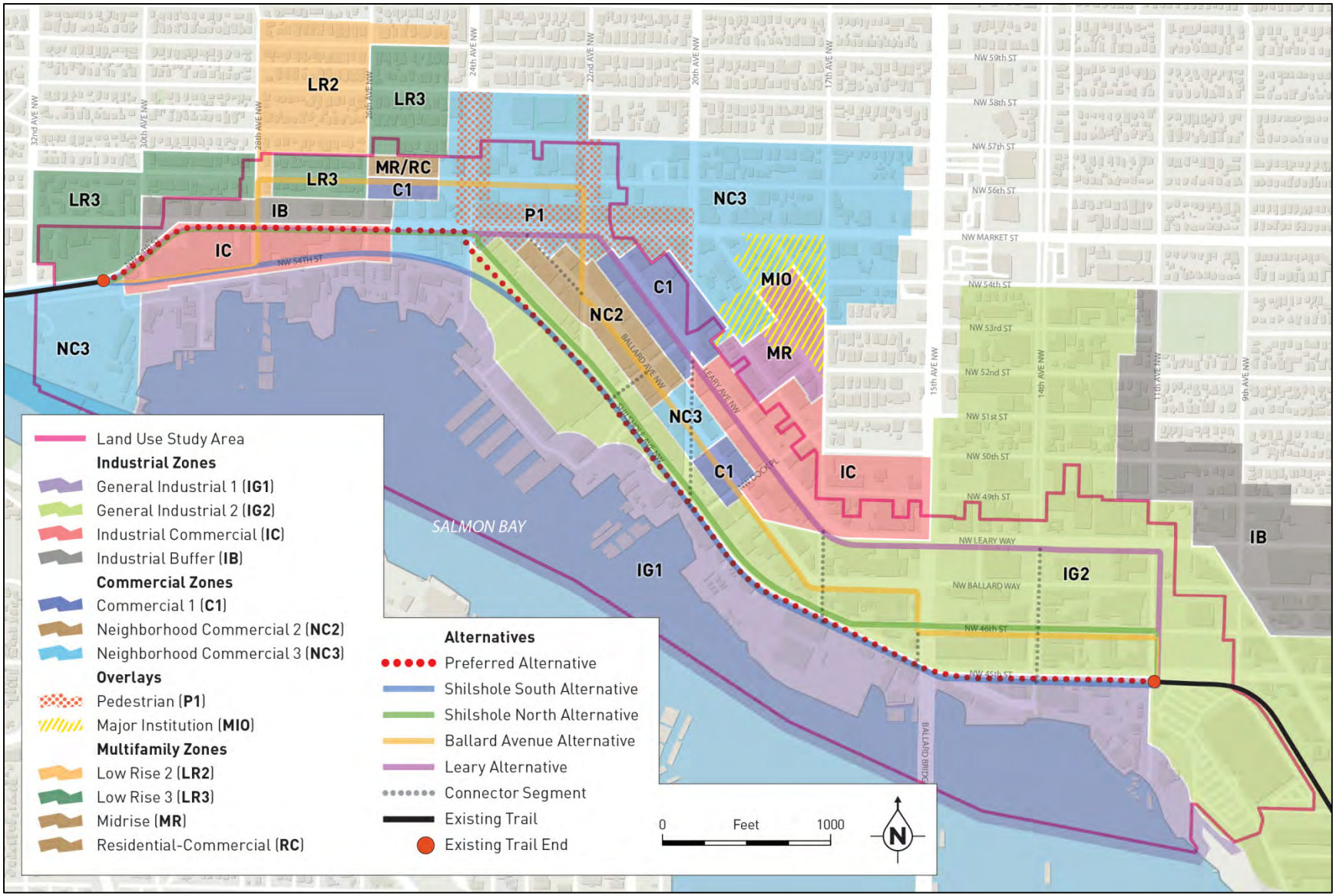


Figure 4-5. Zoning Classification of Parcels in the Study Area

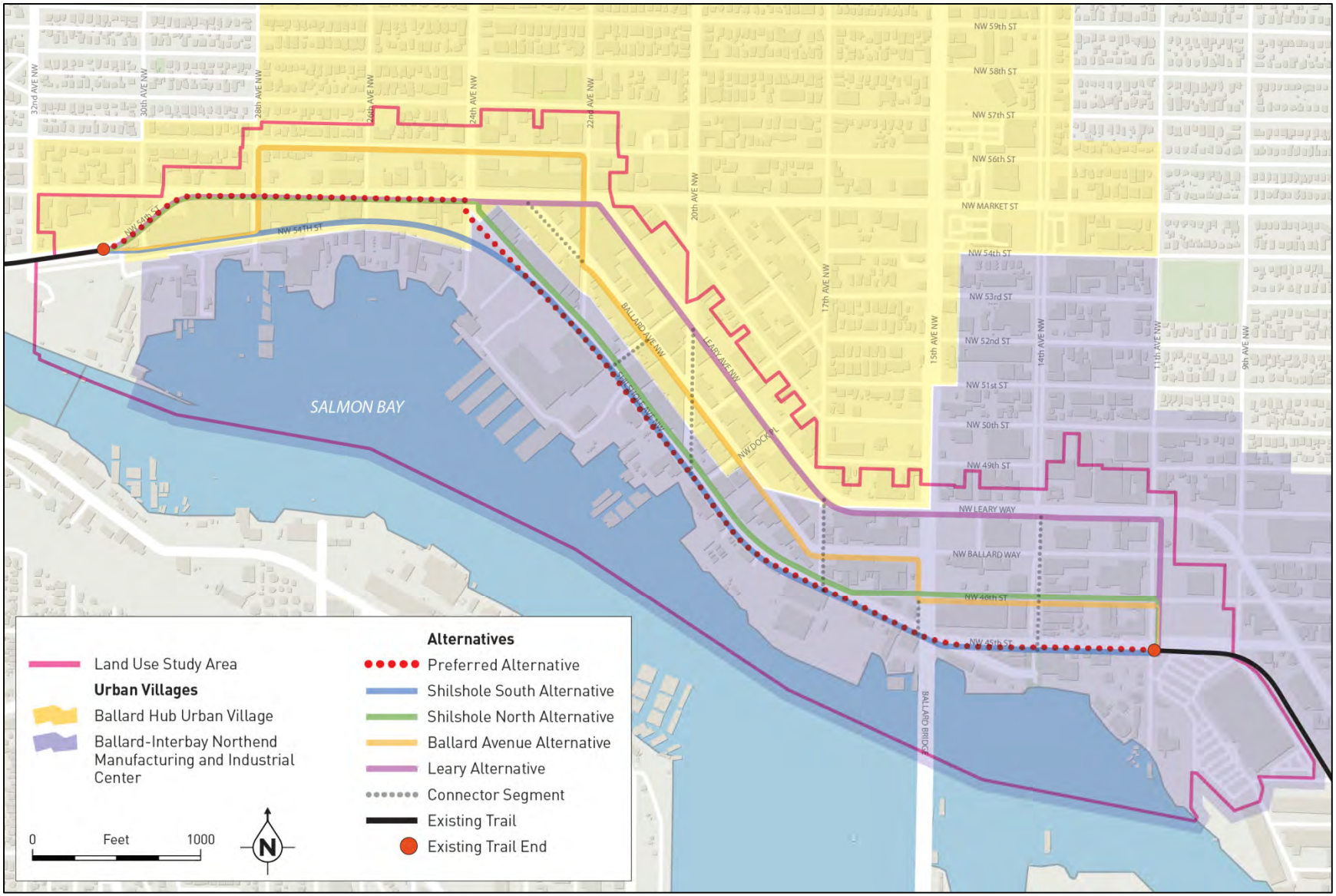


Figure 4-6. Ballard Hub Urban Village and the Ballard-Interbay Northend Manufacturing Industrial Center

4.2.7 Environmental Protection and Historic Preservation

SMC Title 25 regulates designated historic areas and environmentally critical areas. Title 25 protects sensitive environmental features, buildings, landmarks, and architecture that establish the city's unique identity while allowing reasonable development. The regulations promote safe, stable, and compatible development that avoids adverse environmental impacts and potential harm to the designated areas, adjacent property, and the surrounding neighborhood.

Environmentally Critical Areas

An abandoned landfill, liquefaction-prone zones, and fish and wildlife habitat conservation areas are present in the study area (Figure 4-3).

The abandoned landfill is southwest of Shilshole Ave NW, and the land is now used for industrial and office uses. Development within the former landfill area is subject to special engineering and construction management requirements to prevent damage from methane gas buildup, subsidence, and earthquake-induced ground shaking.

The liquefaction-prone zones are located at the southeastern-most corner of the study area. Development in liquefaction-prone areas may require soil engineering studies to determine the physical properties of the surficial soils, especially the thickness of unconsolidated deposits and their liquefaction potential.

Fish and wildlife habitat conservation areas are located near the west trail end and are lands designated and managed to encourage the long-term viability and the proliferation of targeted species. Areas designated by WDFW as priority habitats and species areas are considered to be fish and wildlife habitat conservation areas. Development in fish and wildlife habitat conservation areas that does not encroach within, alter, or increase environmental impacts may be exempt from the critical areas regulations. All other development proposed within fish and wildlife habitat conservation areas or their associated buffers requires an application that complies with SMC Title 25. The project proponent must submit the application to the City and obtain necessary permits and approvals prior to undertaking development.

Ballard Avenue Landmark District

A portion of the study area along Ballard Ave NW lies within the Ballard Avenue Landmark District, an area of historical significance to Ballard and Seattle. The Ballard Avenue Landmark District boundary runs along Ballard Ave NW from NW Dock Pl to the southeast to NW Market St to the northwest (Figure 4-3). All property within the district is subject both to the standards of the applicable zone and regulations concerning the district status. The district designation is intended to preserve, protect, enhance, and perpetuate cultural, social, economic, architectural, and historic heritage. The City has adopted regulations to protect or improve the aesthetic and economic vitality and values of the district; to promote and encourage continued private ownership and use of historic buildings and structures; and to promote the local identity of the area to the extent that these objectives can be reasonably attained. (For more information on the district designation, see Chapter 10, Cultural Resources.)

4.3 Potential Impacts

The land use analysis examined the potential for the project to alter land uses in the study area in a way that would be inconsistent with adopted plans and policies. Transportation, parking, and economic impacts were considered to the extent that they could affect existing land uses (Parametrix, 2017a, 2017b; ECONorthwest, 2016). The consistency of an alternative with adopted policies, plans, and regulations

was also considered. If an alternative could change land use in a way that is inconsistent with policies and plans, this would be a potentially significant adverse impact.

4.3.1 No Build Alternative

Effect on Existing Uses

The No Build Alternative would not alter current land uses. These uses would either remain consistent or continue to adapt and change as determined by population and business growth, market conditions, and regulatory changes.

Consistency with Adopted Plans, Policies, and Codes

The No Build Alternative is inconsistent with regional and local land use plans that emphasize multimodal transportation opportunities and improved connectivity for nonmotorized transportation modes, particularly in areas experiencing rapid growth and development, such as the Ballard Hub Urban Village. Motorized and nonmotorized traffic within the study area is expected to grow between 2015 and 2040 (Parametrix, 2017a). Under the No Build Alternative, nonmotorized users in the study area would continue to travel on available sidewalks and along the street network, which lacks designated bike lanes. Particularly along Shilshole Ave NW, which nonmotorized users often use as a direct link between the two trail ends, the increase in traffic would increase user conflicts and slow freight movement. The No Build Alternative would not mitigate those conflicts through the engineering and design of a designated trail.

The No Build Alternative would be inconsistent with the following policies and plans:

- **City of Seattle Comprehensive Plan**: Goals and policies promote transportation improvements that support walking, strive to direct future development and density to areas conducive to walking and bicycling, and provide increased opportunities to walk and bicycle between urban villages by connecting trails and providing an open space network. Goals also include the facilitation of industrial traffic flow and truck mobility. The No Build Alternative would not improve conditions for pedestrian and bicycle opportunities, and the increased potential for user conflicts would not improve traffic flow or truck mobility. The eastern terminus of the existing trail is located within the BINMIC.

- **Freight Master Plan**: The Freight Master Plan focuses primarily on urban truck movement to support Seattle's increasing demand for the delivery of goods and services in a safe and reliable manner. The vision of the Freight Master Plan is "A vibrant city and thriving economy connecting people and projects within Seattle and to regional and international markets." The vision is supported by six goals addressing: economy, safety, mobility, state of good repair, equity, and the environment. The No Build Alternative would not be consistent with the plan's safety initiative which requires the city to assess conflicts between bicycle and freight mobility to improve safety and the predictable movement of goods and people, nor the plan's strategy to implement improvements that benefit freight mobility.

- **PSRC's VISION 2040**: Transportation investments in regional growth centers and areas with compact, mixed-use development are an integral component of the regional strategy, particularly for nonmotorized uses. Completion of the Missing Link is included as a key project in the Transportation 2040 Update. The No Build Alternative would not be consistent because the Missing Link project would not be built.

- **Seattle Bicycle Master Plan:** The Missing Link is identified as a "catalyst project" whose completion would eliminate a critical network gap and increase user safety. The No Build Alternative would not be consistent because it does not complete the multi-use trail and the network gap would remain.

- **City of Seattle Parks and Recreation 2011 Development Plan**: The plan includes the development of new multi-use trails in accordance with the Bicycle Master Plan, which promotes completion of the Missing Link. The No Build Alternative would not be consistent because it does not complete the Missing Link or develop a new multi-use trail.

4.3.2 Impacts Common to All Build Alternatives

Construction

Construction impacts associated with all of the Build Alternatives include the following:

- Noise generated by construction equipment could disturb business patrons, particularly in commercial areas, or could disturb residential uses.

- Increased traffic from construction crews could delay freight movement for commercial and industrial uses.

- Increased parking needs from construction crews and reduction of available on-street parking could displace or discourage business patrons of retail and entertainment commercial uses and employees for other uses.

- Dust and debris from land-disturbing activities could inhibit pedestrians in pedestrian-oriented commercial centers and other business patrons, employees, and residents.

- Potential partial and temporary sidewalk and road closures could inhibit pedestrians in pedestrian-oriented commercial centers and other business patrons, employees, and residents.

- Roadway congestion could delay freight movement and goods delivery, and frustrate business patrons and residents.

- Temporary changes to driveway widths and locations, and temporary loss of loading zones could disrupt industrial, manufacturing, and commercial uses; could delay or disrupt traffic and access to existing uses near the project footprint; and could delay the movement of goods, although access to all uses within the study area would be maintained.

Noise, traffic, dust and debris, and sidewalk and road closures could result in a temporary loss in patronage for businesses, particularly commercial retail and entertainment that rely on auto and foot traffic. Traffic congestion could delay pick-up and delivery of goods, thus impacting normal business activities. Nonmotorized activity would continue during construction, which would result in user conflicts; however, nonmotorized users would generally use alternative routes to avoid the construction. All construction impacts are expected to be minor and temporary, are not expected to disrupt uses to the extent of being inconsistent with adopted codes, and therefore would not have a significant adverse impact on land uses in the study area.

Operation

Effect on Existing Land Uses

All of the Build Alternatives would connect the existing trail ends, thus providing a dedicated, nonmotorized connection between the surrounding neighborhoods, and connecting trail users to parks and open space, businesses within the study area, and employment opportunities. The project would provide infrastructure improvements such as the new trail, sidewalks, landscaping, and buffers. Improvements would channel most existing BGT users to the new trail and attract new users because the trail would reduce the potential for user conflicts and link to the rest of the BGT. The improvements would also beautify the streetscape and repair sidewalk segments, attracting additional people to the study area. However, some existing sidewalk uses within the right-of-way, including outdoor seating areas, landscaping, and signage, may require modification or relocation as a result of the trail.

The infrastructure improvements could support existing and expanding residential and commercial uses near the trail. Residential and commercial uses could benefit from trail users because new people could be potential residents, customers, and workers (ECONorthwest, 2016). However, the improvements may not support and could even discourage new and expanded industrial uses.

Transportation and parking are important to business activities in the study area. Changes in traffic flow and access can disrupt normal activities and impact the viability of a land use. Freight vehicles require more right-of-way than smaller cars or trucks to conduct business activities, and freight movement is an important economic factor for many businesses. Alterations to the road network associated with all Build Alternatives would facilitate traffic flow at some study area intersections (Parametrix, 2017a), which could encourage ongoing activity of existing uses within the study area. However, all Build Alternatives would likely result in minor delays at some intersections and access points for uses along the alignment.

Elimination of designated loading zones would occur with all of the Build Alternatives, except for the Shilshole South Alternative. Elimination of loading zones could negatively impact business activities, particularly for auto-oriented commercial businesses. Additional people in the study area could also delay freight transport by crossing the roads and driveways used by freight vehicles. Because of the minor disruptions to access and loading for some of these uses within the BINMIC, a minor adverse impact could occur. The impact would not be significant and could be minimized (but not completely eliminated) through the design measures described in Section 1.7.1, Roadway Design and Safety Considerations, and the Transportation Discipline Report (Parametrix, 2017a).

All Build Alternatives would also eliminate parking spaces. The study area has the capacity to absorb parking displaced by each of the Build Alternatives. Additionally, trail completion could offset some loss of parking by encouraging people to travel using nonmotorized means. See Chapter 8, Parking, and the Parking Discipline Report (Parametrix, 2017b) for a discussion of parking impacts.

Businesses would likely adapt to the minor delays, loss of parking, and changes to loading areas along with other changing conditions. These adaptations could increase operating costs, which could place incremental economic pressure on some businesses (ECONorthwest, 2016). However, none of the Build Alternatives are expected to displace existing uses or cause changes that would result in the loss of a business. Impacts are not expected to affect business operating costs to the extent that they would be unable to operate.

Consistency with Adopted Plans, Policies, and Codes

The GMA and several planning documents promote the development of infrastructure for nonmotorized and multimodal transportation opportunities, particularly where the infrastructure connects population centers and existing infrastructure segments (e.g., PSRC's VISION 2040 and Transportation 2040, City of Seattle Climate Action Plan, City of Seattle Parks and Recreation 2011 Development Plan, Seattle Bicycle Master Plan, and Pedestrian Master Plan). These guidance documents influence the development of local codes that regulate current land use and future development, and inform regulators' decision-making process when land use permits are submitted for approval. A project adheres to adopted plans, policies, and codes so that current development is consistent with local and regional long-term plans for land use and so that as land is developed, user conflicts are minimized. If a project does not adhere to adopted plans and policies, user conflicts could negatively affect community health, safety, and welfare.

In general, the project would be consistent with most policies. The BGT is used for both commuting and recreation. State, regional, and local plans and policies generally promote the development of infrastructure for nonmotorized and multimodal transportation opportunities, particularly to connect population centers and existing infrastructure segments. Completion of the Missing Link is specifically included in some plans as a priority improvement. Build Alternatives that minimize trail length in the BINMIC and maximize trail length in the Ballard Hub Urban Village are the most consistent with adopted policies, as described below.

Seattle 2035 Comprehensive Plan

The Urban Village Element, Land Use Element, and Transportation Element from the 2005 Comprehensive Plan (last amended 2015), and the Urban Village Growth Strategy, Land Use, and Transportation sections of the Seattle 2035 Comprehensive Plan generally promote transportation improvements that support walking and bicycling; the provision, expansion, and enhancement of parks and open space; and provision of amenities to support the interests of a range of uses and people. Completion of the Missing Link is specifically included in some parts of both Comprehensive Plans as a priority improvement in order to provide alternatives to motorized transportation, to connect neighborhoods, and for the positive health impacts that trail recreation could provide. The Build Alternatives would be consistent with these aspects of the current Seattle 2035 Comprehensive Plan (City of Seattle, 2016b).

All of the Build Alternatives would serve the Ballard Hub Urban Village. Build Alternatives that locate greater trail length in the Ballard Hub Urban Village would be more consistent with adopted policies that support activated streetscapes in a pedestrian-oriented environment. For details about the applicable adopted policies, see the Land Use Discipline Report (ESA, 2016) and the Comprehensive Plan Crosswalk Table (Appendix F) in Technical Appendix A: Updates and Errata to the Land Use Discipline Report in this FEIS.

Comprehensive Plan policies for the BINMIC support commuting to work to and through the BINMIC by bicycle and walking, but policies also direct that the trail's design should consider the operational requirements of adjacent property owners and users (as determined by the City), the safety of trail users, the operational requirements of industrial users, and that through trails should be located away from industrial areas. Policies discourage actions that could delay freight movement or interfere with industrial uses. Within the BINMIC, water-dependent and industrial uses are intended to be the highest priority use. All of the Build Alternatives require some portion of the trail to be within the BINMIC because the eastern end of the existing trail is in the BINMIC. As such, all Build Alternatives could impact existing industrial uses in the BINMIC. While inconsistencies with the BINMIC policies cannot be avoided, impacts can be mitigated by reducing the types of conflicts that the policy seeks to avoid.

The amount of trail that would be located in the BINMIC varies by alternative (Table 4-1). These and other differences among the alternatives are described separately in Sections 4.3.3 through 4.3.7.

Table 4-1. Summary of Urban Villages and Land Uses Affected by Build Alternatives[1]

Build Alternative	*Length of Trail in BINMIC (approx. linear feet)*	*Length of Trail in Ballard Hub Urban Village (approx. linear feet)*	*Adjacent Land in Industrial Uses (acres and %)*	*Number of Adjacent Water-dependent and/or Water-related Uses[2]*
Preferred	4,545	2,513	31 acres (44%)	27
Shilshole South	4,455	1,983	50 acres (54%)	42
Shilshole North	4,512	2,135	13 acres (41%)	7
Ballard Avenue	2,814	4,704	15 acres (38%)	9
Leary	2,308	4,466	7.4 acres (21%)	3

[1] Includes parcels abutting the alternative or only gaining access via abutting parcels. See Appendices A–D in the DEIS Technical Appendix A, and the Updates and Errata to Technical Appendix A for parcels included for all the Build Alternatives.
[2] Water-dependent and water-related uses are only within the shoreline district.

There could be minor to moderate impacts to priority uses in the BINMIC under any Build Alternative, primarily due to impacts on access, egress, and loading. These impacts are described in greater detail in the Transportation Discipline Report (Parametrix, 2017a). However, the impacts would be localized to particular businesses and, while potentially reducing business activity at certain times, are not expected to cause any business to fail. Therefore, the vitality of the BINMIC would not be significantly adversely impacted under any Build Alternative. See the Economic Considerations Report for details (ECONorthwest, 2016).

All Build Alternatives would reconfigure the existing right-of-way to accommodate the project. The Missing Link would also use a portion of the BTR corridor that overlays street right-of-way, typically at crossings, but in some cases the trail would also parallel the tracks. The Missing Link would provide both a recreation and transportation function, serving nonmotorized commuters from nonindustrial and industrial area businesses.

Seattle Freight Master Plan

The Seattle Freight Master Plan strives to improve the movement of goods throughout the city, but particularly to and within industrial and manufacturing centers. It focuses primarily on urban truck movement, but recognizes that rail, marine, air freight, and pipeline are also important means of transport. The six goals of the Freight Master Plan are: economy, safety, mobility, state of good repair, equity, and environment.

All Build Alternatives would make traffic flow, roadway, and rail improvements that support the plan's goals and policies for efficient traffic flow and safe movement of goods. However, some designated and undesignated loading zones would be altered and removed under all of the Build Alternatives, affecting the delivery and collection of goods that are integral to many industrial and commercial uses. In addition, all of the Build Alternatives would cause minor increases in delays at driveways, which could negatively impact the delivery and collection of goods. The magnitude of impacts to freight mobility would vary

among the alternatives, but none of the Build Alternatives would be inconsistent with the Freight Master Plan. See the Transportation Discipline Report for details (Parametrix, 2017a).

All of the Build Alternatives have been designed to provide predictability and would improve overall safety compared to the No Build Alternative. However, there is potential for some new impacts depending on final design, including sight distances at driveways and conflicts between drivers and trail design features such as planter strips. Measures to avoid and minimize these impacts are described in Section 1.7.1, Roadway Design and Safety Considerations, and the Transportation Discipline Report (Parametrix, 2017a).

City of Seattle Codes: Zoning, Shoreline, Critical Areas, and Historic Preservation

The Missing Link project would be allowed in all zoning designations and the shoreline district within the study area. The Build Alternatives would be designed in compliance with critical areas regulations and would be subject to approval by the Ballard Avenue Landmark District Board for compliance with the Ballard Avenue Landmark District requirements, where applicable. The Build Alternatives may make the area more attractive to development; however, any new development would be required to be consistent with uses allowed in each zone.

4.3.3 **Preferred Alternative**

Construction

In addition to the construction impacts described in Section 4.3.2, Impacts Common to All Build Alternatives, the Preferred Alternative could affect land within 200 feet of the shoreline. Small portions of the Preferred Alternative are within the UI shoreline environment (see Figure 4-3). As described in other chapters of this FEIS, the project would include BMPs to promote consistency with these requirements. The project would comply with applicable critical areas and shoreline regulations.

Operation

Effect on Existing Uses

In the BINMIC, industrial and water-dependent uses are priority uses. Land uses abutting or gaining access along the Preferred Alternative are approximately 44% industrial, 31% commercial, 18% parks and open space (the Ballard Locks and Charles S. English, Jr. Botanical Garden), and 4% vacant, with other uses composing about 3% of the total (see Figures 4-2 and 4-7). The percent of industrial and commercial land uses along the Preferred Alternative is similar to that of the study area (compare Figures 4-4 and 4-7). The parcels along the Preferred Alternative include about 31 acres of land in industrial use.

Of the 46 total parcels abutting or gaining access along the Preferred Alternative, 16 are water-dependent and 11 are water-related (see Table 4-1). Water-dependent and water-related uses combined occupy the highest concentration of land by area (85%) along the Preferred Alternative. These water-dependent and water-related uses within the shoreline district are industrial, commercial, other, or parks and open space. The parks and open space parcels are the 13-acre Ballard Locks and Charles S. English, Jr. Botanical Garden and are included in all Build Alternatives. The Preferred Alternative has fewer water-dependent and water-related uses than the Shilshole South Alternative, but more than the other Build Alternatives for both types of uses. The areas where these uses can be located are limited because their viability depends on their proximity to water.

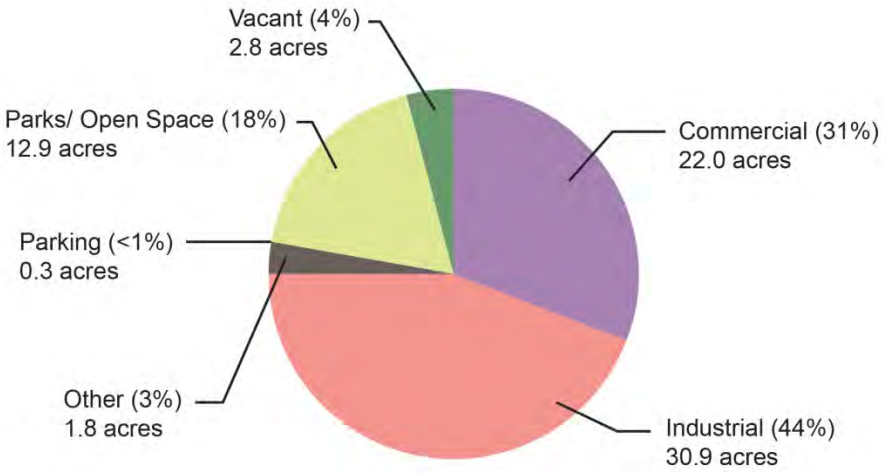


Figure 4-7. Existing Land Uses along the Preferred Alternative

Industrial uses within the study area rely on freight mobility. Freight vehicles tend to occupy more right-of-way than smaller cars or trucks to conduct business activities, which could conflict with the multi-use trail. Changes in traffic flow and access can disrupt normal activities and impact the viability of a land use. Roadway improvements included in the Preferred Alternative would result in a similar (or better) level of service at all intersections, except one, as compared to the No Build Alternative (Parametrix, 2017a). The Preferred Alternative would cross about 39 driveways and loading zone spaces (Parametrix, 2017a). Where the trail intersects access locations, vehicles would need to stop and check for pedestrians and bicyclists before advancing. This impact would likely occur for only short periods (up to an 11-second delay over the No Build Alternative), mostly during commute times, and would not be significant. See the Transportation Discipline Report for details (Parametrix, 2017a). Some drivers would view this as an inconvenience, and it could add to operating costs for some businesses, particularly those with higher volumes of vehicle trips crossing the trail; see the Economic Considerations Report (ECONorthwest, 2016). While these transportation impacts could add to the operational costs, they would not result in changes to land uses.

With the Preferred Alternative, there would be a net reduction of up to four loading zone spaces. Generally, the City prioritizes the retention of loading zone spaces and would work with adjacent businesses to retain or replace loading zones as needed; thus, not all four would necessarily be lost. The Preferred Alternative could also potentially remove some informal loading areas that are within the City right-of-way. However, it is not possible to quantify these areas because they are unpermitted and the City does not recognize them as loading zones (see Chapter 8, Parking, and the Parking Discipline Report [Parametrix, 2017b]). Several commercial and industrial uses have high truck loading, unloading, and delivery activity at driveway locations relative to other uses. Because uses are highly industrial along this alignment, the loss of loading zone spaces and delays during loading and unloading activities could negatively impact industrial uses. Some loading activities that currently occur within the City right-of-way would need to be relocated or the business would need to otherwise adapt because vehicles would not be allowed to block the trail while loading and unloading. Required adjustments and delays could increase costs for businesses, but are not expected to cause significant impacts because businesses would likely adjust their practices around these areas (ECONorthwest, 2016).

The Preferred Alternative would remove 344 parking spaces, a combination of on-street (paid and non-paid) and off-street spaces (Parametrix, 2017b). This number includes unregulated parking that is often double- and sometimes triple-parked, so this number is conservatively high. Removal of these parking spaces would impact the overall parking availability for businesses in the area, the weekly Ballard Farmers Market, and other special events. Employees of businesses along the alignment largely use the spaces for parking, and completion of the trail would require employees to use other parking areas or commute by transit or nonmotorized means. This could result in inconvenience and increased costs for some businesses and employees. It would contribute to a trend of increased congestion in the area that may deter some customers who may choose to patronize businesses with available parking. See Chapter 8, Parking, and the Parking Discipline Report (Parametrix, 2017b).

Many nonmotorized users currently travel on Shilshole Ave NW and NW 45th St east of 24th Ave NW to connect to the east trail end because this is generally the shortest, flattest, and fastest route. For all of the Build Alternatives, it is assumed that nonmotorized users (particularly bicycle traffic) would shift to the trail corridor. Nonmotorized users would also continue to use other roadways in the study area depending on their destination (Parametrix, 2017a). Industrial vehicles (such as fork lifts) and heavy-duty commercial trucks are common along this alignment. Conflicts between vehicles and trail users along this alignment could cause additional delays for freight, with associated increased costs as described above.

While additional delays in access and freight movement may occur, the trail would not prohibit access to any properties, and impacts from the trail would not be significant. Increasing delays in access, however, could contribute to increased operational costs for some businesses (ECONorthwest, 2016).

Consistency with Adopted Plans, Policies, and Codes

The Preferred Alternative is consistent with adopted plans and policies, except for the BINMIC policies in the Comprehensive Plan that relate to locating the trail within the BINMIC.

City of Seattle Comprehensive Plan and Freight Master Plan

Approximately 4,545 linear feet of the Preferred Alternative lies within the BINMIC, representing about 52% of the total 8,768 linear feet for this alternative (Table 4-1). The Preferred, Shilshole South, and Shilshole North Alternatives would have similar lengths of trail in the BINMIC. All three of these alternatives would have more trail within the BINMIC than the Ballard Avenue and Leary Alternatives; however, this impact is not significant because it would not change land uses within the study area.

Of the 46 total uses abutting or gaining access along the Preferred Alternative, 16 are water-dependent and 11 are water-related (see Table 4-1). One of the BINMIC policies in the Comprehensive Plan calls for the highest priority to be placed on water-dependent and industrial uses. The Preferred Alternative could cause intermittent disruptions to driveway operations for these types of uses, an adverse impact that could be minimized (but not completely eliminated) through the design measures described in Section 1.7.1, Roadway Design and Safety Considerations, and the Transportation Discipline Report (Parametrix, 2017a).

The Comprehensive Plan contains goals and policies to improve industrial traffic flow to and through the BINMIC, facilitate truck mobility, and enhance truck connections. The Preferred Alternative could reduce the level of service at two intersections, but freight mobility would be maintained or improve at other intersections. While this alternative could have minor impacts to truck mobility, it would include trail design measures that assist truck mobility, thus improving traffic flow and connections in that portion of the study area, and continuing to support industrial land uses. See Section 1.7.1, Roadway Design and

Safety Considerations; Chapter 7, Transportation; and the Transportation Disciple Report (Parametrix, 2017a).

While this alternative could have minor impacts to truck mobility, it would reestablish NW 45th St as a two-way street open to trucks, thus improving traffic flow and connections in that portion of the study area, and continuing to support industrial land uses. A new signal at 17th Ave NW and Shilshole Ave NW would improve traffic flow, which would benefit both freight and non-freight traffic (Parametrix, 2017a).

By increasing access delays for vehicles, the portion of the Preferred Alternative that runs along Shilshole Ave NW could cause minor impacts to water-dependent and industrial uses, which are priority uses in the BINMIC policies. None of these impacts are considered significant because they would not cause a permanent loss of a priority land use (ECONorthwest, 2016).

City of Seattle Codes: Zoning, Shoreline, Critical Areas, and Historic Preservation

Land adjacent to the Preferred Alternative is mostly zoned to accommodate medium to heavy industrial uses as well as some neighborhood commercial (Figure 4-5). The neighborhood commercial zone supports pedestrian-oriented uses. Trails, such as the Missing Link, would be allowed in all zones. A nominal segment of the Preferred Alternative at the intersection of 24th Ave NW and NW Market St is within the pedestrian overlay, which encourages pedestrians in the downtown Ballard area. The Preferred Alternative would provide pedestrian and nonmotorized access nearby, which would be generally consistent with the goal to encourage a pedestrian-oriented streetscape.

A small portion of the Preferred Alternative is within the UI shoreline environment (Figure 4-3). The Missing Link would be permitted in this shoreline environment and would be required to comply with all applicable shoreline regulations. An abandoned landfill and a liquefaction-prone zone are near the Preferred Alternative, and fish and wildlife habitat conservation areas are within the project footprint near the Ballard Locks. Development in this area would comply with critical areas regulations.

The Preferred Alternative lies outside of the Ballard Avenue Landmark District, and would therefore not be required to comply with development requirements for the district.

4.3.4 Shilshole South Alternative

Construction

Construction impacts that could occur are described in Section 4.3.2, Impacts Common to All Build Alternatives. Similar to the Preferred Alternative, small portions of the Shilshole South Alternative are within the UI shoreline environment (see Figure 4-3). As described in other chapters of this FEIS, the project would include BMPs to promote consistency with these requirements. The project would comply with applicable critical areas and shoreline regulations.

Operation

Effect on Existing Uses

In the BINMIC, industrial and water-dependent uses are the highest priority uses. Land uses abutting or gaining access along the Shilshole South Alternative are approximately 54% industrial, 26% commercial, 14% parks and open space (the Ballard Locks and Charles S. English, Jr. Botanical Garden), and 3% vacant, with other uses composing about 2% of the total (see Figures 4-2 and 4-8). The abutting parcels for this alternative include about 50 acres of land in industrial use, the most of any Build Alternative.

Land uses abutting or gaining access along the Shilshole South Alternative are more industrial compared to the overall study area (compare Figures 4-4 and 4-8).

Of the 58 total uses abutting or gaining access along the Shilshole South Alternative, 29 are water-dependent and 13 are water-related (see Table 4-1). These water-dependent and water-related uses include industrial, commercial, parks and open space, and other uses. The parks and open space parcels are the 13-acre Ballard Locks and Charles S. English, Jr. Botanical Garden and are abutting all Build Alternatives. This alternative has the highest number of water-dependent and water-related uses of any Build Alternative. Water-dependent and water-related uses combined have the largest area of land (89%) along the Shilshole South Alternative. The areas where these uses can be located are limited because their viability depends on their proximity to water.

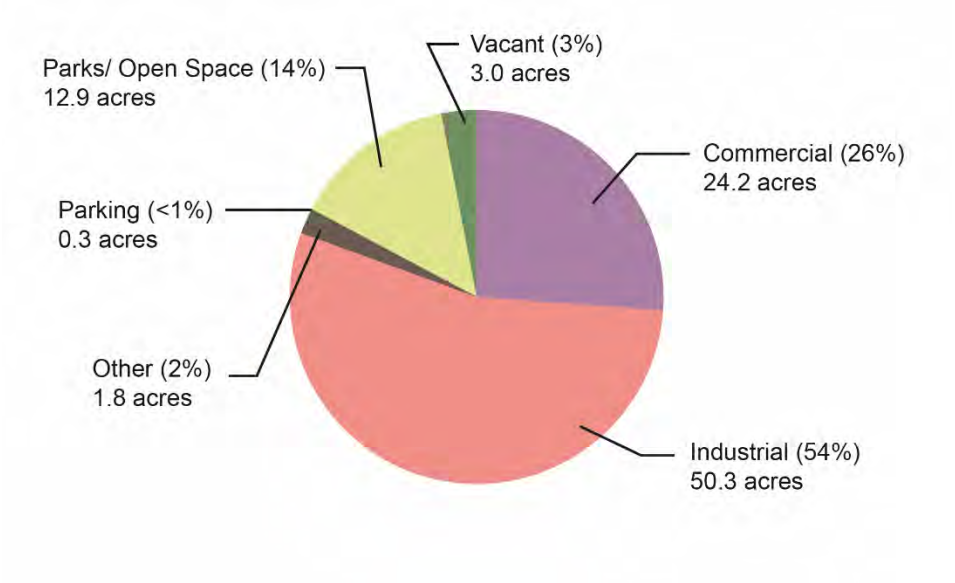


Figure 4-8. Existing Land Uses along the Shilshole South Alternative

Industrial uses in the study area rely on freight mobility. Roadway improvements included in the Shilshole South Alternative would result in similar (or better) levels of service at all intersections, except one, as compared to the No Build Alternative (Parametrix, 2017a). This alternative would cross about 37 driveways and loading zone spaces. Where the trail intersects access locations, vehicles would need to stop and check for pedestrians and bicyclists before advancing, resulting in minor delays to business activities. This impact would likely occur for only short periods (up to 11 seconds more than the No Build Alternative), mostly during commute times, and would not be significant. See the Transportation Discipline Report for details (Parametrix, 2017a). Some drivers would view this as an inconvenience, and it could add to operating costs for some businesses. While the impacts would not result in changes to land uses, they could add to the operational costs for some businesses, particularly those with higher volumes of vehicle trips crossing the trail; see the Economic Considerations Report (ECONorthwest, 2016).

The Shilshole South Alternative is the only Build Alternative where no formally designated loading zone spaces would be removed. It could potentially remove some informal loading areas that are within the City right-of-way. However, it is not possible to quantify these areas because they are generally unpermitted and the City does not recognize them as loading zones (see Chapter 8, Parking, and the Parking Discipline Report [Parametrix, 2017b]). Several commercial and industrial uses have high truck loading, unloading, and delivery activity at driveway locations relative to other uses. Because uses are highly industrial along this alignment, delays during loading and unloading could negatively impact

industrial uses. Some loading activities that currently occur within the City right-of-way would need to be relocated, or the business would need to otherwise adapt because vehicles would not be allowed to block the trail while loading and unloading. Required adjustments and delays could increase costs for businesses, but are not expected to cause significant impacts because businesses would likely adjust their practices around these areas (ECONorthwest, 2016).

The Shilshole South Alternative would remove about 279 parking spaces (Parametrix, 2017b). This number includes unregulated parking that is often double- and sometimes triple-parked, so this number is conservatively high. Removal of these parking spaces would impact the overall parking availability for businesses in the area, the weekly Ballard Farmers Market, and other special events. Employees of businesses along the alignment largely use the spaces for parking, and completion of the trail would require employees to use other parking areas or commute by transit or nonmotorized means. This could result in inconvenience and increased costs for some businesses and employees. It would contribute to a trend of increased congestion in the area that may deter some customers, who may choose to patronize businesses in locations with available parking (ECONorthwest, 2016).

Many nonmotorized users currently travel on the segment of the Shilshole South Alternative east of 24th Ave NW to connect to the east trail end because this is generally the shortest, flattest, and fastest route. The Shilshole South Alternative would channel more recreational users, in addition to commuters, through the manufacturing and industrial area. This would be most noticeable in the area between the Ballard Locks and 24th Ave NW along the unimproved NW 54th St right-of-way, which currently has few nonmotorized users. This increase in nonmotorized users would likely increase the number of user conflicts with vehicles accessing their businesses, resulting in potential delays that could cause inconvenience and/or additional costs for businesses along this section of the route. These additional delays and associated costs are not expected to result in the businesses closing (ECONorthwest, 2016).

While additional delays in access and freight movement may occur, the trail would not prohibit access to any properties, and impacts from the trail would not be significant. Increasing delays in access, however, could contribute to increased operational costs for some businesses (ECONorthwest, 2016).

Consistency with Adopted Plans, Policies, and Codes

The Shilshole South Alternative is consistent with adopted plans and policies, except for the BINMIC policies in the Comprehensive Plan that relate to locating the trail within the BINMIC.

City of Seattle Comprehensive Plan and Freight Master Plan

Approximately 4,455 linear feet of the Shilshole South Alternative lies within the BINMIC, representing about 69% of the total 6,438 linear feet for this alternative (Table 4-1). The Preferred, Shilshole South, and Shilshole North Alternatives would have similar lengths of trail in the BINMIC. All three of these alternatives would have more trail within the BINMIC than the Ballard Avenue and Leary Alternatives. The Shilshole South Alternative would abut the largest number of water-related and water-dependent uses of the Build Alternatives (Table 4-1).

The Shilshole South Alternative could cause minor disruptions to driveway operations for these types of uses. Disruption could be minimized through the design measures described in Section 1.7.1, Roadway Design and Safety Considerations, and the Transportation Discipline Report (Parametrix, 2017a).

The Comprehensive Plan contains goals and policies to improve industrial traffic flow to and through the BINMIC, facilitate truck mobility, and enhance truck connections. The Shilshole South Alternative could reduce the level of service at one intersection, but would maintain (or improve) traffic flow at others.

Traffic improvements along NW 45th St and the signal at 17th Ave NW would be the same as the Preferred Alternative.

By increasing access delays for freight vehicles in the BINMIC, the Shilshole South Alternative could cause minor impacts to water-dependent and industrial uses, which are specified as priority uses in the BINMIC policies. None of these impacts are considered significant because they would not cause a permanent loss of a priority land use (ECONorthwest, 2016).

City of Seattle Codes: Zoning, Shoreline, Critical Areas, and Historic Preservation

Land adjacent to the Shilshole South Alternative is mostly zoned to accommodate medium to heavy industrial uses, with some commercial. The Missing Link would be allowed in all zones. Unlike the other Build Alternatives, the Shilshole South Alternative is completely outside of the pedestrian overlay. While not specifically consistent with the goal to encourage a pedestrian-oriented streetscape within the downtown Ballard area, it is generally consistent in that it would provide pedestrian and nonmotorized access nearby.

A portion of the Shilshole South Alternative is within the UI shoreline environment (Figure 4-3). The Missing Link would be permitted in this shoreline environment, and it would be required to comply with all applicable shoreline regulations.

An abandoned landfill and a liquefaction-prone zone are adjacent to the Shilshole South Alternative, and fish and wildlife habitat conservation areas are within the project footprint near the Ballard Locks. Development in this area would comply with critical areas regulations.

The Shilshole South Alternative lies outside of the Ballard Avenue Landmark District, and would therefore not be required to comply with development requirements for the district.

4.3.5 Shilshole North Alternative

Construction

Construction impacts that could occur are described in Section 4.3.2, Impacts Common to All Build Alternatives. In addition, although less than the Preferred and Shilshole South Alternatives, small portions of the Shilshole North Alternative are within the UI shoreline environment (see Figure 4-3). As described in other chapters of this FEIS, the project would include BMPs to promote consistency with these requirements. The project would comply with applicable critical areas and shoreline regulations.

Operation

Effect on Existing Uses

Industrial and water-dependent uses are priority uses in the BINMIC. Land uses abutting the Shilshole North Alternative are approximately 41% industrial, 39% parks and open space (the Ballard Locks and Charles S. English, Jr. Botanical Garden), 15% commercial, 3% parking, 2% vacant, and less than 1% residential and other uses (see Figures 4-2 and 4-9). All uses along this alignment take access directly from the street frontage.

The mix of land uses abutting the Shilshole North Alternative has a similar percentage of industrial, more parks and open space, less commercial, and less residential compared to the overall study area (compare Figures 4-4 and 4-9).

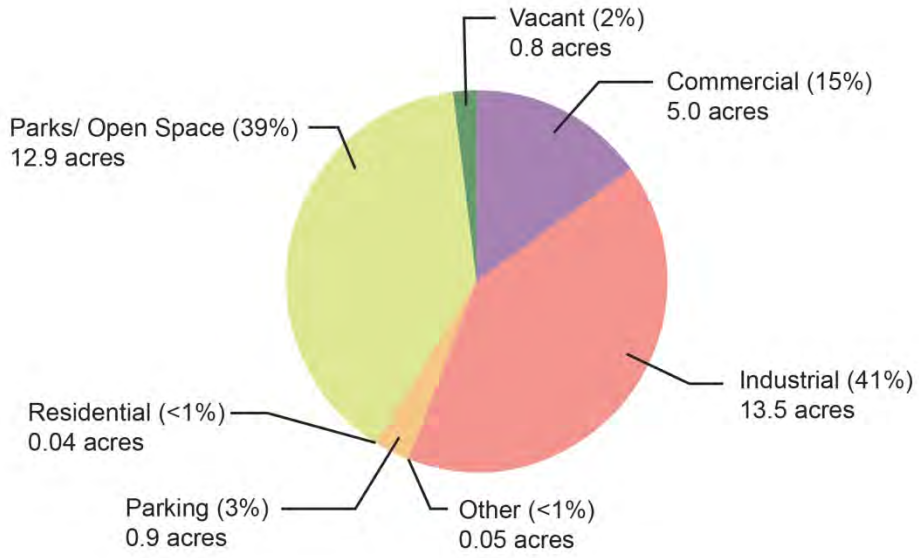


Figure 4-9. Existing Land Uses along the Shilshole North Alternative

Of the 64 total uses abutting this alternative, two uses are water-dependent and 5 are water-related uses (see Table 4-1). The water-dependent uses are the 13-acre Ballard Locks and Charles S. English, Jr. Botanical Garden, which abuts all of the Build Alternatives. This alternative has fewer water-dependent uses than the Preferred, Shilshole South, and Ballard Avenue Alternatives, and the same number of water-dependent uses as the Leary Alternative. This alternative has fewer water-related uses than the Preferred and Shilshole South Alternatives, the same number as the Ballard Avenue Alternative, and more than the Leary Alternative. Water-dependent and water-related uses are about 50% of the land by area along the Shilshole North Alternative.

Changes in traffic flow and access can disrupt normal activities and impact the viability of a land use. Roadway improvements included in the Shilshole North Alternative would result in a decrease in the level of service at four intersections but would maintain (or improve) the level of service at the others relative to the No Build Alternative (Parametrix, 2017a).

The Shilshole North Alternative would cross approximately 54 loading zones and driveways. This alternative would remove the highest number of designated loading zone spaces (approximately 24). It is possible that these spaces could remain by shifting them to other locations along existing block faces, to the other side of a street, or to an adjacent block. Generally, the City prioritizes the retention of loading zone spaces and would work with adjacent businesses to retain or replace loading zones as needed. Thus, not all 24 would necessarily be lost (Parametrix, 2017b).

Because industrial and commercial uses typically have high loading, unloading, and delivery activity at driveways, the removal of loading zones and delays at access points could impact business activities. However, delays at driveways are expected to occur for short periods (up to 10 seconds of delay more than the No Build Alternative), mostly during commute periods, and are therefore not expected to substantially affect business operations (Parametrix, 2017a). Businesses with driveways crossing the trail would need to adjust their operations so that the trail is not blocked by vehicles except during active ingress and egress. Some drivers would view this as an inconvenience, and it could add to operating costs for some businesses. While the impacts would not result in a change land uses, they could add to the operational costs for some businesses, particularly those with higher volumes of vehicle trips crossing the trail; see the Economic Considerations Report (ECONorthwest, 2016).

The Shilshole North Alternative could remove about 206 parking spaces (Parametrix, 2017b). The removal of these parking spaces could impact parking availability for businesses and special events. Generally, industrial and commercial uses have high truck loading, unloading, and delivery activity relative to other uses. Removal of these spaces could have negative impacts to business activity but is not expected to result in a significant impact to land uses along this alignment because other travel modes and off-street parking options are available. Loading and unloading may need to be relocated for some businesses, possibly requiring spaces to be located across the street or on side streets. See Chapter 8, Parking, and the Parking Discipline Report (Parametrix, 2017b).

Many nonmotorized users currently use the segment of the Shilshole North Alternative between 24th Ave NW and 17th Ave NW because this is generally the shortest, flattest, and fastest route. For all of the Build Alternatives, it is assumed that nonmotorized users (particularly bicycle traffic) would shift to the trail corridor. Nonmotorized users would also continue to use other roadways in the study area depending on their destination (Parametrix, 2017a).

Consistency with Adopted Plans, Policies, and Codes

Similar to the Preferred and Shilshole South Alternatives, the Shilshole North Alternative is consistent with adopted plans and policies, except for the BINMIC policies that relate to locating the trail within the BINMIC.

City of Seattle Comprehensive Plan and Freight Mobility Master Plan

Approximately 4,512 linear feet of the Shilshole North Alternative is within the BINMIC, representing 68% of the total 6,647 linear feet for this alternative (Table 4-1). The Preferred, Shilshole South, and Shilshole North Alternatives would have similar lengths of trail in the BINMIC. All three of these alternatives would have more trail within the BINMIC than the Ballard Avenue and Leary Alternatives. Disruption to driveways and intersections could be minimized through the design measures described in Section 1.7.1, Roadway Design and Safety Considerations, and the Transportation Discipline Report (Parametrix, 2017a).

The Comprehensive Plan contains goals and policies to improve industrial traffic flow to and through the BINMIC, facilitate truck mobility, and enhance truck connections. The Shilshole North Alternative would be consistent with these policies because it could generally improve or maintain the level of service at most intersections. However, there would be a decrease in the level of service at four intersections compared to the No Build Alternative.

By increasing access delays for freight vehicles, the portion of the Shilshole North Alternative that runs along Shilshole Ave NW could cause minor impacts to water-dependent and industrial uses, which are specified as priority uses in the BINMIC policies. None of these impacts are considered significant because they would not cause a permanent loss of a priority land use (ECONorthwest, 2016).

City of Seattle Codes: Zoning, Shoreline, Critical Areas, and Historic Preservation

Land adjacent to the Shilshole North Alternative is mostly zoned to accommodate medium to heavy industrial and commercial uses. Similar to the Preferred Alternative, a portion of the Shilshole North Alternative would be within a neighborhood commercial zone, which supports pedestrian-oriented uses. A nominal segment of the alignment at the intersection of 24th Ave NW and NW Market St is in the pedestrian overlay, which encourages pedestrian uses in the downtown Ballard area (Figure 4-5). The Missing Link would be allowed in all zones.

Although less than the Preferred and Shilshole South Alternatives, a portion of the Shilshole North Alternative is within the UI shoreline environment. The Missing Link project would be required to comply with all applicable shoreline regulations.

No portions of the Shilshole North Alternative are within the Ballard Avenue Landmark District (Figure 4-3). Similar to other alignments, critical areas are present nearby, and development would comply with critical areas regulations.

4.3.6 Ballard Avenue Alternative

Construction

Construction impacts that could occur are described in Section 4.3.2, Impacts Common to All Build Alternatives. Although less than the Preferred and Shilshole South Alternatives, a small portion of this alternative is within the UI shoreline environment (see Figure 4-3). As described in other chapters of this FEIS, the project would include BMPs to promote consistency with these requirements. The project would comply with applicable critical areas and shoreline regulations.

Operation

Effect on Existing Uses

Land uses abutting or gaining access along the Ballard Avenue Alternative are approximately 38% industrial, 33% parks and open space, 13% commercial, 8% vacant, and 7% residential, with parking and other uses making up the remaining (see Figure 4-10). All uses abutting this alternative access their properties directly from the street frontage. The mix of land uses adjacent to this alternative is about the same industrial and residential, less commercial, and more parks and open space than the overall study area (compare Figures 4-4 and 4-10). Of the 97 total uses adjacent to the alternative, four uses are water-dependent and five uses are water-related. These water-dependent and water-related uses are clustered at the west end of this alternative, and include industrial uses and parks and open space. The parks and open space parcels are the 13-acre Ballard Locks and Charles S. English, Jr. Botanical Garden, which abut all of the Build Alternatives. The Ballard Avenue Alternative has fewer water-dependent uses than the Preferred and Shilshole South Alternatives, and more than the Shilshole North and Leary Alternatives. This alternative has fewer water-related uses than the Preferred and Shilshole South Alternatives, the same number as the Shilshole North Alternative, and more than the Leary Alternative. Water-dependent and water-related uses combined are about 56% of the land by area along the Ballard Avenue Alternative.

The southeast portion of the Ballard Avenue Alternative is largely industrial, and the middle and northwest segments are largely retail commercial, transitioning into more multifamily uses near the western portion (Figure 4-2). The parcels are relatively small and most have no off-street parking. The Ballard Avenue Landmark District largely inhibits redevelopment because the buildings and structures are historic. Existing industrial and commercial uses in the southeast portion of the alignment are mostly small-scale industrial on relatively small parcels compared to the Shilshole North and Shilshole South Alternatives. Future uses in the Ballard Avenue Landmark District are likely to include more commercial and residential development.

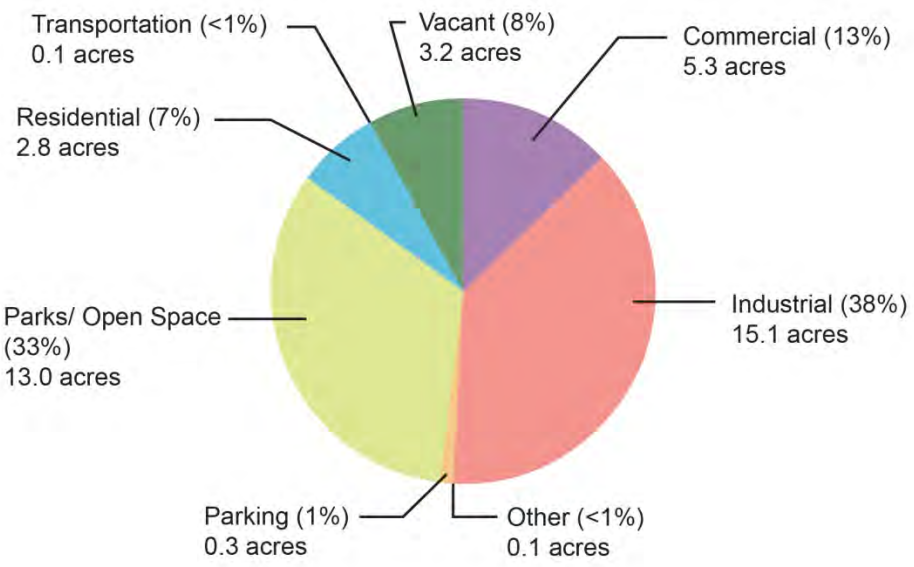


Figure 4-10. Existing Land Uses along the Ballard Avenue Alternative

Changes in traffic flow and access can disrupt normal activities and impact the viability of a land use. Roadway improvements included in the Ballard Avenue Alternative would result in a decrease in the level of service at three intersections but would maintain (or improve) the level of service at the others relative to the No Build Alternative (Parametrix, 2017a). Where the trail intersects access locations, vehicles would need to stop and check for pedestrians and bicyclists before advancing. This impact would likely occur for only short periods (up to 12 seconds more than the No Build Alternative), mostly during commute times, and would not be significant. See the Transportation Discipline Report for details (Parametrix, 2017a). Some drivers would view this as an inconvenience, and it could add to operating costs for some businesses. The Ballard Farmers Market is a permitted use on Ballard Ave NW, which would be impacted by the Ballard Alternative; see the discussion in Chapter 5, Recreation.

This alternative would cross about 41 driveways and loading zone spaces (Parametrix, 2017a). The Ballard Avenue Alternative would potentially remove up to 14 loading zone spaces. It is possible that these spaces could remain by shifting them to other locations along existing block faces, to the other side of a street, or to an adjacent block. Generally, the City prioritizes the retention of loading zone spaces and would work with adjacent businesses to retain or replace loading zones as needed. Thus, not all 14 would necessarily be lost (Parametrix, 2017b).

The Ballard Avenue Alternative could remove about 198 parking spaces that serve adjacent land uses and special events. This loss of on-street parking is not expected to significantly affect land uses along the Ballard Avenue Alternative. See discussion in Chapter 8, Parking, and the Parking Discipline Report (Parametrix, 2017b).

For all of the Build Alternatives, it is assumed that nonmotorized users (particularly bicycle traffic) would shift to the trail corridor. Nonmotorized users would also continue to use other roadways in the study area depending on their destination (Parametrix, 2017a). The Ballard Avenue Alternative would channel many more recreational users through areas of commercial, retail, and entertainment uses than the Preferred, Shilshole North, and Shilshole South Alternatives. Delivery vehicles associated with business activity along this alternative alignment are largely small to medium commercial vehicles, except in the industrial area near the southeast end of the alignment. The nature of many of the commercial, retail, and

entertainment uses along this alternative may be more consistent with trail user patronage than industrial uses. Nearby residential and commercial uses could serve as starting points and destinations for trail users.

Consistency with Adopted Plans, Policies, and Codes

The Ballard Avenue Alternative is consistent with adopted plans and policies, except the BINMIC policies that relate to locating the trail within the BINMIC.

City of Seattle Comprehensive Plan and Freight Master Plan

The Ballard Avenue Alternative is more consistent with Comprehensive Plan policies and goals that promote the expansion of open space networks in high-density areas targeted for residential growth with high pedestrian, bicycle, or transit use than the Preferred, Shilshole South, and Shilshole North Alternatives.

Approximately 2,814 linear feet of the Ballard Avenue Alternative is within the BINMIC, representing 37% of the total 7,518 linear feet for this alternative. The Ballard Avenue and Leary Alternatives would have the least length of trail within the BINMIC of the Build Alternatives (Table 4-1). All of the Build Alternatives are generally not consistent with policies that encourage trails to be located outside of the BINMIC. As with other Build Alternatives, these impacts would not be significant because operation of any of the Build Alternatives is not expected to result in land use changes (ECONorthwest, 2016). Disruption could be minimized through the design measures described in Section 1.7, Roadway Design and Safety Considerations, and the Transportation Discipline Report (Parametrix, 2017a).

By increasing access delays for freight vehicles in the BINMIC, the Ballard Alternative could cause minor impacts to water-dependent and industrial uses. None of these impacts are considered significant because they would not cause a permanent loss of a priority land use (ECONorthwest, 2016).

City of Seattle Codes: Zoning, Shoreline, Critical Areas, and Historic Preservation

Zoning adjacent to the Ballard Avenue Alternative is mixed- and light-industrial, commercial, and residential (Figure 4-5). Similar to the Preferred, Shilshole North, and Leary Alternatives, the Ballard Alternative includes neighborhood commercial zones that specifically support active and attractive pedestrian-oriented experiences. This alternative crosses the pedestrian overlay on 22nd Ave NW and NW Market St. The Missing Link would be allowed in all zones.

Although less than the Preferred and Shilshole South Alternatives, a small portion of the Ballard Avenue Alternative is within the UI shoreline environment, where the proposed use would be permitted. Similar to other alternatives, the western portion of the alignment is within critical areas (Figure 4-3), and development in this area would need to be consistent with critical areas regulations.

A portion of the alternative, from NW Market St to NW Dock Pl, is within the Ballard Avenue Landmark District. This area is particularly sensitive to changes in character, culture, social, and historic use. While the project would be allowed, it would have to be consistent with the development requirements for the District, subject to approval from the Ballard Avenue Landmark District Board.

4.3.7 **Leary Alternative**

Construction

Construction impacts that could occur are described in Section 4.3.2, Impacts Common to All Build Alternatives. Although less than the other Build Alternatives, a small portion of this alternative is within the UI shoreline environment (see Figure 4-3). As described in other chapters of this FEIS, the project would include BMPs to promote consistency with these requirements. The project would comply with applicable critical areas and shoreline regulations.

Operation

Effect on Existing Uses

Land uses abutting or gaining access along the Leary Alternative are approximately 21% industrial, 23% commercial, 37% parks and open space, 13% other, 3% residential, with the remaining parking and vacant (see Figure 4-11). All uses abutting this alternative take access directly from the street frontage. The mix of land uses along this alternative is less industrial, commercial, and residential, but more parks and open space and other uses compared to the study area as a whole (compare Figures 4-4 and 4-11). The Leary Alternative would locate the trail along an alignment with the lowest proportion of industrial uses (Table 4-1). Many of the uses along the Leary Alternative rely on small to medium commercial trucks for the delivery of goods.

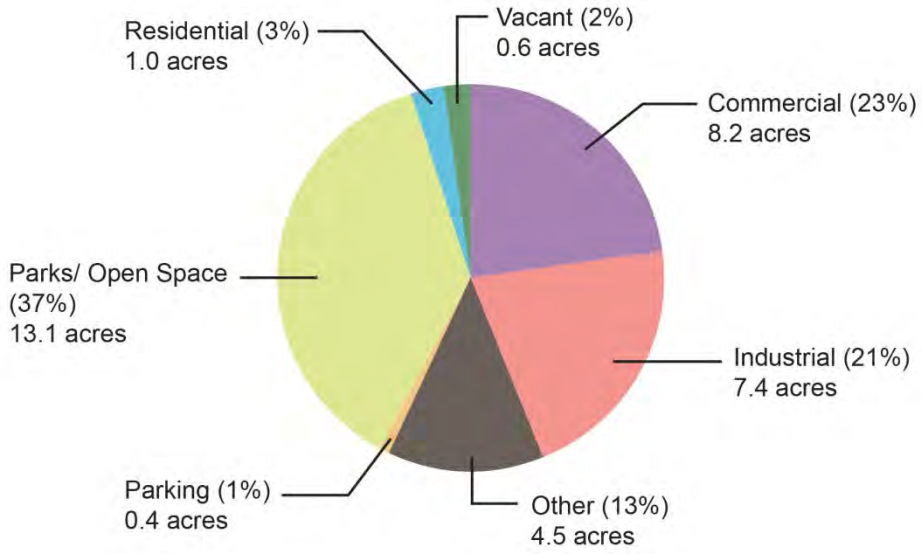


Figure 4-11. Existing Land Uses along the Leary Alternative

The parks and open space parcels are the 13-acre Ballard Locks and Charles S. English, Jr. Botanical Garden. Of the 60 uses, two uses are water-dependent and one is water-related (see Table 4-1). The water-dependent uses are the 13-acre Ballard Locks and Charles S. English, Jr. Botanical Garden, which are included in all Build Alternatives. The Leary Alternative has the same number of water-dependent uses as the Shilshole North Alternative, but less than the other Build Alternatives. It has fewer water-related uses than all of the other Build Alternatives. Water-dependent and water-related uses combined are about 44% of the land by area along the Leary Alternative.

Changes in traffic flow and access can impact the viability of a land use. Under the Leary Alternative, level of service would be reduced at six intersections compared to the No Build Alternative. However, other intersections would be improved or be the same as the No Build Alternative (Parametrix, 2017a).

Approximately 29 driveways and loading zone spaces would be located along the Leary Alternative, the least of any Build Alternative. About 15 loading zone spaces could be removed with construction of this alternative (Parametrix, 2017b). It is possible that these spaces could remain by shifting them to other locations along existing block faces, to the other side of a street, or to an adjacent block. Generally, the City prioritizes the retention of loading zone spaces and would work with adjacent businesses to retain or replace loading zones as needed. Thus, not all 15 would necessarily be lost.

Vehicles crossing the trail could experience minor delays as drivers stop and check for pedestrians and bicyclists before advancing to the roadway (Parametrix, 2017a, 2017b). This impact would likely occur for only short periods (up to 27 seconds more than the No Build Alternative), mostly during commute times, and is not expected to be significant. The delay at driveways would be the greatest with this alternative.

The Leary Alternative could remove approximately 82 parking spaces, the fewest of any of the Build Alternatives (Parametrix, 2017b). Similar to other Build Alternatives, businesses and residential uses could be impacted by the reduction in parking spaces. Fewer spaces may be available for special events in the study area. This loss of on-street parking is not expected to significantly affect land uses along the Leary Alternative. See Chapter 8, Parking, and the Parking Discipline Report for a discussion of parking impacts (Parametrix, 2017b).

For all of the Build Alternatives, it is assumed that nonmotorized users (particularly bicycle traffic) would shift to the trail corridor. Nonmotorized users would also continue to use other roadways in the study area depending on their destination (Parametrix, 2017a).

Consistency with Adopted Plans, Policies, and Codes

As with all other Build Alternatives, the Leary Alternative is consistent with plans and policies, except for the BINMIC policies that relate to locating the trail within the BINMIC.

City of Seattle Comprehensive Plan and Freight Master Plan

Approximately 2,308 linear feet of the Leary Alternative is within the BINMIC, which is about 34% of the total length (6,774 linear feet) of this alternative (Table 4-1). The length of this alternative within the BINMIC is slightly less than the Ballard Avenue Alternative and less than the Preferred, Shilshole South, and Shilshole North Alternatives. Completion of the trail would support plans and policies for the Ballard Hub Urban Village. The Leary Alternative, along with the Shilshole North Alternative, abuts the fewest number of water-dependent uses compared with the other Build Alternatives. It does not abut any water-related uses. All of the Build Alternatives are generally not consistent with policies that encourage trails to be located outside of the BINMIC; however, this impact is not significant because it would not cause a permanent loss of a land use (ECONorthwest, 2016). Potential impacts could be minimized through the design measures described in Section 1.7.1, Roadway Design and Safety Considerations, and the Transportation Discipline Report (Parametrix, 2017a).

City of Seattle Codes: Zoning, Shoreline, Critical Areas, and Historic Preservation

Zoning adjacent to the Leary Alternative allows for a mix of different types of industrial and commercial uses. It has more commercial zoning than the Preferred, Shilshole South, and Shilshole North

Alternatives, and it includes a neighborhood commercial zone that specifically supports active and attractive pedestrian-oriented experiences. Of all the Build Alternatives, the Leary Alternative has the most length in the pedestrian overlay in downtown Ballard (Figure 4-3). Consistent with the Land Use Code's intent for this overlay, this area along NW Market St is developed with mixed street-level uses that concentrate retail and service opportunities. The Missing Link would be allowed in all zones.

A small portion of the Leary Alternative is within the UI shoreline environment but no part is within the Ballard Avenue Landmark District (Figure 4-3). The Missing Link would be permitted in the shoreline environment and would be required to comply with all applicable shoreline regulations. Similar to other alternatives, the western portion of the alignment is within critical areas, and development in this area would need to be consistent with critical areas regulations (Figure 4-3).

4.3.8 Connector Segments

As with the Build Alternatives, the connector segments are consistent with adopted plans and policies, except the BINMIC policies that relate to locating the trail within the BINMIC. Most of the segments are located at least partially within the BINMIC. However, these segments could be used to reduce the total length of trail in the BINMIC by connecting to either the Ballard Avenue or Leary Alternative outside of the BINMIC.

Ballard Avenue NW

The Ballard Avenue NW connector segment is entirely outside of the BINMIC designation; it lies within neighborhood commercial zoning designations, and within the Ballard Avenue Landmark District (Figures 4-3, 4-5, and 4-6). Construction along this segment would be subject to approval by the Ballard Avenue Landmark District Board to comply with District regulations. This segment would be consistent with adopted plans, policies, and codes.

NW Vernon Place

Approximately 50% of the NW Vernon Place connector segment is within the BINMIC and would be inconsistent with the same plan goals and policies as previously described (Figure 4-6). The segment lies within the industrial and commercial zoning designations (Figure 4-5). A portion of the segment is within the Ballard Avenue Landmark District (Figure 4-3). Construction along this segment would be subject to approval by the Ballard Avenue Landmark District Board to comply with District regulations.

20th Avenue NW

Approximately one-quarter of the 20th Avenue NW connector segment is within the BINMIC and would be inconsistent with the same plan goals and policies as previously described (Figure 4-6). The segment lies within industrial, neighborhood commercial, and commercial zoning designations (Figure 4-5). A portion of the segment is within the Ballard Avenue Landmark District (Figure 4-3). Construction along this segment would be subject to approval by the Ballard Avenue Landmark District Board to comply with District regulations. A small portion of this connector segment would be within the shoreline district.

17th Avenue NW

The 17th Avenue NW connector segment is entirely within the BINMIC and would be inconsistent with the same plan goals and policies as previously described (Figure 4-6). The segment is within an industrial zoning designation.

15th Avenue NW

The entire 15th Avenue NW connector segment is within the BINMIC and would be inconsistent with the same plan goals and policies as previously described (Figure 4-6). The segment is within an industrial zoning designation.

14th Avenue NW

The entire 14th Avenue NW connector segment is within the BINMIC and would be inconsistent with the same plan goals and policies as previously described (Figure 4-6). The segment is within an industrial zoning designation.

4.4 Avoidance, Minimization, and Mitigation Measures

The following measures are common to all Build Alternatives.

4.4.1 Construction

Construction of the Missing Link would cause traffic delays and disruptions to residential and business uses in and around the project footprint. The following measures would be used to minimize those impacts:

- The contractor would be required to develop construction and staging plans, including a traffic control plan, to minimize impacts to business and residential access, maintain traffic flow, and maintain business visibility to encourage continued patronage.

- The City would maintain access to private property to the maximum extent feasible, and would notify property owners in advance of activities that might temporarily limit access. The City would provide wayfinding information and assist businesses to minimize impacts of construction.

- The public and business owners would be provided information about the construction schedule, hours of operation, location and duration of lane closures, and changes to parking provisions. This information would allow businesses to coordinate business operations such as delivery times, hours of operation, and other activities accordingly, as well as to provide information to customers to encourage continued patronage.

- The construction schedule and hours of operation would be timed and coordinated with other construction projects to minimize impacts to adjacent and surrounding properties to the greatest extent feasible.

- Additional measures, such as flaggers, could be employed to minimize freight delays in areas heavily used by freight, consistent with City policies promoting efficient transportation flow in industrial areas and to minimize impacts to industrial and manufacturing uses.

- To the extent feasible, loading zones and access would be maintained or alternative loading locations identified to minimize impacts to uses that rely on the delivery and shipment of goods.

- If the City requires temporary construction easements, the City would provide just compensation, as determined by a qualified appraiser to property owners. The City would generally restore temporary construction easements to their pre-construction condition.

4.4.2 **Operation**

The alternatives evaluated for the Missing Link are all partially within industrial zoned areas and the BINMIC. City plans and policies focus on the preservation of land in this area for water-dependent and industrial uses. Therefore, minimizing the extent of the trail within the BINMIC could minimize impacts. Connector segments could be utilized to channel trail users into the Ballard Hub Urban Village, where zoning and policies encourage trail completion, connection, and user activity during day and evening hours. Additional mitigation measures described in Section 1.7.1, Roadway Design and Safety Considerations, and the Transportation Discipline Report (Parametrix, 2017a) could also reduce trail impacts to adjacent land uses. SDOT will coordinate with adjacent businesses and property owners throughout the design process with regard to modification of the right-of-way. including outdoor seating areas, landscaping, and signage.

CHAPTER 5: RECREATION

5.1 Introduction

This section describes existing recreation in the study area and potential recreation impacts. The study area includes the project footprint and the surrounding recreational areas that may be affected by construction or operation of the project. Figure 5-1 shows recreational areas within and adjacent to the project footprint. Recreational sites and uses that are accessible from the trail network but outside of the immediate vicinity are also included within the study area and are shown in Figure 5-2.

Changes from the DEIS

Chapter 5 includes an analysis of the newly developed Preferred Alternative, which was not included in the DEIS. It includes additional information on recreation resources in the study area that was not presented in the DEIS and additional discussion on the impacts to the Ballard Farmers Market. This chapter also reflects updated information on transportation, such as data on signalized intersections.

5.2 Affected Environment

5.2.1 Regional and National Recreation Use and Trends

In 2012, the Washington State Recreation and Conservation Office (RCO) conducted a survey of residents of the Seattle-King Region (as defined by RCO) on recreation trends. The survey found the following information about bicycle riding in King County:

- 38% of residents in King County engage in bicycle riding;
- The average bicycle rider does so on 29.1 days a year;
- 27.6% of bicyclists ride on trails;
- 27% of bicyclists ride on roads and streets; and
- 22.5% of bicyclists ride on rural trails.

The survey also found that 78% of King County residents walk without a pet; 44% jog or run; and 44% walk with a pet. Survey respondents with children were asked which activities their children participate in and responded that 49% walk, 29% bicycle, and 27% jog or run. Survey respondents were also asked how they get to recreation areas, and results indicated that 57% walk or jog to recreation areas, and 23% bicycle to recreation areas. The survey information shows that connectivity of multi-use trails like the BGT is a key recreational benefit not only for users of the trail itself, but also for users of other recreational sites who travel to those sites by walking or bicycling (RCO, 2012; City of Seattle, 2014).

Also in 2012, the Sports and Fitness Industry Association (SFIA) published a Sports, Fitness, and Leisure Activities Participation Report. The report found that nationwide, walking for fitness was the most common recreational activity, with 110.9 million participants annually. Running and jogging were the second most common activity, with 44.3 million participants. Bicycling on roads or paved surfaces was the fourth most common, with 39.2 million participants. The survey also found that, nationwide, running, jogging, walking for fitness, and bicycling on roads and other paved surfaces are all increasing in participation annually (as cited in City of Seattle, 2014).

Figure 5-1. Recreation Areas in the Study Area

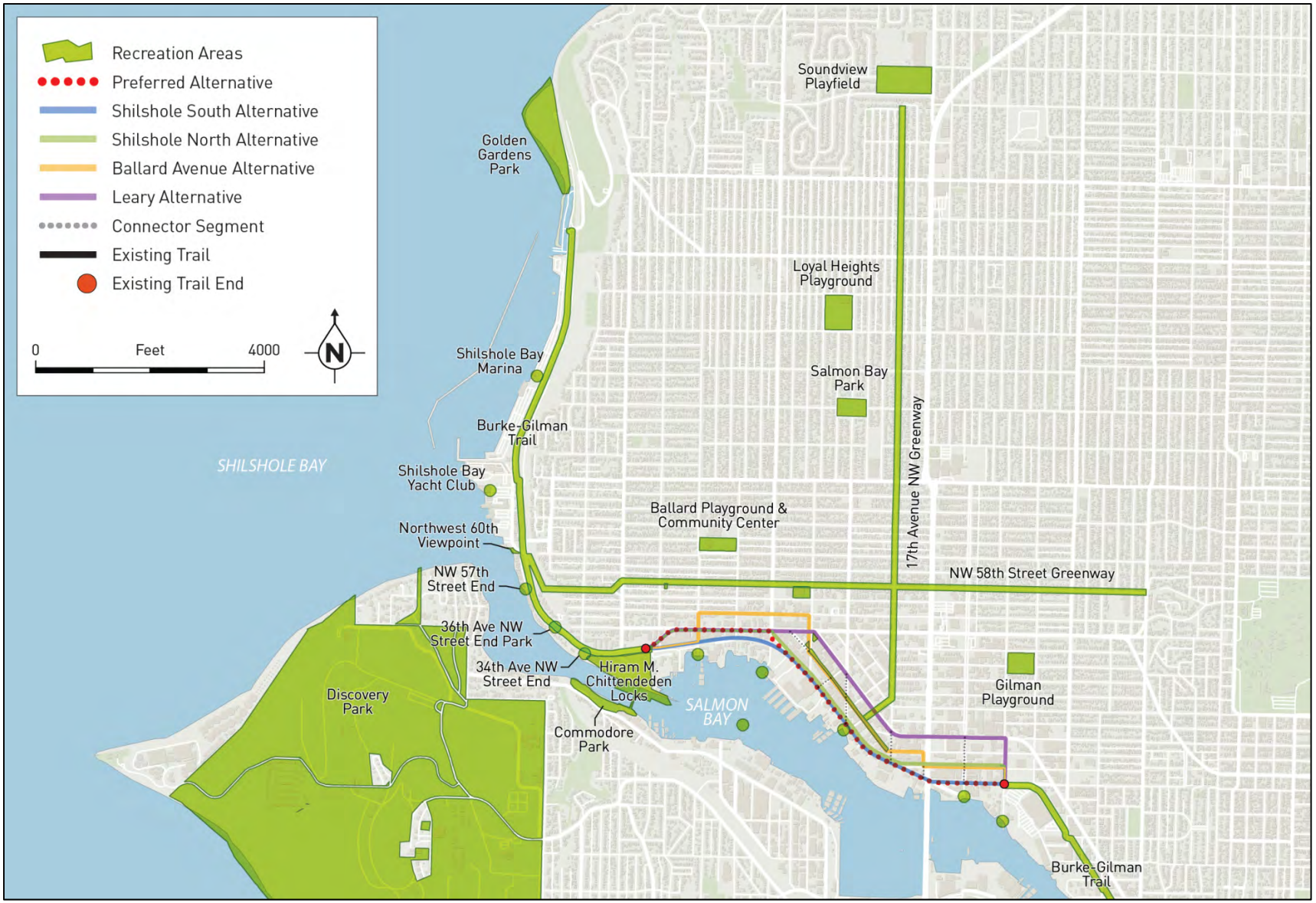


Figure 5-2. Recreation Sites Accessible from the Trail Network

5.2.2 **Bicycling, Jogging, and Walking in the Study Area**

The Missing Link project would complete the Burke-Gilman Trail (BGT), a multi-use facility that is used primarily by bicyclists, walkers, and joggers. Bicycling, walking, and jogging are major recreation activities in the study area. People interested in bicycling, walking, and jogging use the existing segments of the BGT, King County's Regional Trail System (accessed through the BGT), the SDOT bikeway network in Ballard, and Shilshole Ave NW to connect the two existing segments of the BGT, and other streets and sidewalks in the area.

The existing BGT is a 19.8-mile long multi-use trail used by walkers, runner, bicyclists, and skaters. Within the City of Seattle, ownership and maintenance of the trail are shared between SDOT and Seattle Parks and Recreation. The trail is owned and operated by King County outside of Seattle. The trail runs in two disconnected segments. The shorter segment runs from Golden Gardens Park in northwest Ballard to the Ballard Locks. The main segment of the trail resumes at NW 45th St and 11th Ave NW and runs along the Ship Canal to the University of Washington campus, where it turns north and continues until reaching Bothell. User counts and information for the BGT are included in Section 4.2.4 of the Transportation Discipline Report (Parametrix, 2017). The report found that pedestrian volumes are approximately 30% of bicycle volumes on the trail. Bicycle volumes are typically higher on weekdays than on weekends, indicating the high number of commuters using the BGT in addition to recreational users.

The Burke-Gilman Trail is part of King County's Regional Trail System, which includes over 175 miles of multi-use off-road trails and over 300 planned miles of trails. Other major trails in the system include the East Lake Sammamish Trail, Sammamish River Trail, and Interurban Trail. The Burke-Gilman Trail is directly connected to the Sammamish River Trail in Bothell, which is a 10-mile trail that connects to the East Lake Sammamish Trail via the Marymoor Connector Trail (King County, 2017).

Because it connects the two current end points of the BGT, Shilshole Ave NW is commonly used by people despite the lack of dedicated bicycle lanes or pedestrian facilities. Shilshole Ave NW is an arterial running parallel to the Ship Canal through an industrial area. Trucks use the street to access industrial businesses. Shilshole Ave NW is heavily used by visitors on evenings and weekends for free parking to access commercial areas on Ballard Ave NW and NW Market St and the Sunday Ballard Farmers Market. Throughout the study area, recreational users bicycle on public streets and jog and walk on public sidewalks.

SDOT maintains a 450-mile bikeway network in the city made up of separate pathways, marked streets, and connectors. The BGT is part of this network. The network also includes the NW 58th St Greenway and the 17th Ave NW Greenway in Ballard. A greenway is a street right-of-way that, through a variety of design and operational treatments, gives priority to bicyclist and pedestrian circulation and open space over other transportation uses. The treatments may include sidewalk widening, landscaping, traffic calming, and other bicyclist- and pedestrian-oriented features. Among their many functions, greenways create open space opportunities in residential areas that may otherwise lack public open spaces. Neighborhood greenways are designated through neighborhood plans or other City adoption processes.

The NW 58th Street Greenway features pavement markings, a traffic-calming "safety island" at the intersection with 15th Ave NW, new crosswalks with bicycle-accessible signal buttons, and a widened sidewalk on Seaview Ave NW to allow access to the BGT.

Construction on the 17th Ave NW Greenway began in September 2015 and was completed in early 2016. The greenway stretches from NW 90th St to the intersection of 17th Ave NW and NW Dock Pl, from which it follows NW Dock Pl to Ballard Ave NW. The greenway features new curb ramps, crosswalks, crossing beacons, curb extensions, crossing improvements, natural drainage systems, and vehicle

restrictions at various intersections. In addition, the 17th Ave NW and NW Dock Pl intersection will be reconfigured.

5.2.3 Existing Parks and Recreational Areas in the Project Vicinity

Major Recreational Attractions in the Study Area

In addition to City of Seattle-owned parks, the study area includes two major regional recreational sites (the Ballard Locks and the Ship Canal) and the Ballard Avenue Landmark District.

Ballard Locks

The Ballard Locks are operated by the Corps to allow boat passage between Lake Washington and Puget Sound and to regulate the water levels in Lake Washington. Recreational boaters travel through the Ballard Locks. The grounds of the Ballard Locks are operated as a park, with walking paths, lawn areas, a visitor's center, viewing windows to a fish ladder, and the Carl S. English, Jr. Botanical Garden. Boat watching is a major visitor use of the Ballard Locks. Visitors can cross the Ballard Locks by foot, and bicyclists and pedestrians often cross the Ballard Locks to travel between Magnolia and Ballard as an alternative to the Ballard Bridge. The Ballard Locks are a major tourist destination for the Ballard neighborhood.

Ship Canal

The Ship Canal, which connects Lake Washington to Puget Sound, is used for in-water recreation by boaters, kayakers, paddle boarders, and others. Many marinas are located along the shores of the Ship Canal in the vicinity of the study area.

Ballard Avenue Landmark District

Another major recreational activity in the study area is visiting historic areas of Ballard Ave NW. Ballard Ave NW between NW Market St and NW Dock Pl constitutes the historic Ballard Avenue Landmark District. The majority of buildings in the district were constructed from the 1890s to 1940s, and the historic character adds to the recreational quality of the district. The district features restaurants, coffee shops, boutiques, bars, and galleries. The historic aspects of the Landmark District are described in further detail in Chapter 10, Cultural Resources.

City of Seattle Parks

The City of Seattle Parks and Recreation operates 430 parks throughout the city, including athletic fields, tennis courts, neighborhood play areas, community centers, off-leash areas, swimming pools, and golf courses. City parks range from pocket parks and neighborhood parks primarily designed for local residents to large parks that attract tourists and visitors from other areas of the city and the region. City parks cover approximately 11% of the city's land area (City of Seattle, 2016). City parks along the alignments of the proposed Missing Link include Bergen Place Park and Marvin's Garden. Other parks in the vicinity of the study area include Ballard Playground and Community Center, Ballard Commons Park, Thyme Patch Park, and Gilman Playground.

Bergen Place Park

Bergen Place Park is located in Ballard between Leary Ave NW, 22nd Ave NW, and NW Market St. The park features benches, a community information kiosk, and a series of sculptures named "Witness Trees"

created by artist Jenn Lee Dixon. The park is named after Bergen, Norway, a sister city of Seattle, and features a plaque in honor of the sister city relationship. King Olaf of Norway dedicated Bergen Place Park when it first opened in 1975. Bergen Place Park is frequently used as a location for events held in Ballard, including the Ballard SeafoodFest, Syttende Mai, and the weekly Ballard Farmers Market (Section 5.2.4).

Marvin's Garden

Marvin's Garden is a 0.1-acre park at the corner of Ballard Ave NW and 22nd Ave NW. The park features benches, landscaping, and the Ballard Centennial Bell Tower.

Ballard Playground

The Ballard Playground and Community Center is located at 26th Ave NW and NW 60th St. The Community Center features an indoor pool. The playground features fields for soccer and baseball/softball as well as an ADA-compliant play area.

Ballard Commons Park

Ballard Commons Park is located at 22nd Ave NW and NW 57th St. The park is adjacent to the greenway on NW 58th St. The park features a skatepark, public art, lawns and benches, and ADA-accessible walkways. The park also features a spray park. The Ballard Branch of the Seattle Public Library and Ballard Customer Service Center (also commonly known as the Neighborhood Service Center) are located across the street from the park. The park was opened in 2005 and is 1.38 acres.

Thyme Patch Park

Thyme Patch Park is a small 0.11-acre park on NW 58th St near 28th Ave NW. The park was built on a vacant property acquired in 1998 to meet the gap in open space identified in the Crown Hill/Ballard Open Space and Recreation Plan (Seattle Parks and Recreation, 2016). The park features a P-Patch community garden, lawn, benches, and walkways.

Gilman Playground

Gilman Playground is a large (3.9-acre) park located at 9th Ave NW and NW 54th St. Amenities include restrooms, an ADA-compliant play area, and a water feature. The park also has a basketball court, an outdoor tennis court, and fields for soccer and baseball/softball.

Soundview Playfield, Salmon Bay Park, and Loyal Heights Playfield

The 17th Ave NW Greenway ends at Soundview Playfield at NW 90th St. Soundview Playfield is a 10.5-acre park owned and operated by Seattle Parks and Recreation featuring two baseball fields, a soccer field, a playground, walking trails, a water feature, and restrooms. The greenway also runs within two blocks of Salmon Bay Park and within three blocks of Loyal Heights Playfield, both owned and operated by Seattle Parks and Recreation. Salmon Bay Park is a 2.8-acre neighborhood park with picnic tables, benches, a playground, and restrooms. Loyal Heights Playfield is a 6.7-acre park featuring the Loyal Heights Community Center, a basketball court, fields for football and baseball/softball, a play area, and restrooms.

Shoreline Street Ends

Designated shoreline street ends throughout the Ballard neighborhood provide public shoreline access and views. Some street ends feature piers or boat ramps, while others simply feature a public space adjacent to the Ship Canal providing views of the water. The Seattle City Council adopted Resolution Number 29370 in June 1996 calling for the development of public access improvements to shoreline street ends. SDOT's Shoreline Street Ends Project is working to improve shoreline street ends throughout the city, adding additional public access and recreational opportunities. Street ends within or near the study area are described below.

11th Avenue NW Street End

The 11th Ave NW street end features native plantings, a shoreline viewing platform, a bench swing, and birdhouses. These features were installed in spring 2015 through collaboration between SDOT and the University of Washington Landscape Architecture Program.

Public Access Ramp at 14th Avenue NW

The 14th Avenue NW street end in Ballard features a free public boat ramp providing access to the Ship Canal. The site has two piers, two launch ramps, handicap parking spaces, and a portable restroom. Unlike other shoreline street ends, the public access ramp at 14th Ave NW is owned and operated by Seattle Parks and Recreation.

20th Avenue NW/Dock Pl NW Street End

Shoreline access is also available at a street end on the Ship Canal side of Shilshole Ave NW. The street end is not developed for recreational use, but it is accessible.

24th Avenue NW Street End

SDOT owns an existing pier at the 24th Avenue NW street end. The pier is used for water access and shoreline viewing. The pier is also used for public vessel moorage, which is limited to 2 hours. Moorage limits are enforced by the Harbor Patrol. This site has been proposed for a potential new park called the Threading the Needle Park, would include a pedestrian greenway, restored waterfront beach, upgraded dock, and stormwater gardens. The proposed Threading the Needle Park is currently unfunded.

28th Avenue NW Street End

The 28th Avenue NW street end was recently improved by SDOT to provide enhanced recreational opportunities and fish habitat. The 28th Avenue NW street end features native plantings, water access, and a kayak launch.

34th Avenue NW Street End (Salmon Bay Natural Area)

The 34th Avenue NW street end features a viewpoint with views of Salmon Bay, Magnolia Bluff, and the Salmon Bay Bridge, a railroad trestle bridge built in 1914. The park also features a 17-foot-tall bronze "welcome figure" statue sculpted by artist Marvin Oliver.

36th Avenue NW Street End

The 36th Avenue NW street end features a lookout with a view of the Ship Canal, a picnic table, and a bench.

NW 57th Street End

The NW 57th street end is accessible from the Burke-Gilman Trail and is the site of an SPU pump station and combined sewer overflow outfall. The site features a staircase down to a small beach area on the shore of the Ship Canal.

Recreation Accessible from the Disconnected Segment of the Burke-Gilman Trail

The segment of the Burke-Gilman Trail running from the Ballard Locks to Golden Gardens Park is directly adjacent to several parks that are disconnected from trail users using the BGT in other portions of the city and county. As described in Section 5.2.1, 49% of King County residents access recreational areas by walking and 23% access recreational areas by bicycling. Recreational areas accessible from the disconnected segment of the trail include:

- Golden Gardens Park, a major City of Seattle park drawing users from around the city and region. The park is 87.8 acres and features a Puget Sound beach with views of the Olympic Mountains. Amenities at the park include a hand-carry boat launch, picnic sites, fire pits, paths and hiking trails, restrooms, play areas, a basketball court, beach volleyball nets, and an off-leash dog area. The park also features a rental facility used for weddings and ceremonies, among other events.
- Northwest 60th Viewpoint, a small 0.5-acre City of Seattle park with benches facing Shilshole Bay. Views from the park include Magnolia Bluff, the Olympic Mountains, Bainbridge Island, and Puget Sound.
- Private marinas, including the Shilshole Bay Marina and Shilshole Bay Yacht Club.

In addition, recreational users can cross the Ballard Locks on foot (and hand-carry bicycles across) to access recreation sites on the Magnolia side of the Ship Canal. Commodore Park is directly adjacent to the Ballard Locks and features paths, views of the Ship Canal, and restrooms. The park is 3.9 acres. From the Magnolia side of the Ballard Locks, it is a short walk or bicycle ride to Discovery Park, which at 534 acres is the largest park in Seattle. Discovery Park is located on the former site of Fort Lawton and features 2 miles of beaches, 11.8 miles of walking trails, the United Indians of All Tribes' Daybreak Star Cultural Center, the West Point Treatment Plant, the historic West Point Lighthouse, the Discovery Loop Trail (a National Recreation Trail), the Fort Lawton Historic District, and the Discovery Park Environmental Learning Center. The Seattle Bicycle Master Plan shows a recommended off-street trail and cycle track that would connect Discovery Park to Commodore Park and the Ballard Locks (SDOT, 2014).

5.2.4 Recreational Events in the Project Vicinity

Several annual recreational events are held within the study area. In addition, the weekly Ballard Farmers Market is located within the study area.

Ballard Farmers Market

The Ballard Farmers Market is a year-round weekly farmers market on Sundays from 10:00 AM to 3:00 PM. The event is owned and operated by the Seattle Farmers Market Association, a registered non-profit

corporation. The Farmers Market is located on Ballard Ave NW between Vernon Pl NW and 22nd Ave NW. Each Sunday, Ballard Ave NW is closed to traffic for the length of the Farmers Market. The Farmers Market also uses Bergen Place Park for artisan booths each Sunday.

Seventeenth of May Festival

The Seventeenth of May Festival, also known as Syttende Mai, occurs annually in Ballard. The event is organized by the Norwegian Seventeenth of May Committee, a nonprofit organization. The event celebrates the Norwegian Constitution Day holiday. The Seventeenth of May has been celebrated in Seattle since 1889, and the community parade in Ballard has been held annually since 1974. The Ballard event is recognized as the third largest annual Seventeenth of May event in the world (after Oslo and Bergen). The annual event includes entertainment at the Leif Erikson Hall located at 2245 NW 57th St, a music stage at Bergen Place Park at NW Market St and Leary Ave NW, and a parade. The parade route starts at 24th Ave NW and NW 62nd St and follows 24th Ave NW south to NW Market St. The parade then follows NW Market St east to 22nd Ave NW, where it turns south to Ballard Ave NW, then continues southeast along Ballard Ave NW to NW Ione Pl.

SeafoodFest

SeafoodFest is an annual event on the second weekend of July. The first event was held in 1974. Attractions typically include multiple music stages, food vendors, arts and crafts booths, a beer garden, and a big purple slide. Attractions are located along 22nd Ave NW between NW 58th St and Ballard Ave NW; NW Market St from 24th Ave NW to 20th Ave NW; Leary Ave NW between NW Market St and 20th Ave NW; Ballard Ave NW between NW Market St and 22nd Ave NW; and at Ballard Commons Park. Many of the streets featuring attractions are closed to traffic during the event.

Ballard Criterium

The Ballard Criterium bicycle race is held the first or second Saturday of every June, with a rectangular route running west along Ballard Ave NW from NW Dock Pl to NW Vernon Pl, south on NW Vernon Pl to Shilshole Ave NW, east on Shilshole Ave NW to NW Dock Pl, then north on NW Dock Pl to Ballard Ave NW. On the day of the race, these streets are closed from 2:00 PM to 9:00 PM to accommodate the racers. The event has been held since 1994 (APEX Racing, 2017).

5.2.5 Relevant Recreation Plans

Seattle Bicycle Master Plan

The Seattle Bicycle Master Plan, adopted in 2014 (SDOT, 2014), sets out five goals:

1. Ridership: Increase the amount and mode share of bicycle riding in Seattle for all trip purposes.

2. Safety: Improve safety for bicycle riders.

3. Connectivity: Create a bicycle network that connects to places that people want to go, and provides a time-efficient travel option.

4. Equity: Provide equal bicycling access for all; through public engagement, program delivery, and capital investment.

5. Livability: Build vibrant and healthy communities by creating a welcoming environment for bicycle riding.

Strategy 4.1 in the plan is to "Implement the off-street (multi-use trail) bicycle facility network." Actions under Strategy 4.1 include:

- 4.1.1: Develop new multi-use trails. Developing off-street bicycle facilities outside the public right-of-way will require additional feasibility analysis and agreements with land owners.
- 4.1.2: Incorporate best practice crossing design treatments into every new multi-use trail project.
- 4.1.3: Develop multi-use trails "etiquette" signs, and other creative means, to educate users traveling along the trail.
- 4.1.4: Assess multi-use trail lighting needs and work with Seattle City Light (SCL) to provide adequate trail lighting.
- 4.1.5: Install wayfinding with all off-street bicycle facility projects.

The Plan includes a bicycle network map, which recommends bicycle network improvements throughout the city, including 32 miles of recommended off-street bicycle trails. The Missing Link is shown as a recommended off-street trail on the bicycle network map. The bicycle network map also shows two recommended off-street trails linking directly to the Missing Link alignment, including a trail segment across the Ballard Bridge connecting to the existing off-street Ship Canal Trail and a trail segment across the Ballard Locks.

The Plan also identifies "catalyst projects," which are those projects "located at choke points in the network that pose significant challenges to implementation due to physical constraints." Catalyst projects also "Reduce critical barriers to bicycling by closing network gaps and increase safety by building all ages and abilities friendly bicycle facilities to the maximum feasible extent." The Missing Link project is specifically mentioned as a catalyst project.

Seattle Pedestrian Master Plan

The mayor submitted the recommended Pedestrian Master Plan to the Seattle City Council in March 2017, updating the previous (2009) version of the plan. The vision of the plan is to make Seattle the most walkable city in the nation. The plan update identifies six objectives:

- Objective 1: Increase pedestrian safety.
- Objective 2: Improve walkability and accessibility on all streets.
- Objective 3: Complete and maintain the pedestrian system.
- Objective 4: Plan, design, and build Complete Streets to move people and goods.
- Objective 5: Create vibrant public spaces that encourage pedestrian use.
- Objective 6: Raise awareness of the important role of pedestrian movement for transportation, recreation, and in promoting health and preventing disease.

The plan includes maps of priority areas (by sector) for prioritization of infrastructure projects for improving pedestrian conditions.

Parks and Recreation 2011 Development Plan

In 2011, the City of Seattle adopted the Parks and Recreation 2011 Development Plan (City of Seattle, 2011), which identifies goals, objectives, and policies for the park and recreation system and identifies priorities for acquisition and development projects through 2017. The Plan includes the 2011–2016 Capital Improvement Program, which includes over 100 capital projects at City parks, from minor maintenance projects to major renovation and development of new parks.

As part of the Development Plan process, Seattle Parks and Recreation held public meetings, solicited written testimony, and conducted an online survey in 2011. Public feedback indicated that providing more walking trails was one of the four top priorities for outdoor recreation and open spaces, and that walking trails were one of the three park facilities that people felt there should be more of in Seattle (along with sports fields and beach and waterfront land). The Plan also notes that "providing linkages between parks, boulevards, and trails to allow more connections for walking, running, and bicycling, and developing multi-purpose trails like the Burke-Gilman or Interurban trails and completing the 'missing link' in Ballard were suggested."

The Goals in the Parks and Recreation 2011 Development Plan include:

- Goal 1: Provide recreation and learning opportunities by providing and maintaining an adequate balance of parks, open spaces, recreational facilities, and programs tailored to their need to promote respite, socialization, and education.

- Goal 2: Steward Seattle's parks and open spaces for long-term sustainability by conserving, restoring, and maintaining substantial open space, natural areas, shorelines, and wildlife, and by demonstrating a strong conservation ethic.

- Goal 3: Acquire property for parks and open space to fill the identified gaps in usable open space and to manage future growth and change consistent with the City's growth management goals and policies as outlined in the City's Comprehensive Plan.

- Goal 4: Maintain Parks and Recreation's land and facilities. Emphasize good management and fiscal responsibility by making the most effective use of limited resources, evaluating programs and services, protecting the public interest, being accountable for achieving adopted objectives, and guarding against unrealistic expectations.

- Goal 5: Actively engage and build relationships with Seattle's diverse population, the Seattle School District, the Seattle Housing Authority, other departments or agencies, and community-based organizations to bring together a range of services in response to neighborhood priorities.

Specific objectives relevant to the Missing Link project include:

- Objective 2.7: Undertake boulevards and trail improvements with consideration for natural and historic resources associated with such facilities and provide special landscaping, signage, or other design elements that reflect the importance of boulevards and trails as a major link in the City's comprehensive open space system.

- Objective 3.4: In general, priority for the expansion of the open space network shall be given to areas of the city subject to population growth, including urban villages targeted for the largest share of residential growth and those areas not adequately served at present according to the population-based goals for open space.

- Objective 4.3: Coordinate planning and design for park improvements with other City departments.

Additionally, the Distribution Guidelines in the Plan state, "New multi-use trails will be developed in accordance with the Bicycle Master Plan, with a goal of having an interconnected system of primary and secondary trails throughout the city (and as coordinated with Seattle Transportation) as well as a variety of trails within all appropriate parks and green spaces."

Seattle Parks and Recreation is currently working on a 2017 Development Plan, which is anticipated to be adopted by the City Council in September 2017 (Seattle Parks and Recreation, 2017).

City of Seattle Comprehensive Plan

The City of Seattle 2035 Comprehensive Plan was adopted in 2016 (City of Seattle, 2016). The Comprehensive Plan includes two elements relevant to the recreational aspects of the project: the Parks and Open Space element and the neighborhood plan for Crown Hill/Ballard. The Ballard/Interbay Northend Manufacturing & Industrial Center (BINMIC) neighborhood plan (as presented in the Comprehensive Plan) does not include policies or goals for recreation or open space.

The Parks and Open Space chapter of the Comprehensive Plan includes policies relevant to the Missing Link project, including:

- Policy P1.1: Continue to expand the City's park holdings and open space opportunities, with special emphasis on serving urban centers and urban villages that are homes to marginalized populations and areas that have been traditionally underserved.

- Policy P1.3: Provide urban trails, green streets, and boulevards in public rights-of-way as recreation and transportation options and as ways to connect open spaces and parks to each other, to urban centers and villages, and to the regional open space system.

- Policy P1.6: Provide public access to shorelines by using street ends, regulation, or acquisition.

The Crown Hill/Ballard neighborhood plan includes the following goals and policies:

- Goal CH/B-G5: A neighborhood with open space, parks, and recreation sites, connected by a network of "green links," that offer a full range of active and passive recreational opportunities to area residents and visitors, throughout Crown Hill/Ballard.

- Policy CH/B-P13: Increase the range of recreation opportunities and types of open space available in the neighborhood. Encourage the development of new facilities, including but not limited to passive parks, tennis courts, basketball courts, ballfields, play areas, marine and shoreline parks, pedestrian-friendly walkways, trails (including the Burke-Gilman), and gateways.

- Policy CH/B-P14: Enhance existing open space and recreation sites and facilities throughout Crown Hill/Ballard.

5.3 Potential Impacts

5.3.1 No Build Alternative

Recreation Uses

Under the No Build Alternative, current conditions and trends in the study area would continue. Participation in recreational activities such as bicycling, running, jogging, and walking would continue to increase annually as a result of growth in the Ballard area and trends toward increases in recreational running, jogging, walking, and bicycling (as described in Section 5.2.1). Demand for off-road paved trails for these activities would continue to increase. Recreational sites such as the Ballard Locks and Golden Gardens Park would continue to be disconnected from other segments of the BGT.

Consistency with Recreation Plans

The No Build Alternative is not consistent with adopted plans and policies described in Section 5.2.5, which include goals and policies for adding new parks and open space, adding to the local and regional trail network, and, in some plans, specifically building the Missing Link project.

Trail User Conflicts and Safety Concerns

Bicyclists and other recreational users would continue to use public streets (primarily Shilshole Ave NW) between the existing trail segments, many of which lack sidewalks, do not have demarcated areas for bicyclists and pedestrians, and cross railroad tracks. These streets either completely lack or have substandard facilities for recreational users, which results in a greater potential for conflicts between motor vehicles and people walking, running, or biking.

5.3.2 Impacts Common to All Build Alternatives

Construction

Impacts to Existing Recreation Uses

Construction of the Missing Link along any of the alternative routes would disrupt existing recreational uses during the construction period, which would last approximately 12 to 18 months. Impacts would occur if roadways or paths providing access to existing recreational facilities were disrupted or if fugitive dust, odors from paving operations, noise, or construction light and glare affect existing recreational facilities. However, because of the short duration of construction at any given location, no significant impacts are expected. In addition, construction in the roadway or right-of-way has the potential to disrupt use of the road for existing recreational uses such as bicycling. Since construction would not disrupt any areas developed specifically for bicycle use, riders could use other nearby roadways during the construction period.

Under all Build Alternatives, construction of the west end of the Missing Link near 30th Ave NW could disrupt access to the parking lot and entrance of the Ballard Locks. However, access to the Ballard Locks would be preserved on the west end of the parking lot, and the duration of construction at this location would be relatively short.

Operation

Recreation Uses

The completed Missing Link would be used by many people, including bicyclists, skaters, joggers, and walkers. The Missing Link would improve the recreational experience over existing conditions, under which bicycling, walking, and other recreational activities take place on the sidewalk or in the street. The 1.4 miles of trail would likely increase recreational activity in the study area.

Completion of the Missing Link would connect recreational attractions like the Ballard Locks, Golden Gardens Park, and, if an off-street trail or cycle track is completed in the future as described in the Seattle Bicycle Master Plan, Discovery Park to the city-wide and regional multi-use trail system. As described in Section 5.2.1, 57% of King County residents walk or jog to recreation areas and 23% bicycle to recreation areas. Therefore, making these major recreational attractions accessible to bicycles, walkers, and joggers using the BGT would represent a positive impact to recreation. Additionally, each potential alternative route would directly pass by recreational facilities, opening these recreational amenities to trail users. Each alternative would pass different recreational facilities as described below. The different alternative routes would also pass through different intersections, some of which are signalized. The existing segments of the BGT run through very few signalized intersections (including those on the University of Washington campus and one in the Wallingford/Fremont neighborhoods). Signalized intersections require bicyclists and other trail users to stop, and it is generally preferable from a recreational perspective (particularly for bicyclists) to avoid routing multi-use trails through signalized intersections.

Consistency with Recreation Plans

Construction of the Missing Link project would be consistent with the 2035 City of Seattle Comprehensive Plan by expanding recreational opportunities in the city and in the downtown Ballard area, and by expanding the city's network of trails and connections to open space. Completing the project would also be consistent with the Parks and Recreation 2011 Development Plan by filling in gaps in the open space network in Ballard and meeting the public demand for additional trails. The Missing Link project is included in the Bicycle Master Plan as a "catalyst project" and would contribute to completion of the bicycle facility network. The project would be consistent with the Seattle Pedestrian Master Plan by improving pedestrian conditions in a high priority area.

Trail User Conflicts and Safety Issues

By design, multi-use trails accommodate a variety of trail users. Trail user conflicts can result in disruption and negative effects on trail user experiences, as well as potential safety issues. Safety issues are related to the potential for accidents, which can occur on multi-use trails result from such factors as recklessness and irresponsible behavior, poor user preparation or judgment, and unsafe trail conditions. User conflicts occur when there is competition or perceived incompatibility of use by different types of users. Types of conflicts include speed of travel and safety issues. The potential for conflicts between trail users and vehicles is described in Chapter 7, Transportation. While the potential for trail user conflicts and safety issues on the completed Missing Link exists, conditions for users would be safer than under current conditions with no dedicated multi-use trail.

Two factors that influence the safety and the perception of safety of trail users are the width of the trail and the types of intersections trail users need to cross. All Build Alternatives would have a 10- to 12-foot trail width, except for a short, 8-foot wide section along the Shilshole South Alternative. Alternatives vary in the types of intersections included in the route and in how many of the intersections would be signalized. Signalized crossings increase both safety and perception of safety for recreational users of the

trail when it crosses busy intersections. In addition to signalized intersections, several unsignalized intersections in the study area experience high volumes of peak hour traffic. Where the Missing Link crosses these intersections, they could require signalization or some other treatment to improve safety and crossing conditions. Individual trail users have different levels of tolerance for risk and perceived risk. For example, an experienced adult bicyclist commuter may have a higher tolerance for perceived risk than a bicycling family with young children. The greater the number of high-traffic intersections (particularly unsignalized intersections) along a route, the less desirable it becomes for some trail users. Driveways along the trail route can also increase the perceived risk and reduce the desirability of the route for some trail users. The number of signalized intersections, busy but unsignalized intersections, and driveways along the trail route varies by alternative.

5.3.3 **Preferred Alternative**

Construction

Impacts to Existing Recreation Uses

Shilshole Ave NW is the primary route used by bicyclists traveling between the existing segments of the BGT. Construction of the Missing Link project would likely disrupt and displace bicycle users of Shilshole Ave NW during construction. This impact would be temporary, and other streets in the vicinity, including Ballard Ave NW and Leary Ave NW, could be used by bicyclists during the construction period.

Some shoreline street ends along the Ship Canal, including the 14th Ave NW boat ramp and the public pier at 24th Ave NW, are accessible from Shilshole Ave NW and NW 45th St. During construction, it could be more difficult to access these street end parks, and construction activities may be audible and visible to park users. However, construction duration at any one location would be relatively short, and access to street ends would be maintained. Access to the 20th Ave NW street end, which is only accessible from Shilshole Ave NW, may need to be closed while the trail is constructed in the immediate vicinity of that intersection. However, other street ends would be accessible within four or six blocks distance, so impacts would be minor.

Operation

Recreation Uses

As described in Section 5.3.2, completion of the Preferred Alternative would provide additional recreational opportunities in the study area and would improve recreational connectivity for users of the regional bicycle trail network.

Compared to all alternatives other than the Shilshole South Alternative, the Preferred Alternative would be the most disconnected from commercial areas of Ballard with high pedestrian circulation. Therefore, it would provide a similar recreational experience to existing segments of the BGT. This route would cross through only one signalized intersection, which would be preferable for trail users, particularly bicyclists. A signal is proposed on Shilshole Ave NW at 17th Ave NW that would facilitate trail users accessing the trail in that location.

This alternative would run the closest to the Ship Canal and Salmon Bay. The trail would run within one block of the 14th Ave NW boat ramp and the 24th Ave NW pier and within two blocks of the recently developed 28th Ave NW street end. The trail would run directly adjacent to the currently undeveloped 15th Ave NW street end and the 20th Ave NW street end. SDOT's Shoreline Street Ends Program is dedicated

to preserving and improving public use of shoreline street ends. This alternative would support that program by increasing access to the street ends.

Consistency with Recreation Plans

As described in Section 5.3.2, the Missing Link project would be consistent with a variety of recreation plans. However, Shilshole Ave NW is not within the Ballard Hub Urban Village in the City of Seattle Comprehensive Plan. The Ballard Hub Urban Village has a variety of goals and policies related to improving recreation and open space. Shilshole Ave NW is mapped within the BINMIC, which does not have any policies or goals for recreation or open space. Although much of the Preferred Alternative would technically be outside of the Ballard Hub Urban Village, it would still meet the recreation and open space goals of the neighborhood by linking the existing trail segments and connecting recreational and open space areas within the neighborhood.

Trail User Conflicts and Safety Concerns

The Preferred Alternative route would likely be a preferable route for bicyclists and commuters, as the route would only cross five unsignalized intersections and one signalized intersection. Although this route would run through fewer intersections (both signalized and unsignalized) than the Shilshole North, Ballard Avenue, and Leary Alternatives, it would pass 39 driveways and loading zone spaces. While construction of the Missing Link along the Preferred Alternative would greatly increase safety for trail users, some users may choose not to use this trail segment due to the perception of risk from busy intersections and driveways, and prevalence of industrial traffic.

5.3.4 **Shilshole South Alternative**

Construction

Impacts to Existing Recreation Uses

Shilshole Ave NW is the primary route used by bicyclists traveling between the existing segments of the BGT. Construction of the Missing Link project would likely disrupt and displace bicycle users of Shilshole Ave NW during construction. This impact would be temporary, and other streets in the vicinity, including Ballard Ave NW and Leary Ave NW, could be used by bicyclists during the construction period.

The series of shoreline street ends along the Ship Canal, including the 14th Ave NW boat ramp and the public pier at 24th Ave NW, are accessible from streets included on the Shilshole South Alternative route, including NW 54th St, Shilshole Ave NW, and NW 45th St. During construction, it could be more difficult to access these street end parks, and construction activities may be audible and visible to park users. However, construction duration at any one location would be relatively short, and access to street ends would be maintained. It may not be possible to maintain access to the 20th Ave NW street end during construction within the immediate vicinity of that street, as it is only accessible from Shilshole Ave NW. However, other street ends would be accessible within four or six blocks distance, so impacts would be minor.

Operation

Recreation Uses

As described in Section 5.3.2, completion of the Shilshole South Alternative would provide additional recreational opportunities in the study area and would improve recreational connectivity for users of the regional bicycle trail network.

The Shilshole South Alternative, along with the Preferred Alternative, would be the most disconnected from commercial areas of Ballard with high pedestrian circulation as compared to the other Build Alternatives. Therefore, it would provide a similar recreational experience to existing segments of the BGT. This route would not cross through any intersections that are currently signalized, which would be preferable for trail users, particularly bicyclists.

This alternative would run the closest to the Ship Canal and Salmon Bay. The trail would run within one block of the 14th Ave NW boat ramp, the 24th Ave NW pier, and the recently developed 28th Ave NW street end. The trail would run directly adjacent to the currently undeveloped 15th Ave NW street end and the 20th Ave NW street end. SDOT's Shoreline Street Ends Program is dedicated to preserving and improving public use of shoreline street ends. This alternative would support that program by increasing access to the street ends.

Consistency with Recreation Plans

As described in Section 5.3.2, the Missing Link project would be consistent with a variety of recreation plans. However, Shilshole Ave NW and the rest of the proposed Shilshole South Alternative route are not within the Ballard Hub Urban Village in the City of Seattle Comprehensive Plan. The Ballard Hub Urban Village has a variety of goals and policies related to improving recreation and open space. Shilshole Ave NW is mapped within the BINMIC, which does not have any policies or goals for recreation or open space. Although the Shilshole South Alternative would technically be outside of the Ballard Hub Urban Village, it would still meet the recreation and open space goals of the neighborhood by linking the existing trail segments and connecting recreational and open space areas within the neighborhood.

Trail User Conflicts and Safety Concerns

The Shilshole South Alternative route would likely be a preferable route for bicyclists and commuters, as there would be no signalized intersections. The route would cross six unsignalized intersections. Although this route would run through fewer intersections (both signalized and unsignalized) than the Ballard Avenue and Leary Alternatives, it would pass 37 driveways and loading zone spaces. While construction of the Missing Link along the Shilshole South Alternative would greatly increase safety for trail users, some users may choose not to use this trail segment due to the perception of risk from busy intersections and driveways, and prevalence of industrial traffic.

5.3.5 **Shilshole North Alternative**

Construction

Impacts to Existing Recreation Uses

Impacts would be the same as for the Shilshole South Alternative (Section 5.3.4), although disruption to shoreline street end recreational sites would be lower; the route would be an additional block removed

from the 28th Ave NW and 14th Ave NW street ends and would be across the street from the 20th Ave NW street end.

Operation

Recreation Uses

The Shilshole North Alternative would provide a similar recreational experience to the Shilshole South Alternative (Section 5.3.4), but trail users who want to access shoreline street end parks would need to cross Shilshole Ave NW, a busy road with only one dedicated crossing point (at NW Vernon Pl). Therefore, this alternative would not provide as much connectivity to existing recreational sites as the Shilshole South Alternative. The route would also run through five signalized intersections, which could affect the recreational experience of the trail for bicyclists.

Consistency with Recreation Plans

Impacts would be the same as for the Shilshole South Alternative (Section 5.3.4).

Trail User Conflicts and Safety Concerns

Impacts would be similar to the Shilshole South Alternative (Section 5.3.4), but the route would run through 8 additional intersections (14 total). Five of the intersections would be signalized. Trail users would be required to turn left at the 24th Ave NW and NW Market St intersection. This route would also cross 54 driveways and loading zone spaces, more than would be crossed by the other three Build Alternatives. Individual trail users are likely to have different levels of comfort with the intersections and driveways along each potential Shilshole alternative.

5.3.6 **Ballard Avenue Alternative**

Construction

Impacts to Existing Recreation Uses

Construction of the Ballard Avenue Alternative would impact recreation along the construction route, including Marvin's Garden at 22nd Ave NW and Ballard Ave NW, which it would directly pass; and Bergen Place Park at 22nd Ave NW and NW Market St, which it would run past on the opposite side of 24th Ave NW. Construction would be audible and visible to park users at these parks during the construction period, which would be relatively short at these sites. Construction could also disrupt access to Marvin's Garden for some park users, but the park would remain open during the construction period and accessible from Ballard Ave NW. Construction of the Ballard Avenue Alternative along 22nd Ave NW and NW 56th St could be audible from Ballard Commons Park at 22nd Ave NW and NW 57th St. These impacts would be minor due to the short construction period and because the parks would remain open to the public.

Construction along Ballard Ave NW would be audible and visible to shoppers, diners, and other visitors to the historic Ballard Avenue Landmark District. Construction between NW Dock Pl and 22nd Ave NW would be relatively short. The Ballard Farmers Market could potentially continue to be held on Sundays during the construction period. The contractor would be required to contain the construction zone in order to provide unimpeded access to the Farmers Market and to keep the area safe and hazard free. However, it is possible that the Farmers Market could be required to relocate temporarily during construction along

Ballard Ave NW, which could result in adverse impacts to the recreational experience of the Farmers Market as well as other impacts to the surrounding neighborhood.

Operation

Recreation Uses

As described in Section 5.3.2, completion of the Ballard Avenue Alternative would provide additional recreational opportunities in the study area and would improve recreational connectivity for users of the regional bicycle trail network.

The Ballard Avenue Alternative would run through the Ballard Avenue Landmark District, which would provide a different recreational experience than the Shilshole alternatives and other existing segments of the BGT. This route is likely more desirable for pedestrians, particularly those visiting the historic Landmark District for recreational purposes.

Ballard Ave NW between 22nd Ave NW and NW Vernon St is currently closed on Sundays for the Ballard Farmers Market, which runs from 10:00 AM to 3:00 PM. During the Farmers Market, the trail could be heavily congested. It is possible that some bicyclists would continue to ride through the Market. It is likely that walkers and joggers using the trail would continue on the same route through the Farmers Market, contributing to congestion. The Farmers Market is typically very crowded with customers, often with strollers, dogs, and small children. The conflict between the BGT and the Farmers Market would likely decrease the recreational experience of both. SDOT would consider options for avoiding this conflict, including detouring the trail around the Market on Sunday, coordinating with the Farmers Market to reconfigure the layout of the Market while maintaining a 20-foot fire lane, or moving the Market to a new location. These options have the potential to alter the recreational experience of the Farmers Market, the BGT, or both. Based on comments received on the DEIS, it is acknowledged that the level of impact to the Farmers Market would be likely be more substantial than identified in the DEIS analysis.

The Ballard Avenue Alternative would cross four signalized intersections and one intersection with a rapid flashing beacon. Crossing this many signalized intersections in a short portion of the BGT would decrease the desirability of this portion of the route for bicyclists and other BGT users and would provide a substantially different recreational experience than provided by existing portions of the trail.

Consistency with Recreation Plans

As described in Section 5.3.2, the Missing Link project would be consistent with a variety of recreation plans. Unlike the Shilshole alternatives, the Ballard Avenue Alternative would run through the Ballard Urban Hub Village and would meet the recreational goals of that neighborhood.

Trail User Conflicts and Safety Concerns

The Ballard Avenue Alternative is likely to be a desirable trail segment for pedestrians, particularly those visiting the Ballard Avenue Landmark District. However, an increase in pedestrian use of the BGT along this segment would likely increase trail user conflicts between pedestrians and bicyclists.

If the conflict between the Farmers Market and trail users is not avoided by detouring the trail, reconfiguring the Market, or moving the Market to another location, BGT users would likely continue along the BGT route through the Market, creating user conflicts between BGT users and Farmers Market attendees. Particularly if bicyclists choose to ride through the Farmers Market, there could be safety

issues as described in Chapter 7, Transportation. While the BGT would not be closed, some trail users would likely use adjacent streets to travel between segments of the BGT to avoid congestion, most likely traveling on Leary Ave NW or Shilshole Ave NW. Bicyclists and other trail users using adjacent roads that are not part of the multi-use trail system would experience lower safety levels than they experience while using the multi-use trail system. This would be particularly true when trail users are diverted from the trail as traffic from cars increases from visitors to the Farmers Market.

The Ballard Avenue Alternative would cross approximately 41 driveways and loading zone spaces, and the route would cross 15 intersections. While four intersections would be signalized (and a fifth intersection would have a rapid flashing beacon), some trail users could still perceive risk crossing these intersections, making this portion of the trail undesirable to them.

5.3.7 **Leary Alternative**

Construction

Impacts to Existing Recreation Uses

Construction impacts of the Leary Alternative would be the same as for all Build Alternatives, as described in Section 5.3.2.

Operation

Recreation Uses

The Leary Alternative would provide a different recreational experience than the Shilshole or Ballard Avenue Alternatives. Leary Ave NW and NW Market St are currently major arterials with four lanes of traffic, although both roads along the trail alignment would be reduced to one lane in each direction with a center two-way left turn lane. NW Market St between 22nd Ave NW and 24th Ave NW is a busy commercial district, but the other portions of the route feature less pedestrian foot traffic. The Leary Alternative route would include eight signalized intersections, the most of any of the alternative routes and substantially more than any existing portion of the BGT, potentially making it a less desirable route for bicyclists and other trail users.

Consistency with Recreation Plans

Impacts would be the same as for the Ballard Avenue Alternative as described in Section 5.3.6.

Trail User Conflicts and Safety Issues

The Leary Alternative would cross 29 driveways and loading zone spaces, fewer than the other alternatives. However, the Leary Alternative would also cross 17 intersections. While eight of these intersections are signalized, it is still possible that some trail users would find the route undesirable due to a perceived lack of safety when crossing these intersections. There may be increased trail user conflicts on the portions of the route adjacent to NW Market St as more pedestrians use the trail.

5.3.8 Connector Segments

Construction

Impacts to Existing Recreation Uses

Impacts from construction of connector segments would be the same as for all Build Alternatives, as described in Section 5.3.2.

Operation

Operational impacts associated with connector segments would be the same as for all Build Alternatives, as described in Section 5.3.2. The NW Vernon Street connector segment would require signalization of the intersection of NW Vernon St and Shilshole Ave NW, potentially reducing the recreational quality for some bicyclists but increasing perception of safety for others. Some connector segments would require trail users to make left turns at intersections, such as at 14th Ave NW and NW Leary Way; 17th Ave NW and NW Leary Way; 20th Ave NW and Leary Ave NW; and Ballard Ave NW and NW Market St. These left turns could make these routes undesirable for some trail users due to safety concerns.

5.4 Avoidance, Minimization, and Mitigation Measures

5.4.1 Measures Common to All Alternatives

The following measures would be used to minimize impacts on existing recreational activities:

- Implement construction BMPs such as wetting and covering disturbed soils, washing vehicle tires and undercarriages, and shutting off idling equipment to control fugitive dust and vehicle emissions.

The following measures would be used to minimize trail user conflicts and enhance safety:

- Install signage indicating limits of the trail right-of-way, trail etiquette, and yield protocols.
- Provide signage warning trail users they are approaching signalized or unsignalized intersections.
- Design the trail to meet applicable accessibility guidelines, including current design standards for curves and sight distance, based on a design speed for the fastest users, bicyclists.

5.4.2 Measures Specific to Alternatives

For the Ballard Avenue Alternative, SDOT would coordinate with the Ballard Farmers Market to determine the best method of coordinating trail use through or around the Market. The Market may need to be relocated or reconfigured to allow for both uses in the same general area, or the trail could be detoured around the Farmers Market on Sundays.

CHAPTER 6: UTILITIES

6.1 Introduction

This section describes the public utilities present in the Missing Link study area, potential impacts related to construction and operation, and potential mitigation measures. Utilities addressed in the analysis include water, wastewater, storm drainage, solid waste, electricity, natural gas, and telecommunication services.

Changes from the DEIS

Chapter 6 includes analysis of the newly developed Preferred Alternative, which was not included in the DEIS. No other substantive revisions were made to this chapter, relative to the DEIS.

6.2 Affected Environment

Numerous utilities are located in the highly industrialized study area. This section describes the utilities currently identified within or adjacent to the alternative alignments. Additional site-specific identification of utilities would be required prior to any construction activity. Only the locations of utilities that would potentially be disrupted or relocated by the project are described.

SCL provides electrical service within the study area. Electrical lines run along and across all roads included in the five Build Alternatives and connector segments. Natural gas service is provided by Puget Sound Energy (PSE).

SPU provides sanitary sewer and potable water service within the study area. Wastewater and water lines run along and across all roads included in the five Build Alternatives as well as the connector segments. SPU also provides storm drainage and solid waste collection. The study area drains to the combined sewer system. In a combined sewer system, stormwater is diverted with other wastewater to the sanitary sewer system and then onto a wastewater treatment plant. During wet weather conditions, stormwater runoff from streets, parking lots, and roof drains can exceed the capacity of the sewer system. If flow rates in the combined sewer exceed the capacity of the system, the excess flow of stormwater and untreated sewage is discharged into water bodies through permitted outfalls, resulting in a combined sewer overflow event. In the study area, untreated flows discharge into the Lake Washington Ship Canal during high flow events. SPU has adopted the *Plan to Protect Seattle's Waterways* (SPU 2015) and is pursuing projects to reduce combined sewer overflow events in the study area.

Telecommunication services in the study area are provided by private companies including CenturyLink and Comcast.

6.3 Potential Impacts

6.3.1 No Build Alternative

Under the No Build Alternative, a multi-use trail segment would not be constructed in the study area. There would be no disruption or relocation of any public or private utility lines or facilities related to the BGT.

6.3.2 Impacts Common to all Build Alternatives

Construction

Construction of the Build Alternatives has the potential to impact utilities. Construction would occur in segments. Construction duration in any one location would depend on the extent of utility relocations required, storm drainage improvements needed, and the existing roadway reconfigurations. During construction, temporary utility outages could occur. Utility relocations during construction could include movement of fire hydrants, stormwater catch basins, and overhead utilities as well as the installation of new drainage structures. Because all utilities are present on all streets in the Build Alternatives, all utilities have the potential to be impacted by construction activities.

The Missing Link project could require the relocation of overhead power lines, light poles, or fire hydrants in some locations where the roadway would shift into areas that are currently occupied by a parking strip or parking areas. Areas where this could occur are described below under each alternative. Where this would occur, SDOT would coordinate with SPU and/or SCL and would relocate any affected utilities. Long-term operation of the utilities would not be impacted.

In some locations, solid waste, recycling, and yard waste receptacle placements may need to be temporarily relocated to accommodate construction equipment. SPU would identify temporary locations and communicate with property and business owners.

Operation

The trail would not impact the long-term operation of utilities. In some locations, solid waste, recycling, and yard waste receptacle placements may need to be permanently relocated. SPU would identify new locations and communicate with property and business owners.

6.3.3 Preferred Alternative

Construction

Construction impacts would be the same as described in Section 6.3.2 for all Build Alternatives.

The following above-ground utilities may need to be relocated:

- Street lights on the north side of NW 46th St;
- Utility poles, overhead power lines, and street lights on the south side of NW Market St; and
- Street lights and a fire hydrant on NW 54th St.

Operation

Operational impacts would be the same as described in Section 6.3.2 for all Build Alternatives.

The Preferred Alternative would result in new and replaced impervious surface area as some of the gravel shoulder and roadway would be rebuilt to accommodate the trail. Any additional impervious surface area would increase stormwater runoff. However, the additional area would be relatively small compared to the overall area draining to the combined sewer system, so the impact would not be significant. New stormwater systems and storm drainage improvements, and relocation of stormwater catch basins to manage runoff from the trail, may also improve existing stormwater drainage problems.

6.3.4 Shilshole South Alternative

Construction

Construction impacts would be the same as described in Section 6.3.2 for all Build Alternatives.

Operation

Operational impacts to utilities from the Shilshole South Alternative are not anticipated.

The Shilshole South Alternative would result in new and replaced impervious surface area as some of the gravel shoulder, and roadway would be rebuilt to accommodate the trail. Any additional impervious surface area would increase stormwater runoff to the combined sewer system. However, the additional area would be relatively small compared to the overall area draining to the combined sewer system, so the impact would not be significant.

6.3.5 Shilshole North Alternative

Construction

The following above-ground utilities may need to be relocated:

- Street lights on the north side of NW 46th St;
- Utility poles and overhead power lines on the north side of Shilshole Ave NW;
- Utility poles, overhead power lines, and street lights on the south side of NW Market St; and
- Street lights and a fire hydrant on NW 54th St.

Operation

Operational impacts would be the same as described in Section 6.3.2 for all Build Alternatives.

6.3.6 Ballard Avenue Alternative

Construction

The following above-ground utilities may need to be relocated:

- Utility poles and overhead lines on both sides of NW 56th St;
- Utility poles and overhead lines on the east side of 28th Ave NW;
- Utility poles, overhead power lines, and street lights on the south side of NW Market St; and
- Street lights and a fire hydrant on NW 54th St.

While each Build Alternative would require the installation of new stormwater management facilities, stormwater management would be particularly necessary on Ballard Ave NW. Because Ballard Ave NW is crowned, the roadway portion that includes the BGT would likely need to be built up above its current level. Without changing the existing storm drainage system, it would be too far below the grade of the new trail segment to work properly, and water would likely pond on the sidewalk.

Residential property owners along the south side of NW 56th St between 26th Ave NW and 28th Ave NW could be required to place garbage, recycling, and yard waste receptacles on the other side of the street on pick-up days. This impact would only occur when construction activities were directly adjacent to their properties.

Operation

Operational impacts would be the same as described in Section 6.3.2 for all Build Alternatives.

6.3.7 Leary Alternative

Construction

The following above-ground utilities may need to be relocated:

- Utility poles on the east side of 11th Ave NW;
- Street lights on the south side of NW Leary Way;
- Street lights and utility poles on the southwest side of Leary Ave NW;
- Utility poles, overhead power lines, and street lights on the south side of NW Market St; and
- Street lights and a fire hydrant on NW 54th St.

Operation

Operational impacts would be the same as described in Section 6.3.2 for all Build Alternatives.

6.3.8 Connector Segments

Construction

Most connector segments have utility poles and/or street lights that may need to be relocated, depending on trail design.

Operation

Operational impacts would be similar to those described in Section 6.3.2 for the Build Alternatives.

6.4 Avoidance, Minimization, and Mitigation Measures

6.4.1 Measures Common to All Alternatives

Avoidance, minimization, and mitigation measures related to utilities would include the following:

- Close coordination with utility providers to identify and physically locate utilities prior to any construction activity.
- Communication with property owners prior to any construction activity to obtain input on the locations of utility connections that may not be documented.

- Notification of property owners in advance of disruptions in service to affected utilities.
- Compliance with code requirements to install stormwater systems and storm drainage improvements as well as to relocate stormwater catch basins to manage runoff from the trail, which may also improve existing stormwater drainage problems.

CHAPTER 7: TRANSPORTATION

7.1 Introduction

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

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

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

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

Changes from the DEIS

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

7.2 Affected Environment

7.2.1 Study Area

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

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

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

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

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

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

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

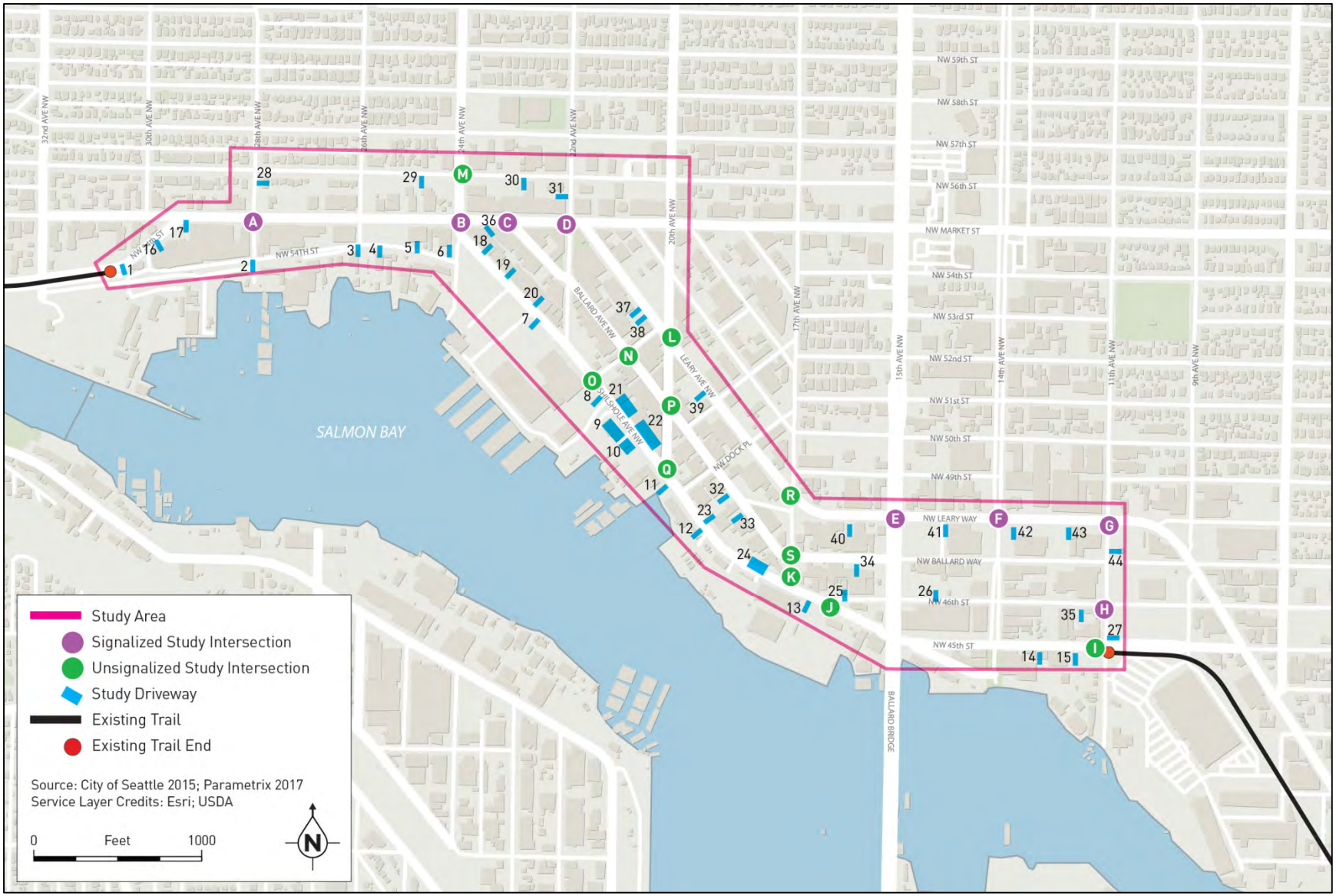


Figure 7-1. Transportation Discipline Study Area and Study Intersections and Driveways

7.2.2 **Roadway Network**

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

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

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

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

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

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

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

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

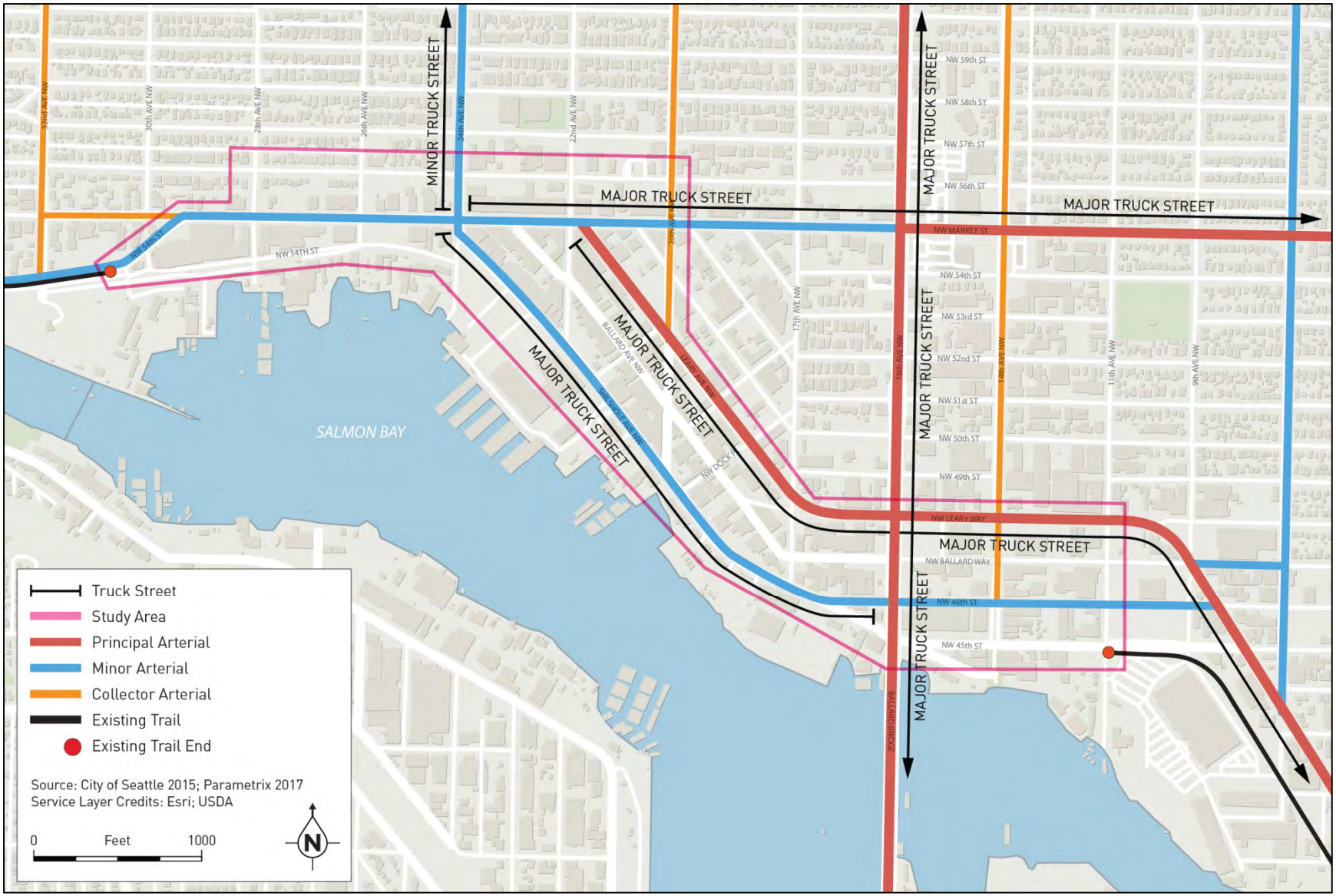


Figure 7-2. Transportation Discipline Study Area Roadway Hierarchy

7.2.3 Intersection Operations and Driveway Delay

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

Table 7-1. Level of Service Thresholds

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

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

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

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

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

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

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

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

ID[1]	*Intersection*	*Traffic Control*	*2015 Existing Conditions PM Peak Hour*[2]	
			LOS	*Delay (sec)*
A	NW Market St/28th Ave NW	Signal	A	6
B	NM Market St/24th Ave NW	Signal	D	42
C	NM Market St/Ballard Ave NW	Pedestrian Half Signal	A	8
D	NW Market St/22nd Ave NW/ Leary Ave NW	Signal	D	54
E1	15th Ave NW/NW Leary Way Southbound Off-Ramp	Signal	B	15
E2	15th Ave NW/NW Leary Way Northbound Off-Ramp	Signal	E	61
F	NW Leary Way/14th Ave NW	Signal	A	8
G	NW Leary Way/11th Ave NW	Signal	B	14
H	11th Ave NW/NW 46th St	Signal	B	18
I	11th Ave NW/NW 45th St	Unsignalized	A	10
J	NW 46th St/Shilshole Ave NW	Unsignalized	A	8
K	Shilshole Ave NW/NW 17th St	Unsignalized	E	46
L	Leary Ave NW/20th Ave NW	Unsignalized	F	260
M	NW 56th St/24th Ave NW	Unsignalized	F	54
N	NW Vernon Pl/Ballard Ave NW	Unsignalized	C	18
O	NW Vernon Pl/Shilshole Ave NW	Unsignalized	C	19
P	Ballard Ave NW/20th Ave NW	Unsignalized	B	14
Q	Shilshole Ave NW/20th Ave NW	Unsignalized	C	18
R	NW Leary Way/17th Ave NW	Unsignalized	F	50
S	NW Ballard Way/17th Ave NW	Unsignalized	A	9

[1] ID number matches ID number on Figure 7-1 and Figure 7-3.
[2] Existing conditions delay is based on volume data collected in 2015, 2016, and 2017; however, 2015 still serves as the baseline year.

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

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

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

ID[1]	*Driveway*	*2015 Existing Conditions PM Peak Hour Delay (sec)*[2]
24	Shilshole Ave NW/Salmon Bay Sand and Gravel Maintenance	22
25	NW 46th St/Ballard Marine	19
26	NW 46th St/Ballard Blocks Development	38
27	11th Ave NW/U.S. Post Office	0
28	28th Ave NW/Townhomes	9
29	NW 56th St/Mark24	9
30	NW 56th St/Ballard Square Parking	12
31	22nd Ave NW/Chase Bank	14
32	Ballard Ave NW/Ballard Sheet Metal Works	10
33	Ballard Ave NW/Ballard Hardware Loading Zone	0
34	NW Ballard Way/Warden Fluid Dynamics	11
35	NW 46th St/Radtke Marine	10
36	NW Market St/Alley	12
37	Leary Ave NW/Ballard Landmark	11
38	Leary Ave NW/Public Parking/Caffè Fiore	12
39	Leary Ave NW/Carter Subaru Ballard	9
40	NW Leary Way/BOLT Modern Storage	18
41	NW Leary Way/Quest Church	14
42	NW Leary Way/Office Max	10
43	NW Leary Way/U-Haul	19
44	11th Ave NW/7-Eleven	10

[1] ID number matches ID number on Figure 7-1.
[2] Existing conditions delay is based on driveway volume data collected in 2015, 2016, and 2017; however, 2015 still serves as the baseline year.

7.2.4 **Freight**

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

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

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

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

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

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

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

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

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

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

Table 7-4. 2015 Representative Driveway Movements and Operations[1]

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

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

7.2.5 Nonmotorized Users

Nonmotorized Facilities

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

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

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

Pedestrian and Bicycle Volumes

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

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

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

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

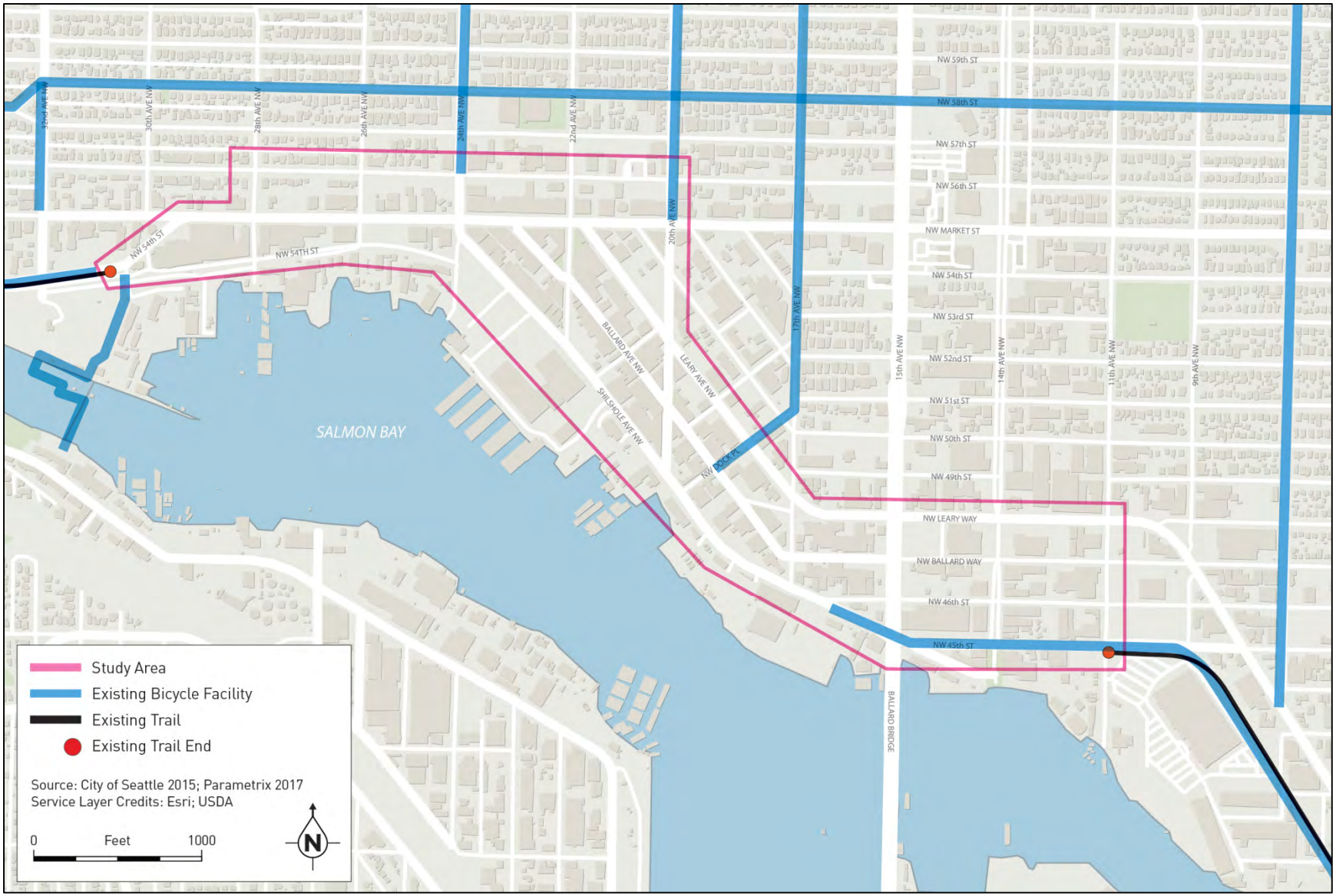


Figure 7-4. Existing Conditions Study Area Bicycle Facilities

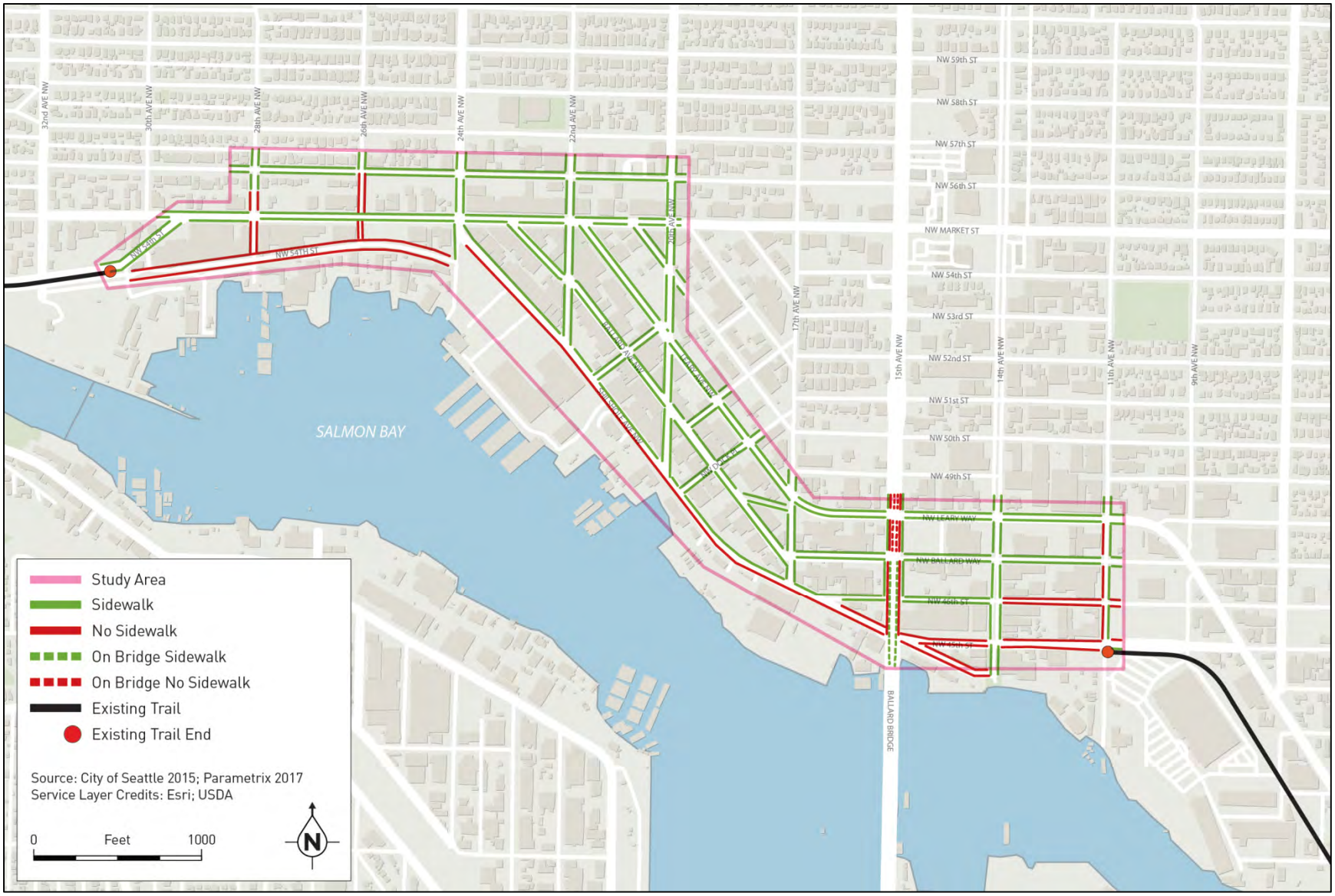


Figure 7-5. Existing Conditions Study Area Sidewalks

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

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

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

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

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

PM Peak Hour	*Total Bicycles*	*Westbound Bicycles*	*Eastbound Bicycles*	*Total Pedestrians*	*Westbound Pedestrians*	*Eastbound Pedestrians*
5:00–6:00 PM	190	145	45	50	35	15

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

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

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

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

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

7.2.6 Public Transportation

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

7.2.7 Freight Rail

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

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

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

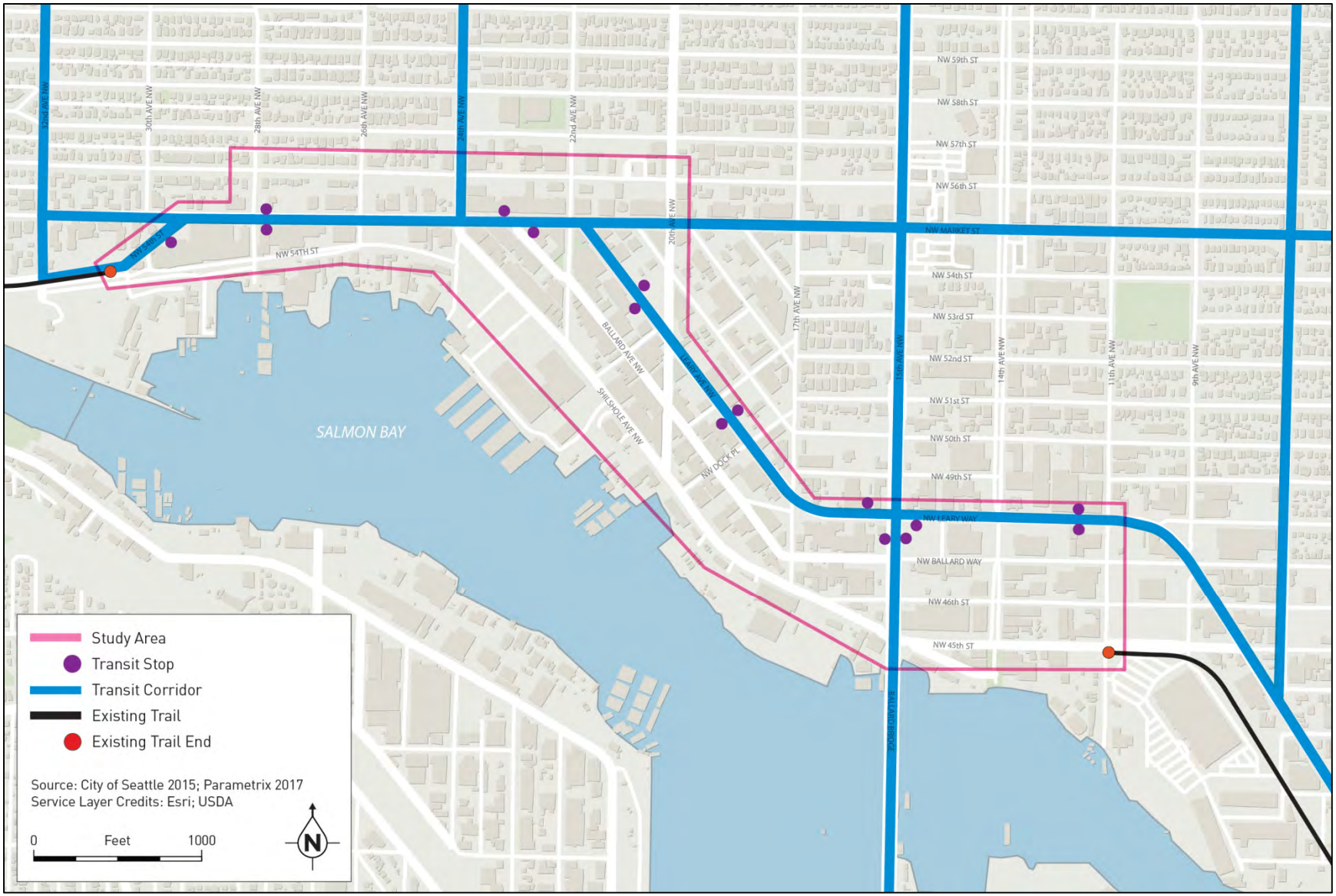


Figure 7-6. Existing Conditions Transit Stops and Corridors

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

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

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

7.2.8 **Safety**

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

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

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

Figure 7-7. Study Area Corridor Collisions

Figure 7-8. Study Area Intersection Collisions

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

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

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

7.3 Potential Impacts

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

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

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

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

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

Figure 7-9. Study Area Collisions Involving Nonmotorized Users

Figure 7-10. Study Area Nonmotorized Incident Responses

7.3.1 No Build Alternative

Construction

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

Operation

Roadway Network

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

Traffic Volumes and Operations

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

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

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

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

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

Freight

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

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

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

Nonmotorized Facilities

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

Pedestrian and Bicycle Volumes

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

Public Transportation

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

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

Freight Rail

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

Safety

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

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

7.3.2 Impacts Common to All Build Alternatives

Construction

Traffic Volumes and Operations

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

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

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

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

Delays resulting from these sources are likely to be temporary.

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

Freight

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

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

Nonmotorized Facilities

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

Public Transportation

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

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

Freight Rail

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

Safety

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

Operation

Roadway Network

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

Traffic Volumes and Operations

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

Freight

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

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

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

Nonmotorized Facilities

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

Pedestrian and Bicycle Volumes

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

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

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

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

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

Safety

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

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

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

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

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

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

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

7.3.3 **Preferred Alternative**

Construction

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

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

Operation

Roadway Network

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

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

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

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

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

Traffic Volumes and Operations

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

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

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

Intersections where LOS would improve include:

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

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

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

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

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

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

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

LOS would worsen at the following intersection:

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

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

Freight

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

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

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

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

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

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

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

Nonmotorized Facilities

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

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

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

Public Transportation

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

Freight Rail

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

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

Safety

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

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

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

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

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

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

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

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

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

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

7.3.4 Shilshole South Alternative

Construction

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

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

Operation

Roadway Network

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

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

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

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

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

Traffic Volumes and Operations

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

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

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

Intersections where LOS would improve include:

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

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

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

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

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

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

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

Freight

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

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

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

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

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

Nonmotorized Facilities

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

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

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

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

Public Transportation

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

Freight Rail

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

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

Safety

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

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

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

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

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

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

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

7.3.5 Shilshole North Alternative

Construction

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

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

Operation

Roadway Network

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

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

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

Traffic Volumes and Operations

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

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

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

The intersections where LOS would improve include:

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

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

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

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

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

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

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

LOS would worsen at the following intersections:

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

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

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

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

Freight

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

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

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

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

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

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

Nonmotorized Facilities

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

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

Public Transportation

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

Freight Rail

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

Safety

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

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

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

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

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

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

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

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

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

7.3.6 Ballard Avenue Alternative

Construction

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

Operation

Roadway Network

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

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

Traffic Volumes and Operations

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

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

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

Intersections where LOS would improve include:

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

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

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

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

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

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

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

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

LOS would worsen at the following intersections:

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

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

Freight

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

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

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

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

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

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

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

Nonmotorized Facilities

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

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

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

Public Transportation

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

Freight Rail

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

Safety

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

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

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

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

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

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

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

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

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

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

7.3.7 Leary Alternative

Construction

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

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

Operation

Roadway Network

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

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

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

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

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

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

Traffic Volumes and Operations

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

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

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

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

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

The intersections where LOS would improve include:

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

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

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

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

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

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

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

LOS would worsen at the following intersections:

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

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

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

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

Freight

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Nonmotorized Users

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

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

Public Transportation

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

Freight Rail

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

Safety

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

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

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

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

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

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

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

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

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

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

7.3.8 Connector Segments

Construction

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

Operation

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

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

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

7.4 Avoidance, Minimization, and Mitigation Measures

7.4.1 Measures Common to All Alternatives

Construction

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

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

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

Operation

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

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

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

7.4.2 Measures Specific to Each Alternative

Preferred Alternative

Traffic Operations

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

Freight

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

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

Nonmotorized Users

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

Public Transportation

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

Freight Rail

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

Safety

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

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

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

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

Shilshole South Alternative

Traffic Operations

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

Freight

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

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

Nonmotorized Users

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

Public Transportation

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

Freight Rail

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

Safety

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

Shilshole North Alternative

Traffic Operations

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

Freight

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

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

Nonmotorized Users

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

Public Transportation

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

Freight Rail

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

Safety

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

Ballard Avenue Alternative

Traffic Operations

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

Freight

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

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

Nonmotorized Users

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

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

Public Transportation

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

Freight Rail

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

Safety

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

Leary Alternative

Traffic Operations

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

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

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

Freight

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

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

Nonmotorized Users

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

Public Transportation

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

Freight Rail

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

Safety

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

CHAPTER 8: PARKING

8.1 Introduction

This chapter describes publicly available on-street and off-street parking in the BGT Missing Link study area and analyzes the potential impacts of project construction and operation on these resources. The Parking Discipline Report (Parametrix, 2017) describes in detail the methods used to identify and evaluate parking in the study area. Analysts relied on the following three recent parking studies to determine the on-street and off-street parking conditions in the study area in 2017:

- The 2015 Ballard Parking Study—on-street parking (SDOT, 2015a);
- The 2017 BGT Missing Link Parking Study—on-street and off-street parking (IDAX, 2017); and
- The Ballard Off-street Parking Study, July 2014—off-street parking (SDOT, 2014).

Changes from the DEIS

Chapter 8 was updated to reflect comments received on the DEIS and to include analysis of the Preferred Alternative. Additional evening and weekend parking data were collected to provide more information on potential impacts. Other edits were made to correct errors and improve clarity.

These three studies were used because they were completed recently and cover the entire study area.

8.2 Affected Environment

The study area for the Missing Link parking analysis is the area bounded by the Ship Canal to the south, 9th Ave NW to the east, NW 50th St/Tallman Ave NW/NW 58th St to the north, and 32nd Ave NW to the west (Figure 8-1). For the portions of the study area bounded by a street, the study area includes the entire street. This area, which is approximately two blocks from the most peripheral of the Build Alternatives, is the distance most people would be willing to walk to their destinations after parking, accounting for such factors as the trip purpose, topography, the walking environment, and available time.

The affected environment consists of the parking supply, parking occupancy, and parking utilization in the study area in 2017. These terms are defined as follows:

- **Parking supply** comprises all publicly available on-street and off-street parking spaces in the study area, whether available at no cost or for a fee.
- **Parking occupancy** is the number of parking spaces that are occupied at a given time.
- **Parking utilization** is the percentage of the parking supply that is being occupied at a given time.

Parking supply, occupancy, and utilization vary throughout the study area and fluctuate depending on the day of the week and the time of day. Therefore, data were collected during multiple hours of both weekdays and weekends. Data collected during any weekday are assumed to reflect typical weekday parking. Data collected during any weekend are assumed to reflect typical weekend parking.

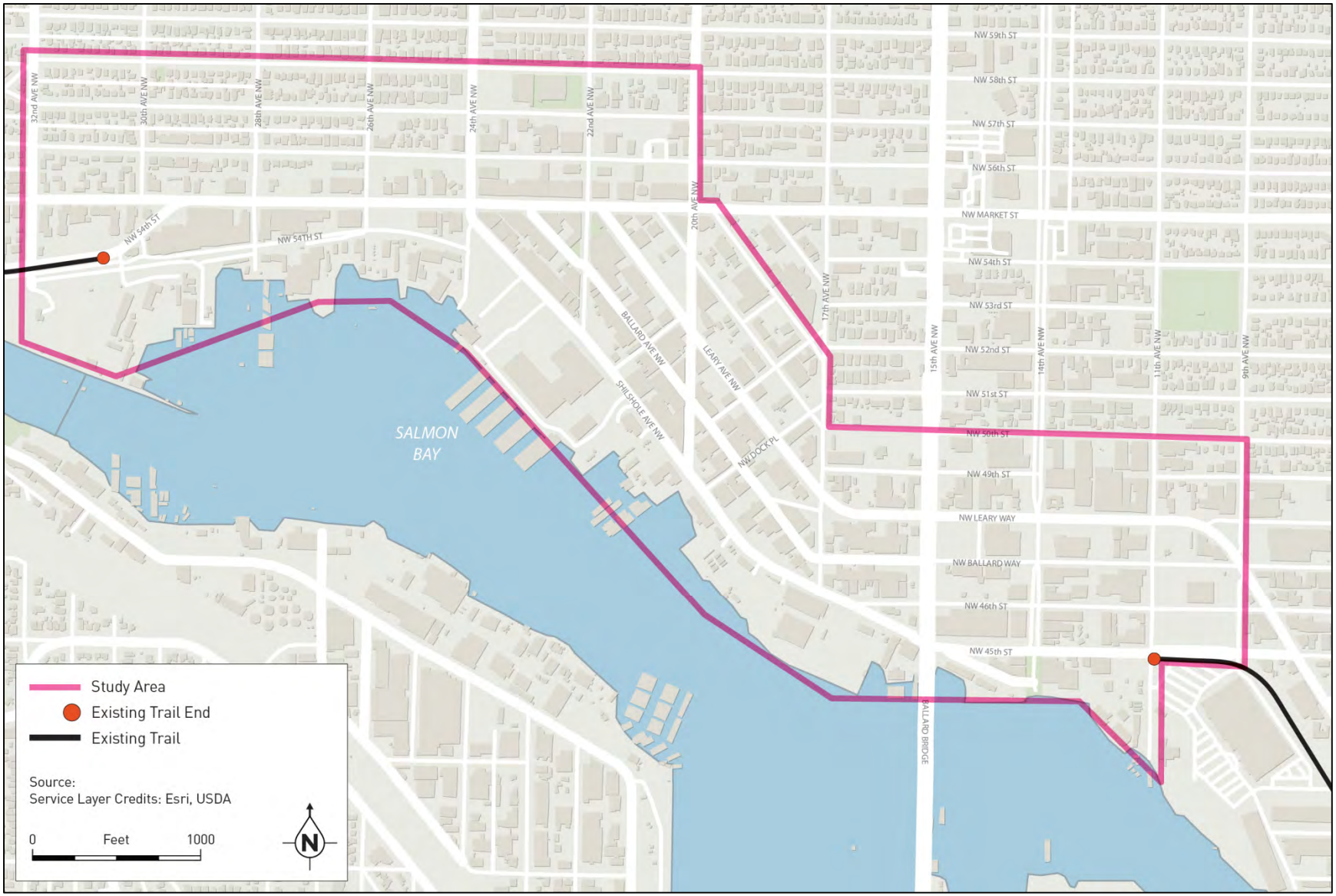


Figure 8-1. Parking Study Area

8.2.1 **Parking Supply**

The study area contains different types of parking supply. This analysis considered the following types of parking:

- On-street parking spaces;
- Off-street parking spaces available for public use; and
- On-street passenger and commercial loading spaces.

On-street and Off-street Parking

In the study area, on-street parking varies from short-term metered parking with 2-hour limits to unmetered spaces with no time limits. All on-street parking spaces in the study area, whether paid or unpaid, were included in the parking analysis.

Unstriped areas of City-owned right-of-way along some blocks of Shilshole Ave NW have historically been used by private businesses for parking and loading, although these areas are not formally organized and have not been expressly approved or permitted as parking areas by the City. The occupancy of parked vehicles depends on the efficiency of the drivers parking on a particular day. In some areas along Shilshole Ave NW, vehicles could be perpendicularly parked on one day and aligned in a parallel manner the next. These unpermitted spaces were counted as they are currently used, whether it is parallel, multiple parallel rows, perpendicular, or angled parking.

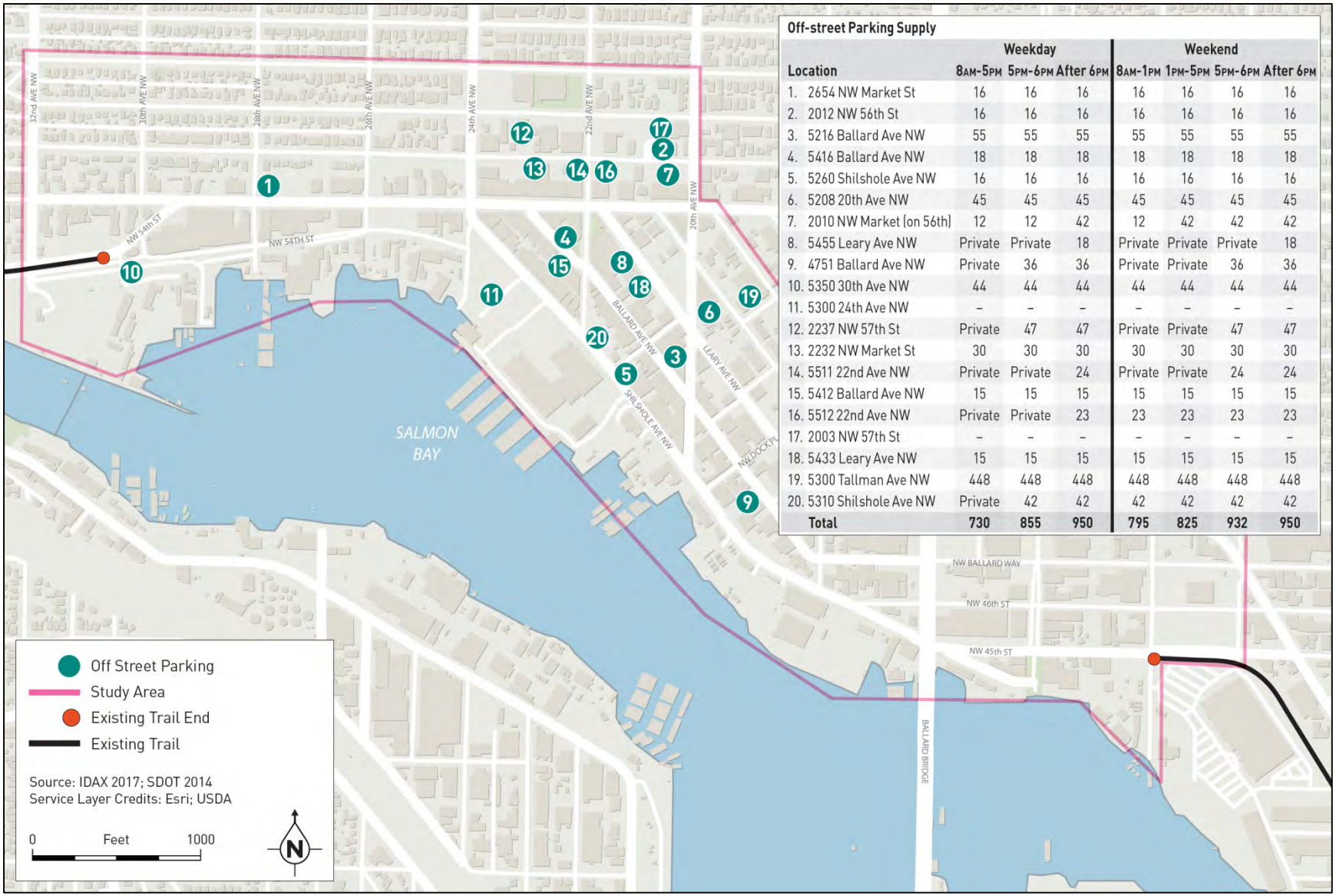
NW 54th St between 26th Ave NW and 30th Ave NW is not identified as a legal City street. While people do park on this section of NW 54th St, the parking was not counted as available public parking supply because it is not an officially sanctioned City street or public parking area.

A total of 20 off-street parking lots and garages were included in the parking analysis. Users of these off-street lots available for public use are generally required to pay lot-specific rates that vary by parking duration. The number of off-street parking lots and garages in the study area can change quickly, as new lots open and others close due to various factors, including new development displacing lots and garages or new lots and garages being built. This analysis provides the most accurate estimation of off-street parking at time of writing.

A total of 3,086 on-street parking spaces and a minimum of 730 off-street parking spaces are available for public use in the study area on weekdays (Table 8-1). The off-street parking supply varies throughout the day as well as by day of week. The weekday off-street supply from 8 AM to 5 PM is 730 spaces, from 5 PM to 6 PM it is 855 spaces, and after 6 PM it is 950 spaces. The weekend off-street supply from 8 AM to 1 PM is 795 spaces, from 1 PM to 5 PM it is 825 spaces, from 5 PM to 6 PM it is 932 spaces, and after 6 PM it is 950 spaces. To be conservative, the minimum off-street parking supply count for weekday (730) and weekend (795) is used in Table 8-1. Figure 8-2 shows the on-street parking supply for each block face in the study area, and Figure 8-3 shows the off-street parking supply for each lot and garage in the study area.

The weekend on-street parking supply can be affected by events such as the Ballard Farmers Market, which is held every Sunday on one block of Ballard Ave NW between NW Vernon Pl and 22nd Ave NW and on 22nd Ave NW between Ballard Ave NW and NW Market St. On Sundays, no on-street parking is allowed on this block between 6 AM and 5 PM, but all of the paid parking blocks in the study area are free on Sundays with no time restrictions; therefore, parking occupancy and utilization could be considerably different than on Saturdays.

Figure 8-2. On-Street Parking Supply



Off-street Parking Supply

	Weekday			Weekend			
Location	8AM-5PM	5PM-6PM	After 6PM	8AM-1PM	1PM-5PM	5PM-6PM	After 6PM
1. 2654 NW Market St	16	16	16	16	16	16	16
2. 2012 NW 56th St	16	16	16	16	16	16	16
3. 5216 Ballard Ave NW	55	55	55	55	55	55	55
4. 5416 Ballard Ave NW	18	18	18	18	18	18	18
5. 5260 Shilshole Ave NW	16	16	16	16	16	16	16
6. 5208 20th Ave NW	45	45	45	45	45	45	45
7. 2010 NW Market (on 56th)	12	12	42	12	42	42	42
8. 5455 Leary Ave NW	Private	Private	18	Private	Private	Private	18
9. 4751 Ballard Ave NW	Private	36	36	Private	Private	36	36
10. 5350 30th Ave NW	44	44	44	44	44	44	44
11. 5300 24th Ave NW	–	–	–	–	–	–	–
12. 2237 NW 57th St	Private	47	47	Private	Private	47	47
13. 2232 NW Market St	30	30	30	30	30	30	30
14. 5511 22nd Ave NW	Private	Private	24	Private	Private	24	24
15. 5412 Ballard Ave NW	15	15	15	15	15	15	15
16. 5512 22nd Ave NW	Private	Private	23	23	23	23	23
17. 2003 NW 57th St	–	–	–	–	–	–	–
18. 5433 Leary Ave NW	15	15	15	15	15	15	15
19. 5300 Tallman Ave NW	448	448	448	448	448	448	448
20. 5310 Shilshole Ave NW	Private	42	42	42	42	42	42
Total	**730**	**855**	**950**	**795**	**825**	**932**	**950**

Figure 8-3. Off-Street Parking Supply

Table 8-1. Parking Supply in Study Area

	Paid On-Street Supply[1]	*Non-Paid On-Street Supply*[2]	*Total On-Street Supply*	*Off-Street Parking Supply*[2]	*Total Parking Supply*
Weekday					
Number of Spaces	484	2,602	3,086	730	3,816
Percent of Total	13%	68%	81%	19%	100%
Weekend					
Number of Spaces	484	2,602	3,086	795	3,881
Percent of Total	12%	67%	79%	21%	100%

Sources:
[1] SDOT, 2015a.
[2] IDAX, 2017.

Loading Zone Spaces

Table 8-2 summarizes the existing loading zone spaces in the study area. In some cases, the City may post one sign for a loading zone that could accommodate multiple vehicles. Each loading zone sign was assumed to indicate one loading zone space. In total, 132 loading zone spaces are available in the study area; these spaces are relatively evenly distributed throughout the study area (Figure 8-4). Loading zone spaces are used for various purposes including commercial loading, passenger drop-off, and taxi loading.

Table 8-2. Loading Zone Spaces in Study Area

Unrestricted Loading Zone Spaces	*Passenger Loading Zone Spaces*	*Truck-Only Loading Zone Spaces*	*Commercial Vehicle Loading Zone Spaces*	*Total Loading Zone Spaces*
82	15	32	3	132

Source: SDOT, 2015b.

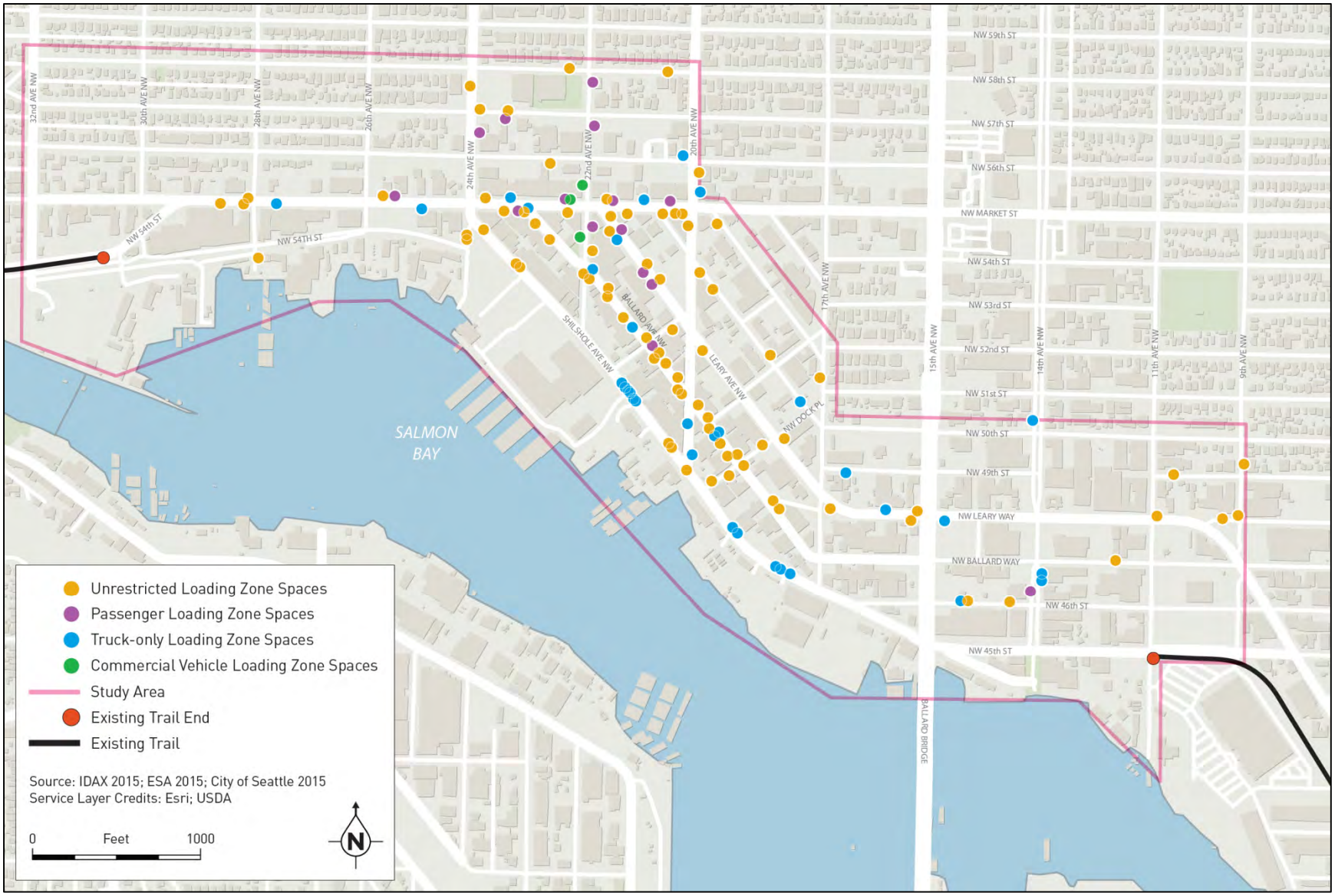


Figure 8-4. Loading Zone Spaces

8.2.2 Parking Occupancy and Utilization

SDOT sets an on-street utilization target range of 70 to 85% for commercial and mixed-use areas. However, SDOT does not have an on-street utilization target for residential and industrial areas, where parking turnover is less important. SDOT's on-street utilization target for commercial and mixed-use areas is consistent with SDOT's Annual On-Street Paid Parking Occupancy (SDOT, 2015a) requirements to manage paid parking areas so that one or two parking spaces are available per block face. At higher levels of utilization, it becomes difficult for a driver to find an on-street parking space. If the threshold of 85% for on-street parking utilization is exceeded, it is assumed that the motorists who would otherwise park on the street on a particular block would search farther for an on-street parking space or would use off-street parking.

Occupancy and Utilization by Time of Day—Weekday

Weekday occupancy and utilization data were collected during the AM and PM peak periods to capture the daily fluctuations in occupancy and utilization from business-related, retail-related, and residential parking. Occupancy and utilization data were collected at 8 AM, 9 AM, 3 PM, 4 PM, 5 PM, 6 PM, 7 PM, 8 PM, and 9 PM.

Table 8-3 summarizes the weekday on-street and off-street parking occupancy and utilization observed in the study area across the time periods studied for the 2017 existing conditions. On-street and off-street parking occupancy and utilizations are described separately below.

<u>On-Street Parking Occupancy and Utilization—Weekday</u>

As shown in Table 8-3, the occupancy and utilization for weekday on-street parking varies throughout the day. Major findings are as follows:

- Parking occupancy and utilization for paid parking varies dramatically throughout the day and is low in the morning and very high later in the evening. Paid parking utilization is highest at 7 PM and 8 PM (95%) and lowest at 8 AM (29%).
- Parking occupancy and utilization for non-paid parking is consistently moderate throughout the day. Non-paid parking utilization is highest at 9 AM (68%) and lowest at 9 PM (57%).

The following is a summary of on-street parking occupancy and utilization for each hour evaluated.

On-street parking utilization is highest at **8 AM** in the non-paid, residential blocks of central Ballard and on the northernmost blocks of the study area. The majority of the paid parking in Ballard has very low utilization at 8 AM. It is assumed that the main destination in the study area on weekdays is the Ballard central business district and the businesses on Shilshole Ave NW. It is also assumed that the non-paid, residential parking areas in the central portion of the study area, roughly south of NW Market St and west of 15th Ave NW, and the northernmost blocks may have high utilization due to residents leaving cars there. The non-paid, residential area in central Ballard has high utilization throughout all hours studied. West of 28th Ave NW, the residential density is lower; therefore, there is more available parking in the northwestern corner of the study area. Utilization in the southeast portion of the study area is mixed.

At **9 AM**, more of the non-paid parking in central Ballard has filled up, and some of the paid blocks also have high utilization. Some of the blocks in the northernmost portion of the study area have a decline in utilization from 8 AM to 9 AM. This could be due to some residents leaving for work outside of the study area. In the southeast portion of the study area, utilization increased slightly but is still mixed.

At **3 PM**, utilization is very different than during the morning hours studied. Utilization is still very high on the non-paid blocks in central Ballard, but by 3 PM most of the paid blocks have reached a moderate level of utilization, and some have reached over 85% utilization. Utilization on the northernmost blocks slightly increased after the morning, with the paid blocks seeing more usage.

Utilization declines slightly throughout the study area between 3 PM and **4 PM**. The central Ballard non-paid blocks are still highly utilized, but the paid blocks are less utilized. This could be due to some daytime workers leaving the study area and freeing up spaces for those who would have used paid blocks. The northern and southeastern portions of the study area are largely similar between 3 PM and 4 PM, with mixed utilization.

Utilization continues to decline slightly between 4 PM and **5 PM**. This could reflect more daytime workers leaving the study area for the day. At the same time, utilization on the paid blocks increases by 13%, possibly reflecting more people coming to the Ballard central business district for evening activities and evening restaurant/bar workers coming to work. The northern and southeastern portions of the study area are largely similar between 4 PM and 5 PM, with mixed utilization.

Utilization for the study area increases slightly at **6 PM**, but the geographic occupancy pattern is unique at 6 PM. Utilization for paid spaces in the Ballard central business district increases dramatically from 71 to 91%, possibly reflecting the high occupancy for evening activities in the study area. Utilization for non-paid spaces continues to decline slightly from its peak at 9 AM, possibly reflecting that many daytime workers have left the study area for the day. Utilization for the northern portion of the study area remains mixed, similar to the other hours during the day, while utilization for the southeastern portion of the study area slightly declines from 5 PM.

Utilization for the study area increases slightly at **7 PM**. Utilization for paid spaces in the Ballard central business district continued to increase to almost capacity at 95%, reflecting the high utilization for evening activities in the study area. Utilization for non-paid spaces stayed similar to 6 PM, possibly reflecting that many daytime workers have left the study area for the day. Utilization for the northern portion of the study area started filling up, while utilization for the southeastern portion of the study area continued to decline.

Utilization for the study area decreased slightly at **8 PM**. Utilization for paid spaces in the Ballard central business district continued to be near capacity at 95%, reflecting the high utilization for evening activities in the study area. Utilization for non-paid spaces continued to decline slightly from its peak at 9 AM, possibly reflecting that many daytime workers have left the study area for the day. Utilization for the northern portion of the study area continued to increase, while utilization for the southeastern portion of the study area continued to decline.

Utilization for the study area continued to decrease slightly at **9 PM**. Utilization for paid spaces in the central business district started to decline from the peak of 95% at 7 and 8 PM to 92%. Utilization for non-paid spaces continued to decline slightly from its peak at 9 AM. Utilization for the northern portion of the study area continued to increase, while utilization for the southeastern portion of the study area continued to decline with a large amount of availability in this area.

Table 8-3. Overall On-Street Parking Occupancy and Utilization—Weekday

Parking Type	*Parking Supply*	*Weekday Occupancy and Utilization (%)*																	
		8 AM		*9 AM*		*3 PM*		*4 PM*		*5 PM*		*6 PM*		*7 PM*		*8 PM*		*9 PM*	
		Occupancy	*Utilization*	*Occupancy*	*Utilization*	*Occupancy*	*Utilization*	*Occupancy*	*Utilization*	*Occupancy*	*Utilization*	*Occupancy*	*Utilization*	*Occupancy*	*Utilization*	*Occupancy*	*Utilization*	*Occupancy*	*Utilization*
Paid	484	139	29%	206	43%	323	67%	280	58%	343	71%	440	91%	461	95%	460	95%	447	92%
Non-Paid	2,602	1,706	66%	1,779	68%	1,754	67%	1,684	65%	1,579	61%	1,564	60%	1,595	61%	1,564	60%	1,482	57%
Total	3,086	1,845	60%	1,985	64%	2,077	67%	1,964	64%	1,922	62%	2,004	65%	2,056	67%	2,024	66%	1,929	63%

Sources: SDOT, 2015a; IDAX, 2017.

Off-Street Parking Occupancy and Utilization—Weekday

Table 8-4 summarizes weekday off-street parking occupancy and utilization within the study area. Utilization by time ranges from a high of 71% at 9 AM to a low of 20% at 9 PM. Parking utilization is higher during the AM peak period than the PM peak period. Some lots and garages within the study area are not open to the public at all hours of the day. When lots or garages are not available for public use, they are indicated as "Private" in Table 8-4.

Unused and Available Parking—Weekday

Table 8-5 shows the number of unused and available parking spaces in the study area that are available on-street and off-street for weekdays during each hour of the parking study. A minimum of 1,009 on-street spaces and 213 off-street spaces are unused and available between 8 AM and 9 PM. Overall, 3 PM has the smallest supply of unused and available parking spaces (1,286), because both on- and off-street occupancy is moderate at this time (67 and 62%, respectively).

Occupancy and Utilization by Time of Day—Weekend

Weekend occupancy and utilization data were collected during the AM and PM peak periods on a typical Saturday to capture the daily fluctuations in occupancy and utilization from business-related, retail-related, and residential parking. Occupancy and utilization data were collected at 8 AM, 9 AM, 12 PM, 3 PM, 4 PM, 5 PM, 6 PM, 7 PM, 8 PM, and 9 PM.

Table 8-6 summarizes the weekend on-street and off-street parking occupancy and utilization observed in the study area across the time periods studied for the 2017 existing conditions. On-street and off-street parking occupancy and utilizations are described separately below.

On-Street Parking Occupancy and Utilization—Weekend

As shown in Table 8-6, the occupancy and utilization for weekend on-street parking is similar to but more heavily utilized than on weekdays. Specific findings are as follows:

- Parking occupancy and utilization for paid parking varies dramatically throughout the day and is low in the morning and very high later in the evening. Paid parking utilization is highest at 7 PM and 8 PM (99%) and lowest at 8 AM (35%).
- Parking occupancy and utilization for non-paid parking is consistently moderate throughout the day. Non-paid parking utilization is highest at 4 PM (68%) and lowest at 8 AM (51%).
- The weekend on-street parking supply can be affected by events such as the Ballard Farmers Market, which is held every Sunday on one block of Ballard Ave NW between NW Vernon Pl and 22nd Ave NW. On Sundays, no on-street parking is allowed on this block between 6 AM and 5 PM.
- In addition, all of the paid parking blocks in the study area are free on Sundays with no time restrictions; therefore, parking occupancy and utilization could be considerably different than on Saturdays.

Table 8-4. Off-Street Parking Occupancy and Utilization—Weekday

Lot/ Garage Number	*Parking Supply*	*Weekday Occupancy and Utilization (%)* [1]																	
		8 AM		*9 AM*		*3 PM*		*4 PM*		*5 PM*		*6 PM*		*7 PM*		*8 PM*		*9 PM*	
		Occupancy	*Utilization*	*Occupancy*	*Utilization*	*Occupancy*	*Utilization*	*Occupancy*	*Utilization*	*Occupancy*	*Utilization*	*Occupancy*	*Utilization*	*Occupancy*	*Utilization*	*Occupancy*	*Utilization*	*Occupancy*	*Utilization*
1	16	4	26%	8	52%	12	75%	7	43%	4	27%	2	13%	7	44%	4	25%	4	25%
2	16	3	16%	3	16%	5	31%	16	100%	16	100%	10	63%	2	13%	1	6%	1	6%
3	55	14	25%	31	56%	24	44%	21	39%	55	100%	32	58%	8	15%	18	33%	10	18%
4	18	7	38%	9	51%	16	89%	8	44%	11	59%	16	89%	9	50%	6	33%	5	28%
5	16	4	27%	6	36%	10	63%	8	50%	11	67%	16	100%	11	69%	10	63%	4	25%
6	45	7	15%	9	20%	16	36%	11	23%	14	31%	21	47%	36	80%	25	56%	12	27%
7	12/42	2	17%	2	17%	4	33%	5	42%	10	83%	24	57%	39	93%	23	55%	16	38%
8	18	Private	Private	Private	Private	Private	Private	Private	Private	Private	Private	13	72%	5	28%	7	39%	5	28%
9	36	Private	Private	Private	Private	Private	Private	Private	Private	11	30%	16	44%	6	17%	2	6%	1	3%
10	44	10	23%	20	45%	29	66%	24	55%	15	34%	7	16%	28	64%	33	75%	19	43%
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	47	Private	Private	Private	Private	Private	Private	Private	Private	4	9%	1	2%	3	6%	0	0%	0	0%
13	30	6	20%	8	27%	21	70%	16	53%	14	47%	11	37%	17	57%	9	30%	7	23%
14	24	Private	Private	Private	Private	Private	Private	Private	Private	Private	Private	16	67%	24	100%	17	71%	13	54%
15	15	3	20%	4	27%	7	47%	6	40%	8	53%	12	80%	6	40%	8	53%	7	47%
16	23	Private	Private	Private	Private	Private	Private	Private	Private	Private	Private	8	35%	7	30%	7	30%	6	26%
17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	15	4	27%	9	60%	7	47%	2	13%	6	40%	3	20%	6	40%	8	53%	1	7%
19	448	333	74%	408	91%	302	67%	263	59%	152	34%	106	24%	123	27%	95	21%	74	17%
20	42	Private	Private	Private	Private	Private	Private	Private	Private	28	67%	42	100%	25	60%	7	17%	6	14%
Totals	730/ 855/ 950[2]	396	54%	517	71%	453	62%	387	53%	358	42%	356	37%	362	38%	280	29%	191	20%

Source: IDAX, 2017; SDOT, 2014.
Note: Utilization highlighted in gray indicates that this is an estimated value, based on ratios of similar nearby lots and garages.
[1] "Private" indicates spaces that are not open for public use.
[2] Total parking spaces vary based on public availability of off-street parking lots. Numbers represent 8 AM – 5 PM/5 PM – 6 PM/After 6 PM.

Table 8-5. Available Unused Parking—Weekday

	8 AM		9 AM		3 PM		4 PM		5 PM		6 PM		7 PM		8 PM		9 PM	
	On-Street[1]	Off-Street[2]	On-Street[1]	Off-Street[2]	On-Street[1]	Off-Street[2]	On-Street[1]	Off-Street[2]	On-Street[1]	Off-Street[2]	On-Street[1]	Off-Street[2]	On-Street[1]	Off-Street[2]	On-Street[1]	Off-Street[2]	On-Street[1]	Off-Street[2]
Parking Supply	3,086	730	3,086	730	3,086	730	3,086	730	3,086	855	3,086	950	3,086	950	3,086	950	3,086	950
Parking Occupancy (Filled Spaces)	1,845	396	1,985	517	2,077	453	1,964	387	1,922	358	2,004	356	2,056	362	2,024	280	1,929	191
Utilization (%)	60%	54%	64%	71%	67%	62%	64%	53%	62%	42%	65%	37%	67%	38%	66%	29%	63%	20%
Available Unused Parking (Unfilled Spaces)	1,241	334	1,101	213	1,009	277	1,122	343	1,164	497	1,082	594	1,030	588	1,062	670	1,157	759

Sources:
[1] SDOT, 2015a; IDAX, 2017.
[2] IDAX, 2017; SDOT, 2014.

Table 8-6. Overall On-Street Parking Occupancy and Utilization—Weekend

Parking Type	Parking Supply	Weekend Occupancy and Utilization (%)																	
		8 AM		9 AM		12 PM		3 PM		4 PM		5 PM		6 PM		7 PM		8 PM		9 PM	
		Occupancy	Utilization	Occupancy	Utilization	Occupancy	Utilization	Occupancy	Utilization	Occupancy	Utilization	Occupancy	Utilization	Occupancy	Utilization	Occupancy	Utilization	Occupancy	Utilization	Occupancy	Utilization
Paid	484	167	35%	231	48%	461	95%	464	96%	465	96%	472	98%	476	98%	478	99%	478	99%	466	96%
Non-Paid	2,602	1,333	51%	1,497	58%	1,711	66%	1,749	67%	1,773	68%	1,755	67%	1,705	66%	1,705	66%	1,669	64%	1,627	63%
Total	3,086	1,500	49%	1,728	56%	2,172	70%	2,213	72%	2,238	73%	2,227	72%	2,181	71%	2,183	71%	2,147	70%	2,093	68%

Sources: SDOT, 2015a; IDAX, 2017.

The following is a summary of on-street parking occupancy and utilization for each hour evaluated.

On-street parking utilization is highest at **8 AM** in the non-paid, residential blocks of central Ballard and on the northernmost blocks of the study area. The majority of the paid parking in Ballard has very low utilization at 8 AM. It is assumed that the main destination on weekends in the study area is the Ballard central business district. It is also assumed that the non-paid, residential parking areas in the central portion of the study area, approximately south of NW Market St and west of 15th Ave NW, and the northernmost blocks may have high utilization due to residents leaving cars there. The non-paid, residential area in central Ballard has high utilization throughout all hours studied. West of 28th Ave NW, the residential density is lower; therefore, there is more available parking in the northernmost corner of the study area. Utilization in the southeast portion of the study area is low on weekend mornings.

At **9 AM**, even more of the non-paid parking in central Ballard has filled up, and utilization on some of the paid blocks has started to increase. In the northernmost portion of the study area the utilization remained similar to 8 AM as residents are assumed to still be at home. In the southeastern portion of the study area utilization increased slightly, but was still low.

At **12 PM**, utilization is very different than during the morning hours studied. Not only is utilization very high on the non-paid blocks in central Ballard, but by 12 PM most of the paid blocks are approaching 100% utilization. Utilization on the northernmost blocks slightly increased compared to the morning, and utilization in the southeastern portion of the study area has also increased.

At **3 PM**, utilization for the study area increased slightly. Utilization remained very high on the non-paid and paid blocks in central Ballard, with the paid blocks being almost 100% utilized. Utilization on the northernmost blocks decreased slightly compared to the morning, while utilization in the southeastern portion of the study area increased slightly.

At **4 PM**, utilization increased slightly throughout the study area. The central non-paid blocks are still highly utilized, with the paid blocks almost 100% utilized. The northern and southeastern portions of the study area continued to increase slightly in utilization compared to 3 PM.

Utilization remained similar between 4 and **5 PM**. The central non-paid blocks were still highly utilized, with the paid blocks almost 100% utilized. While the northern portion remained similar to the previous hour, the southeastern portion of the study area started to have slightly less utilization than at 4 PM.

Utilization remained similar between 5 and **6 PM**. The central non-paid blocks are still highly utilized, with the paid blocks almost 100% utilized. While the northern portion remained similar to the previous hour, the southeastern portion of the study area continued to have less utilization than the previous hour.

At **7 PM**, utilization remained similar to the previous hour. The central non-paid blocks were still highly occupied, with the paid blocks almost 100% utilized. While the northern portion remained similar to the previous hour, the southeastern portion of the study area continued to have less utilization than the previous hour.

At **8 PM**, utilization remained similar to the previous hour. The central non-paid blocks were still highly occupied, with the paid blocks almost 100% utilized. While the northern portion remained similar to the previous hour, the southeastern portion of the study area continued to have less utilization than the previous hour.

At **9 PM,** utilization for the study area started to decline. The central non-paid blocks were still highly occupied, with the paid blocks almost 100% utilized. While the northern portion remained similar to the previous hour, the southeastern portion of the study area continued to have less utilization than the previous hour and is relatively underutilized.

Off-Street Parking Occupancy and Utilization—Weekend

Table 8-7 summarizes weekend off-street parking occupancy and utilization within the study area. Utilization by time ranges from a high of 49% at 7 PM to a low of 24% at 8 AM. Parking utilization is higher during the PM peak period than the AM peak period. Some lots and garages within the study area are not open to the public at all hours of the day. When lots or garages are not available for public use, they are indicated as "Private" in Table 8-7.

Total Unused and Available Parking—Weekend

Table 8-8 shows the number of unused parking spaces in the study area that are available for both on-street and off-street parking for weekends during each hour of the parking study. A minimum of 848 on-street spaces and 483 off-street spaces are available between 8 AM and 9 PM at any given time period. Overall, 4 PM has the smallest supply of unused and available parking spaces (1,344) because the on-street utilization is 73% and the off-street utilization is 40%.

Table 8-7. Off-Street Parking Occupancy and Utilization—Weekend

Lot/ Garage Number	*Parking Supply*	*Weekend Occupancy and Utilization (%)* [1]																			
		8 AM		*9 AM*		*12 PM*		*3 PM*		*4 PM*		*5 PM*		*6 PM*		*7 PM*		*8 PM*		*9 PM*	
		Occupancy	*Utilization*	*Occupancy*	*Utilization*	*Occupancy*	*Utilization*	*Occupancy*	*Utilization*	*Occupancy*	*Utilization*	*Occupancy*	*Utilization*	*Occupancy*	*Utilization*	*Occupancy*	*Utilization*	*Occupancy*	*Utilization*	*Occupancy*	*Utilization*
1	16	3	19%	3	19%	3	19%	3	19%	2	13%	2	13%	3	19%	3	19%	3	19%	3	19%
2	16	1	6%	3	19%	3	19%	5	31%	4	25%	7	44%	7	44%	13	81%	12	75%	10	63%
3	55	19	35%	22	40%	17	31%	25	45%	24	44%	35	64%	37	67%	45	82%	46	84%	44	80%
4	18	0	0%	1	6%	5	28%	8	44%	8	44%	11	61%	13	72%	15	83%	16	89%	16	89%
5	16	1	6%	1	6%	5	31%	9	56%	13	81%	12	75%	16	100%	16	100%	16	100%	16	100%
6	45	39	87%	44	98%	43	96%	37	82%	37	82%	39	87%	44	98%	45	100%	29	64%	32	71%
7	12/42	1	8%	1	8%	12	100%	13	31%	21	50%	23	55%	24	57%	39	93%	23	55%	16	38%
8	18	Private	Private	Private	Private	Private	Private	Private	Private	Private	Private	Private	Private	6	33%	6	33%	7	39%	7	39%
9	36	Private	Private	Private	Private	Private	Private	Private	Private	Private	Private	24	67%	32	89%	32	89%	27	75%	26	72%
10	44	21	48%	31	70%	44	100%	44	100%	38	86%	26	59%	21	48%	15	34%	14	32%	13	30%
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	47	Private	Private	Private	Private	Private	Private	Private	Private	Private	Private	3	6%	4	9%	5	11%	3	6%	0	0%
13	30	1	3%	4	13%	25	83%	28	93%	21	70%	18	60%	29	97%	28	93%	28	93%	29	97%
14	24	Private	Private	Private	Private	Private	Private	6	25%	16	67%	11	46%	14	58%	17	71%	10	42%	10	42%
15	15	4	27%	3	20%	6	40%	4	27%	4	27%	5	33%	8	53%	10	67%	13	87%	9	60%
16	23	2	9%	4	17%	12	52%	10	43%	12	52%	11	48%	17	74%	21	91%	18	78%	14	61%
17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	15	5	33%	5	33%	10	67%	10	67%	10	67%	13	87%	15	100%	15	100%	12	80%	10	67%
19	448	85	19%	88	20%	101	23%	99	22%	90	20%	82	18%	80	18%	95	21%	73	16%	60	13%
20	42	12	29%	35	83%	26	62%	31	74%	29	69%	24	57%	42	100%	42	100%	41	98%	42	100%
Totals	795/ 825 932/ 950[2]	194	24%	245	31%	312	39%	332	40%	329	40%	346	37%	412	43%	462	49%	391	41%	357	38%

Sources: IDAX, 2017; SDOT, 2014.
[1] "Private" indicates spaces that are not open for public use.
[2] Total parking spaces vary based on public availability of off-street parking lots. Numbers represent 8 AM – 12 PM/1 PM – 4 PM/5 PM – 6 PM/After 6 PM.

Table 8-8. Available Unused Parking—Weekend

	8 AM		*9 AM*		*12 PM*		*3 PM*		*4 PM*		*5 PM*		*6 PM*		*7 PM*		*8 PM*		*9 PM*	
	On-Street[1]	*Off-Street*[2]	*On-Street*[1]	*Off-Street*[2]	*On-Street*[1]	*Off-Street*[2]	*On-Street*[1]	*Off-Street*[2]	*On-Street*[1]	*Off-Street*[2]	*On-Street*[1]	*Off-Street*[2]	*On-Street*[1]	*Off-Street*[2]	*On-Street*[1]	*Off-Street*[2]	*On-Street*[1]	*Off-Street*[2]	*On-Street*[1]	*Off-Street*[2]
Parking Supply	3,086	795	3,086	795	3,086	795	3,086	825	3,086	825	3,086	932	3,086	950	3,086	950	3,086	950	3,086	950
Parking Occupancy (Filled Spaces)	1,500	194	1,728	245	2,172	312	2,213	332	2,238	329	2,227	346	2,181	412	2,183	462	2,147	391	2,093	357
Utilization (%)	49%	24%	56%	31%	70%	39%	72%	40%	73%	40%	72%	37%	71%	43%	71%	49%	70%	41%	68%	38%
Available Unused Parking (Unfilled Spaces)	1,586	601	1,358	550	914	483	873	493	848	496	859	586	905	538	903	488	939	559	993	593

Sources:
[1] SDOT, 2015a; IDAX, 2017.
[2] IDAX, 2017; SDOT, 2014.

8.3 Potential Impacts

Construction impacts on parking were evaluated qualitatively because the location and amount of affected parking would change as construction progresses. The potential for temporary loss of parking is described below for each alternative, along with disruption to business access and loading areas.

The operational impacts of the Build Alternatives for parking in 2040, the design year, were evaluated using the following methods:

- A comparison of the total number of on-street and off-street parking spaces in the study area under the No Build Alternative and the Build Alternatives.
- An assessment of the parking supply under the Build Alternatives in relation to the existing parking occupancy.

8.3.1 No Build Alternative

Construction

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

Operation

The parking supply and loading zone spaces in the study area under the No Build Alternative are expected to remain the same as under existing (2017) conditions. Table 8-9 summarizes the expected No Build Alternative parking supply.

Table 8-9. No Build Alternative Parking Supply

	Paid On-Street Supply	*Non-Paid On-Street Supply*	*Total On-Street Supply*	*Off-Street Parking Supply*	*Total Parking Supply*
Number of Spaces	484	2,602	3,086	730	3,816
Percent of Total	13%	68%	81%	19%	100%

Occupancy of both on-street and off-street parking within the study area is expected to increase by the year 2040 in conjunction with population and employment growth in Ballard. Parking prices (adjusted for inflation) would also increase for both on-street and off-street parking based on this increase in occupancy. Parking supply would remain constant under the No Build Alternative. Therefore, an increase in occupancy (number of spaces filled) would increase on-street parking utilization rates across all time periods and all parts of the study area. However, the scale of increased on-street parking occupancy or utilization cannot be predicted using typical traffic forecasting tools.

The No Build Alternative would not change the existing (2017) passenger and commercial loading zone spaces (Table 8-10).

Table 8-10. Loading Zone Spaces under the No Build Alternative

Unrestricted Loading Zone Spaces	*Passenger Loading Zone Spaces*	*Truck-Only Loading Zone Spaces*	*Commercial Vehicle Loading Zone Spaces*	*Total Loading Zone Spaces*
82	15	32	3	132

8.3.2 Impacts Common to All Build Alternatives

Construction

Construction activities for the Build Alternatives would temporarily affect on-street parking throughout the entire study area. The amount of parking affected would vary by construction stage and street block, and would be determined once construction and staging plans are finalized. Parking supply outside of the construction area would not be affected. Access routes or loading zones at some businesses could be blocked, but this would only occur intermittently. Off-street parking is not expected to be affected by construction, except for minor temporary changes in access. Construction impacts are not significant because the overall availability of parking during the construction period would be largely unchanged and the City would maintain parking availability to the extent feasible during construction.

Operation

Occupancy of both on-street and off-street parking within the study area would increase by the year 2040 in conjunction with population and employment growth. All of the Build Alternatives would remove parking spaces, as described below for each alternative. Therefore, an increase in parking occupancy, coupled with reduced parking supply, would increase on-street and off-street parking utilization across the study area. Because occupancy of on-street spaces in some areas is already high, the removal of on-street parking spaces would likely shift occupancy to off-street parking areas.

All of the Build Alternatives would improve the nonmotorized facilities in the form of the new multi-use trail, new sidewalks, and improved road crossings. The enhanced availability of nonmotorized facilities for bicyclists and pedestrians under all of the Build Alternatives would provide local residents, employees, and visitors with additional choices in how they travel to, from, and through the study area. This could result in changes to the split among vehicle and nonmotorized modes of travel. A shift to nonmotorized modes could reduce parking occupancy in the study area, which would minimize the impacts of parking loss associated with the Build Alternatives.

City policy prioritizes other uses of street space over parking and is moving toward limiting parking requirements for new development. The Missing Link would replace some parking with enhanced nonmotorized facilities, supporting overall City planning goals for reducing dependency on single-occupancy vehicles (SOVs) in Ballard. The loss of parking would not be considered significant because the parking loss is spread throughout the alignments, can be absorbed in other on-street or off-street spaces throughout the study area although drivers may need to travel further, and is consistent with City planning goals relating to street space prioritization.

8.3.3 **Preferred Alternative**

Construction

Construction impacts are not significant and would be the same for all of the Build Alternatives. There are no construction impacts unique to the Preferred Alternative compared to the other alternatives.

Operation

Parking Supply

The Preferred Alternative would remove a total of approximately 344 on-street parking spaces (Table 8-11). These parking spaces would be replaced by the new multi-use trail, sidewalks, landscaping, and buffers. The removed parking spaces are generally characterized as employee and business customer parking for industrial businesses, and include the following areas:

- Both sides of NW 54th St would have no parking between 30th Ave NW and NW Market St.
- Along NW Market St between NW 54th St and 24th Ave NW, parking would remain similar to today on the north side of the street and would have some parking spaces removed on the south side of the street.
- The north side of Shilshole Ave NW and NW 45th St would remain largely unchanged, except at intersections where pedestrian crossing improvements require the removal of a few parking spaces close to the intersections and between NW Vernon Pl and 20th Ave NW. Between NW Vernon Pl and 20th Ave NW, the roadway would be shifted to the north to provide additional space for vehicle movements at driveways on the south side of Shilshole Ave SW. In this area, the parking spaces on the north side of Shilshole Ave NW would be reoriented as parallel parking spaces.
- The south side of Shilshole Ave NW and NW 45th St would largely have no parking from where the multi-use trail intersects Shilshole Ave NW at 24th Ave NW until 14th Ave NW, except for the segment between NW Vernon Pl and 20th Ave NW because parallel parking spaces would be provided.

Approximately 62 of the 344 removed spaces could remain between the proposed multi-use trail and existing buildings or between the proposed multi-use trail and Shilshole Ave NW depending on where the trail is adjacent to the roadway or buildings. If these 62 spaces remain, the Preferred Alternative would remove approximately 282 on-street parking spaces.

Overall, the loss of 344 on-street parking spaces represents approximately 11% of the on-street parking supply in the study area and approximately 9% of the total parking supply (on-street and off-street) in the study area. The loss of parking would not be considered a significant adverse impact because the parking loss is spread throughout the Preferred Alternative, can be absorbed in other on-street or off-street spaces throughout the study area although drivers may need to travel further, and is consistent with City planning goals relating to street space prioritization.

Table 8-11. On-Street and Off-Street Parking Supply under the No Build Alternative and Preferred Alternative

Parking Type	*No Build Alternative*	*Preferred Alternative*	*Net Parking Supply Change*	*Percent Reduction in Supply*
On-street	3,086	2,742	344	11%
Paid	484	486	0	0%
Non-paid	2,602	2,258	344	13%
Off-street	730	730	0	0%
Total	**3,816**	**3,472**	**344**	**9%**

Loading Zone Spaces

Table 8-12 summarizes the net change in loading zone spaces between the No Build Alternative and the Preferred Alternative. The Preferred Alternative could potentially remove two unrestricted loading zone spaces and two truck-only loading zone spaces. These spaces could remain by shifting them to other locations along existing block faces, to the other side of a street, or to an adjacent block. Generally, the City prioritizes retention of loading zone spaces and will work with adjacent businesses to retain or replace loading zones to the maximum extent feasible, as needed. However, moving loading zone spaces may not be an option on some blocks; therefore, to be conservative, it was assumed that all four loading zone spaces would be removed by the Preferred Alternative. This could result in trucks parking in the street to unload or developing other approaches to loading, which would present safety concerns for trail users and vehicles. SDOT would work with the potentially affected businesses to maintain freight access, and reduce potential impacts to businesses.

Table 8-12. On-Street Loading Zone Spaces under the No Build Alternative and Preferred Alternative

Alternative	*Unrestricted Loading Zone Spaces*	*Passenger Loading Zone Spaces*	*Truck-Only Loading Zone Spaces*	*Commercial Vehicle Loading Zone Spaces*	*Total Loading Zone Spaces*
No Build	82	15	32	3	132
Preferred	80	15	30	3	128
Net Reduction	2	0	2	0	4

8.3.4 Shilshole South Alternative

Construction

Construction impacts would be the same for all of the Build Alternatives, and are not significant. There are no construction impacts unique to the Shilshole South Alternative compared to the other alternatives.

Operation

Parking Supply

The Shilshole South Alternative would remove a total of approximately 279 on-street parking spaces (Table 8-13). These parking spaces would be replaced by the new multi-use trail, sidewalks, landscaping, and buffers. The removed parking spaces are generally characterized as employee and business customer parking for industrial businesses, and include the following areas:

- The north side of Shilshole Ave NW and NW 45th St would remain largely unchanged, except at intersections where pedestrian crossing improvements require the removal of a few parking spaces close to the intersections.
- The south side of Shilshole Ave NW and NW 45th St would largely have no parking between 24th Ave NW and 11th Ave NW.

Space for approximately 68 of the 279 spaces could continue to remain between the proposed multi-use trail and existing buildings, or between the proposed multi-use trail and Shilshole Ave NW depending on where the trail is adjacent to the roadway or buildings. If these 68 spaces remain, the Shilshole South Alternative would remove approximately 211 on-street parking spaces.

Overall, the loss of approximately 279 on-street parking spaces represents approximately 9% of the on-street parking supply in the study area and approximately 7% of the total parking supply (on-street and off-street combined) in the study area. The loss of parking would not be considered a significant adverse impact because the parking loss is spread throughout the Shilshole South Alternative, can be absorbed in other on-street or off-street spaces throughout the study area although drivers may need to travel further, and is consistent with City planning goals relating to street space prioritization.

Table 8-13. On-Street and Off-Street Parking Supply under the No Build Alternative and Shilshole South Alternative

Parking Type	*No Build Alternative*	*Shilshole South Alternative*	**Net Parking Supply Change**	*Percent Reduction in Supply*
On-street	3,086	2,807	279	9%
Paid	484	484	0	0%
Non-paid	2,602	2,323	279	11%
Off-street	730	730	0	0%
Total	**3,816**	**3,537**	**279**	**7%**

Loading Zone Spaces

Table 8-14 summarizes the net change in loading zone spaces between the No Build Alternative and the Shilshole South Alternative. The Shilshole South Alternative would not remove any designated loading zone spaces (i.e., those marked by a sign). It could potentially remove or relocate some undesignated loading areas used by businesses that are within the City right-of-way. However, it is not possible to quantify these areas because they are not recognized by the City.

Table 8-14. On-Street Loading Zone Spaces under the No Build Alternative and Shilshole South Alternative

Alternative	*Unrestricted Loading Zone Spaces*	*Passenger Loading Zone Spaces*	*Truck-Only Loading Zone Spaces*	*Commercial Vehicle Loading Zone Spaces*	*Total Loading Zone Spaces*
No Build	82	15	32	3	132
Shilshole South	82	15	32	3	132
Net Change	0	0	0	0	0

8.3.5 Shilshole North Alternative

Construction

Construction impacts would be the same for all of the Build Alternatives, and are not significant. There are no construction impacts unique to the Shilshole North Alternative compared to the other alternatives.

Operation

Parking Supply

The Shilshole North Alternative would remove a total of approximately 206 on-street parking spaces (Table 8-15). These parking spaces would be replaced by the new multi-use trail, sidewalks, landscaping, and buffers. The removed parking spaces are generally characterized as employee and business customer parking for industrial businesses, and include the following areas:

- Both sides of NW 54th St would have no parking between 30th Ave NW and NW Market St.
- Along NW Market St between NW 54th St and 24th Ave NW, parking would remain similar to today on the north side of the street and some parking spaces would be removed on the south side of the street.
- Much of the parking on the north side of Shilshole Ave NW would be removed under this alternative, but some parallel parking would remain.
- The south side of Shilshole Ave NW would remain largely unchanged, except at intersections where pedestrian crossing improvements require the removal of a few parking spaces close to the intersections.
- Both sides of NW 46th St would largely have no parking from Shilshole Ave NW to 11th Ave NW.

Overall, the loss of approximately 206 on-street parking spaces represents approximately 7% of the on-street parking supply in the study area and approximately 5% of the total parking supply (on-street and off-street) in the study area. The loss of parking would not be considered a significant adverse impact because the parking loss is spread throughout the Shilshole North Alternative, can be absorbed in other on-street or off-street spaces throughout the study area although drivers may need to travel further, and is consistent with City planning goals relating to street space prioritization.

Table 8-15. On-Street and Off-Street Parking Supply under the No Build Alternative and Shilshole North Alternative

Parking Type	*No Build Alternative*	*Shilshole North Alternative*	**Net Parking Supply Change**	*Percent Reduction in Supply*
On-street	3,086	2,880	206	7%
Paid	484	486	-2*	0%
Non-paid	2,602	2,394	208	8%
Off-street	730	730	0	0%
Total	**3,816**	**3,610**	**206**	**5%**

*The DEIS design for the Shilshole North Alternative included an increase of two paid parking spaces where the No Build Alternative had one loading zone space and one unused bus zone. Generally, the City prioritizes the retention of loading zone spaces and would not assume a conversion to a parking space. However, the initial design did not delineate loading zone spaces. The City would work with adjacent businesses to prioritize the retention or replacement of loading zones as needed.

Loading Zone Spaces

Table 8-16 summarizes the net change in loading zone spaces between the No Build Alternative and the Shilshole North Alternative. The Shilshole North Alternative could potentially remove or relocate 10 unrestricted loading zone spaces and 14 truck-only loading zone spaces. These spaces could remain by shifting them to other locations along existing block faces, to the other side of a street, or to an adjacent block. Generally, the City prioritizes the retention of loading zone spaces, and the City would work with adjacent businesses to retain or replace loading zones to the maximum extent feasible, as needed. However, moving loading zone spaces may not be an option on some blocks; therefore, to be conservative, it was assumed that all 24 loading zone spaces would be removed by the Shilshole North Alternative. Of all the Build Alternatives, this represents the highest number of loading zone spaces removed for the project, and could represent a substantial inconvenience for loading/unloading of merchandise for businesses along Shilshole Ave NW. This action could result in trucks parking illegally in the street or developing other approaches to loading, which would present safety concerns for trail users and vehicles. SDOT would work with the potentially affected businesses to maintain freight access, and reduce potential impacts to businesses.

Table 8-16. On-Street Loading Zone Spaces under the No Build Alternative and Shilshole North Alternative

Alternative	*Unrestricted Loading Zone Spaces*	*Passenger Loading Zone Spaces*	*Truck-Only Loading Zone Spaces*	*Commercial Vehicle Loading Zone Spaces*	*Total Loading Zone Spaces*
No Build	82	15	32	3	132
Shilshole North	72	15	18	3	108
Net Reduction	10	0	14	0	24

8.3.6 **Ballard Avenue Alternative**

Construction

Construction impacts would be the same for all of the Build Alternatives and are not significant. There are no construction impacts unique to the Ballard Avenue Alternative compared to the other alternatives.

Operation

Parking Supply

The Ballard Avenue Alternative would remove a total of approximately 198 on-street parking spaces (Table 8-17). These parking spaces would be replaced by the new multi-use trail, sidewalks, landscaping, and buffers. The removed parking spaces are generally characterized as residential, employee, and business customer parking for retail businesses. A small number of removed parking spaces in the southeast portion of the study area can be characterized as employee and business customer parking for industrial businesses, and include the following areas:

- The south side of NW 56th St would have no parking between 28th Ave NW and 22nd Ave NW.
- The west side of 22nd Ave NW would have no parking between NW 56th St and Ballard Ave NW.
- The southwest side of Ballard Ave NW would have no parking between 22nd Ave NW and 17th Ave NW.
- The south side of NW Ballard Way would have no parking between 17th Ave NW and 15th Ave NW.
- The south side of NW 46th St would have no parking between 15th Ave NW and 11th Ave NW.
- The west side of 11th Ave NW would have no parking between NW 46th St and NW 45th St.

Overall, the loss of approximately 198 on-street parking spaces represents approximately 6% of the on-street parking supply in the study area and approximately 5% of the total parking supply (on-street and off-street) in the study area. The Ballard Avenue Alternative is the only Build Alternative to have an impact on paid parking, with the removal of 86 paid parking spaces or 18% of paid parking within the study area. The loss of parking would not be considered a significant adverse impact because the parking loss is spread throughout the Ballard Avenue Alternative, can be absorbed in other on-street or off-street spaces throughout the study area although drivers may need to travel further, and is consistent with City planning goals relating to street space prioritization.

Table 8-17. On-Street and Off-Street Parking Supply under the No Build Alternative and Ballard Avenue Alternative

Parking Type	*No Build Alternative*	*Ballard Avenue Alternative*	**Net Parking Supply Change**	*Percent Reduction in Supply*
On-street	3,086	2,888	198	6%
Paid	484	398	86	18%
Non-paid	2,602	2,490	112	4%
Off-street	730	730	0	0%
Total	**3,816**	**3,618**	**198**	**5%**

Loading Zone Spaces

Table 8-18 summarizes the net change in loading zone spaces between the No Build Alternative and the Ballard Avenue Alternative. The Ballard Avenue Alternative could potentially remove or relocate 10 unrestricted loading zone spaces, two truck-only loading zone spaces, and two commercial vehicle loading zone spaces. It is possible that these spaces could remain by shifting them to other locations along existing block faces, to the other side of a street, or to an adjacent block. Generally, the City prioritizes the retention of loading zone spaces, and the City would work with adjacent businesses to retain or replace loading zones to the maximum extent feasible, as needed. However, moving loading zone spaces may not be an option on some blocks; therefore, to be conservative, it was assumed that all 14 loading zone spaces would be removed by the Ballard Avenue Alternative. This could result in trucks parking in the street to unload or developing other approaches to loading, which would present safety concerns for trail users and vehicles. SDOT would work with the potentially affected businesses to maintain freight access, and reduce potential impacts to businesses.

Table 8-18. On-Street Loading Zone Spaces under the No Build Alternative and Ballard Avenue Alternative

Alternative	*Unrestricted Loading Zone Spaces*	*Passenger Loading Zone Spaces*	*Truck-Only Loading Zone Spaces*	*Commercial Vehicle Loading Zone Spaces*	*Total Loading Zone Spaces*
No Build	82	15	32	3	132
Ballard Avenue	72	15	30	1	118
Net Reduction	10	0	2	2	14

8.3.7 Leary Alternative

Construction

Construction impacts would be the same for all of the Build Alternatives and are not significant. There are no construction impacts unique to the Leary Alternative compared to the other alternatives.

Operation

Parking Supply

The Leary Alternative would remove a total of approximately 82 on-street parking spaces (Table 8-19). These parking spaces would be replaced by the new multi-use trail, sidewalks, landscaping, and buffers. The removed parking spaces are generally characterized as residential, employee, and business customer parking for retail businesses, and includes some parking along the south side of NW Market St and NW Leary Ave and the west side of 11th Ave NW.

Overall, the loss of approximately 82 on-street parking spaces represents approximately 3% of the on-street parking supply in the study area and approximately 2% of the total parking supply (on-street and off-street) in the study area. The loss of parking would not be considered a significant adverse impact because the parking loss is spread throughout the Leary Alternative, can be absorbed in other on-street or

off-street spaces throughout the study area although drivers may need to travel further, and is consistent with City planning goals relating to street space prioritization.

Table 8-19. On-Street and Off-Street Parking Supply under the No Build Alternative and Leary Alternative

Parking Type	*No Build Alternative*	*Leary Alternative*	**Net Parking Supply Change**	*Percent Reduction in Supply*
On-street	3,086	3,004	82	3%
Paid	484	490	-6*	-1%*
Non-paid	2,602	2,514	88	3%
Off-street	730	730	0	0%
Total	**3,816**	**3,734**	**82**	**2%**

*An increase of six paid parking spaces under the Leary Alternative is due to the DEIS design for Leary Alternative shifting a bus zone and including additional parking spaces where the No Build Alternative had three loading zone spaces and one unused bus zone. Generally, the City prioritizes the retention of loading zone spaces and would not assume a conversion to a parking space. However, the initial design did not delineate loading zone spaces. The City would work with adjacent businesses to prioritize the retention or replacement of loading zones as needed.

Loading Zone Spaces

Table 8-20 summarizes the net change in loading zone spaces between the No Build Alternative and the Leary Alternative. The Leary Alternative could potentially remove or relocate eight unrestricted loading zone spaces, three passenger loading zone spaces, and four truck-only loading zone spaces. It is possible that these spaces could remain by shifting them to other locations along existing block faces, to the other side of a street, or to an adjacent block. Generally, the City prioritizes the retention of loading zone spaces, and the City would work with adjacent businesses to retain or replace loading zones to the maximum extent feasible, as needed. However, moving loading zone spaces may not be an option on some blocks; therefore, to be conservative, it was assumed that all 15 loading zone spaces would be removed by the Leary Alternative. This could result in trucks parking in the street to unload or developing other approaches to loading, which would present safety concerns for trail users and vehicles. SDOT would work with the potentially affected businesses to maintain freight access, and reduce potential impacts to businesses.

Table 8-20. On-Street Loading Zone Spaces under the No Build Alternative and Leary Alternative

Alternative	*Unrestricted Loading Zone Spaces*	*Passenger Loading Zone Spaces*	*Truck-Only Loading Zone Spaces*	*Commercial Vehicle Loading Zone Spaces*	*Total Loading Zone Spaces*
No Build	82	15	32	3	132
Leary	74	12	28	3	117
Net Reduction	8	3	4	0	15

8.3.8 Connector Segments

Construction

Construction impacts would be the same for all of the Build Alternatives, and are not significant. There are no construction impacts unique to the connector segments compared to the other alternatives.

Operation

The designs of the connector segments would depend on what segments were being connected; therefore, it is assumed that on-street parking and loading zone removal could occur on one or both sides of any connector segment that was used in the selected alternative. Table 8-21 lists the number of spaces on each side of each segment. The worst case would be the removal of all on-street spaces on any one segment. However, removal of all on-street spaces on both sides of the street would be unlikely, and would only occur on a narrow street with insufficient width for parking.

Table 8-21. On-Street Parking and Loading Zone Spaces Under the Connector Segments

Segment Name	*Street Name/Side of Street*	*Net Parking Supply Change*	*Net Loading Zone Supply Change*
Ballard Ave NW	Ballard Ave NW between NW Market St and 22nd Ave NW (northeast side)	14	1
	Ballard Ave NW between NW Market St and 22nd Ave NW (southwest side)	39	3
NW Vernon Pl	NW Vernon Pl between Shilshole Ave NW and Ballard Ave NW (northwest side)	6	0
	NW Vernon Pl between Shilshole Ave NW and Ballard Ave NW (southeast side)	8	0
20th Ave NW	20th Ave NW between Shilshole Ave NW and Ballard Ave NW (east side)	9	1
	20th Ave NW between Shilshole Ave NW and Ballard Ave NW (west side)	9	2
	20th Ave NW between Ballard Ave NW and Leary Ave NW (east side)	11	0
	20th Ave NW between Ballard Ave NW and Leary Ave NW (west side)	13	0
17th Ave NW	17th Ave NW between NW 46th St and NW Ballard Way (east side)	4	0
	17th Ave NW between NW 46th St and NW Ballard Way (west side)	1	0
	17th Ave NW between NW Ballard Way and NW Leary Way (east side)	2	0
	17th Ave NW between NW Ballard Way and NW Leary Way (west side)	9	0

Segment Name	*Street Name/Side of Street*	*Net Parking Supply Change*	*Net Loading Zone Supply Change*
15th Ave NW	15th Ave NW between NW 46th St and NW Ballard Way (west side)	0	0
14th Ave NW	14th Ave NW between NW 45th St and NW 46th St (east side)	3	0
	14th Ave NW between NW 45th St and NW 46th St (mid-block)	18	0
	14th Ave NW between NW 45th St and NW 46th St (west side)	7	0
	14th Ave NW between NW 46th St and NW Ballard Way (east side)	3	2
	14th Ave NW between NW 46th St and NW Ballard Way (mid-block)	18	0
	14th Ave NW between NW 46th St and NW Ballard Way (west side)	4	1
	14th Ave NW between NW Ballard Way and NW Leary Way (east side)	5	0
	14th Ave NW between NW Ballard Way and NW Leary Way (west side)	7	0

8.4 Avoidance, Minimization, and Mitigation Measures

8.4.1 Measures Common to All Build Alternatives

Construction

Construction avoidance, minimization, and mitigation measures would be the same for all of the Build Alternatives.

While the Missing Link would reduce the overall parking supply in the study area during construction, the City would maintain parking availability to the extent feasible during construction. Once construction and staging plans have been developed, the City could determine practices to manage parking during construction so that parking is convenient and accessible to businesses and their patrons to the extent feasible. In addition, the City would continue to enforce short-term parking limits to make the most efficient use of the supply of short-term parking within the project construction area. The City could encourage the contractor's workers to find alternative parking areas away from the work site or to use transit to access the work site, thereby maximizing available nearby parking spaces for the public. Strategies used by the contractor could include, but are not limited to, setting up an off-site parking area and/or setting up a staging area to store tools and materials that would eliminate the need to park work trucks close to the work site.

Operation

Operation avoidance, minimization, and mitigation measures would be the same for all of the Build Alternatives.

The alternatives evaluated for the Missing Link would eliminate between approximately 82 and 344 on-street parking spaces, which represents 2 to 9% of all on- and off-street parking supply in the study area. If connector segments were used, this number could increase or decrease, depending on the combination of segments selected.

Current City plans and policies include strategies to encourage the use of transit and nonmotorized modes of travel, and to discourage the use of SOVs. This emphasis is reflected in the City's prioritization in which curb space for transit and loading has higher priority than on-street parking (City of Seattle, 2016). It is the City's general policy to replace short-term parking only when a project results in a concentrated and substantial amount of on-street parking loss. This project would not remove parking spaces in a concentrated or substantial manner. Although the on-street parking loss may be perceived to be substantial, the parking removal would be spread out along each of the alternative alignments. The maximum amount of on-and off-street parking in the study area that could be removed is 9% (under the Preferred Alternative).

Mitigation measures to offset the impact of parking removal include:

- Working with individual property and business owners, as well as interested stakeholders and the general public, throughout the design process to better understand the parking needs along the alignment
- Identifying areas where parking can be installed or replaced as the project progresses through design
- Modify on-street parking policies and practices, such as varying rates by time of day, to make parking more consistently available for short-term users.
- Adjust short-term parking limits to make the most efficient use of the supply of short-term parking for customers of study area businesses.
- Continue to provide information on off-street parking spaces on the City's website, including the Seattle Parking Map.
- Work with transit agencies to increase the awareness of transit routes and facilities in the area and to encourage visitors to use alternative modes of transportation.
- Work with businesses to increase the awareness of the BGT and other bicycle and pedestrian connections in the area to encourage employees and visitors to use nonmotorized modes of transportation.

A mitigation measure to offset the loss of loading zones would be to shift loading zone spaces to other locations along existing block faces, to the other side of a street, or to an adjacent block. However, shifting loading zone spaces could remove additional parking spaces.

CHAPTER 9: AIR QUALITY AND GREENHOUSE GAS EMISSIONS

9.1 Introduction

This chapter first describes the existing air quality and greenhouse gas (GHG) baseline conditions in the study area, summarizes the regulatory context, and identifies air pollutants of concern. The chapter then compares each alternative's effect on air quality and GHGs in relation to existing regulations, plans, and policies, including the City of Seattle GHG guidelines for SEPA evaluations.

The chapter distinguishes between air pollutants and GHGs. Both are generated locally, but GHG emissions contribute to cumulative carbon dioxide levels on a global scale. Additionally, air pollutants and GHGs are regulated separately.

The study area selected for the analysis of air quality and GHG emissions is the same study area applied to the transportation analysis (see Chapter 7, Figure 7-1).

Changes from the DEIS

Chapter 9 includes an analysis of the newly developed Preferred Alternative, which was not included in the DEIS. The air quality and GHG analysis has also been updated to reflect new transportation data collected for all alternatives, including the No Build and Preferred Alternatives.

9.2 Affected Environment

9.2.1 Regulatory Agencies, Policies, and Requirements

Air quality in the Puget Sound region is regulated and enforced by federal, state, and regional agencies including the EPA, Ecology, and the Puget Sound Clean Air Agency (PSCAA). In addition, the City of Seattle has a plan to address climate change. These agencies' distinct roles are described below.

U.S. Environmental Protection Agency

The 1970 Clean Air Act (last amended in 1990) requires the EPA to set National Ambient Air Quality Standards (NAAQS) for six common air pollutants to protect the public from the negative health effects of air pollution (EPA, 2015c). The six principal pollutants, called "criteria" pollutants, include the following:

- ozone,
- carbon monoxide (CO),
- particle pollution or "particulate matter" (PM),
- nitrogen dioxide (NO2),
- sulfur dioxide (SO2), and
- lead.

The NAAQS specify the concentration of these pollutants to which the public can be exposed without adverse health effects and with an adequate margin of safety.

NAAQS are divided into two categories: primary standards and secondary standards. Primary standards protect the general public health, including sensitive populations such as asthmatics, children, and the elderly. Secondary standards protect the public welfare against hazards such as decreased visibility and damage to animals, crops, vegetation, and buildings (EPA, 2015a).

Two size categories of PM are regulated: "inhalable coarse particles" with diameters between 2.5 and 10 micrometers, and "fine particles" with diameters 2.5 micrometers and smaller (EPA, 2015a). A micrometer is one millionth of a meter. Particles less than 10 micrometers can pass through the nose and throat and enter the lungs.

The units of measure for the specified standards are parts per million (ppm) by volume, parts per billion (ppb) by volume, and micrograms per cubic meter of air ($\mu g/m^3$). Table 9-1 lists the primary and secondary standards set by the EPA for the six criteria pollutants (EPA, 2015a). The standards are periodically reviewed and may be revised by the EPA.

Table 9-1. National Ambient Air Quality Standards (NAAQS)

Pollutant		*Primary/ Secondary*	*Averaging Time*	*Level*	*Form*
Carbon Monoxide		Primary	8-hour	9 ppm	Not to be exceeded more than once per year.
			1-hour	35 ppm	
Lead		Primary and secondary	Rolling 3-month average	0.15 $\mu g/m^3$	Not to be exceeded.
Nitrogen Dioxide		Primary	1-hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years.
		Primary and secondary	Annual	53 ppb	
Ozone		Primary and secondary	8-hour	0.070 ppb	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years.
Particle Pollution	PM2.5	Primary	Annual	12.0 $\mu g/m^3$	Annual mean, averaged over 3 years.
		Secondary	Annual	15.0 $\mu g/m^3$	Annual mean, averaged over 3 years.
		Primary and secondary	24-hour	35 $\mu g/m^3$	98th percentile, averaged over 3 years.
	PM10	Primary and secondary	24-hour	150 $\mu g/m^3$	Not to be exceeded more than once per year on average over 3 years.
Sulfur Dioxide		Primary	1-hour	75 ppb	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years.
		Secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year.

Source: EPA, 2015a.

The agencies have designated areas of the United States according to whether they are meeting the NAAQS, as follows (Ecology, 2015a, 2015b, 2015c):

- **Nonattainment areas**: Areas that exceed the NAAQS for a pollutant by the number of times predesignated by the EPA;
- **Maintenance areas**: Areas that were once designated as nonattainment but are now achieving the NAAQS; and
- **Attainment areas:** Areas that have air pollution levels below the NAAQS.

In nonattainment areas, states must develop plans to reduce emissions and bring the area back into attainment of the NAAQS. The General Conformity Rule, established by the Clean Air Act Amendments of 1990, ensures that the actions taken by federal agencies in nonattainment and maintenance areas do not interfere with a state's plans to meet national standards for air quality (Ecology, 2015a).

In addition, EPA's Mandatory Reporting of Greenhouse Gases Rule requires large sources of GHGs to report their GHG emissions data. Several types of industries are subject to this rule, including suppliers of certain products that would result in GHG emissions if released, combusted, or oxidized; direct emitting source categories; and facilities that inject carbon dioxide underground for sequestration purposes. Facilities that emit 25,000 metric tons or more per year of GHGs are required to submit annual reports to EPA (EPA, 2015b).

> The principal source of Washington's GHG emissions is transportation (approximately 47% of total state gross GHG), followed by fossil fuel combustion in the residential, commercial, and industrial sectors (approximately 20%) and electricity consumption from these sectors (approximately 20%) (Ecology, 2007).

Washington State Department of Ecology

Ecology maintains an air quality program with a goal of safeguarding public health and the environment by preventing and reducing air pollution. Through the air quality program, Ecology collects and shares information regarding air quality conditions, effects, and mitigation on a statewide level. Ecology also oversees the development and conformity of the State Implementation Plan (SIP), a complex collection of documents that describes how the state implements, maintains, and enforces NAAQS. While states have the authority to adopt more stringent thresholds than the federal government, Ecology's ambient air quality standards parallel those of the EPA presented in Table 9-1 (Ecology, 2016).

In December 2010, Ecology adopted Chapter 173-441 WAC – Reporting of Emissions of Greenhouse Gases. This rule institutes mandatory GHG reporting for the following:

- Facilities that emit at least 10,000 metric tons of GHGs per year in Washington; or
- Suppliers of liquid motor vehicle fuel, special fuel, or aircraft fuel that supply products equivalent to at least 10,000 metric tons of carbon dioxide per year in Washington.

Puget Sound Clean Air Agency

The PSCAA is responsible for air quality in King County and has local authority for setting regulations and permitting of stationary air pollutant sources and construction emissions. PSCAA also maintains and operates a network of ambient air quality monitoring stations throughout its jurisdiction.

City of Seattle Climate Action Plan 2013

The City's Climate Action Plan (CAP) acknowledges that cities play a powerful role in addressing climate change. Since adoption of the original CAP in 2006, Seattle has taken action on 15 of the 18 strategies established to meet the Kyoto Protocol target for reducing GHG emissions (City of Seattle, 2013). The most recent version of the CAP was adopted in 2013, expanding the CAP vision to include zero net GHG emissions by 2050 and preparing for the likely impacts of climate change. The 2013 CAP provides an action strategy that focuses on reducing GHG emissions while supporting other community goals, including building vibrant neighborhoods, fostering economic prosperity, and enhancing social equity. The plan includes goals of tripling the amount of bicycling from 2007 levels by 2017; reducing passenger vehicle emissions by 82%; reducing passenger vehicle miles traveled by 20% by 2030; trending away from single occupant vehicles; and reducing GHG emissions per mile of Seattle vehicles by 2030 (City of Seattle, 2013).

9.2.2 Air Quality and Pollutants of Concern

Scientific evidence shows that long- and short-term exposure to air pollutants can cause a variety of adverse health effects, including respiratory conditions, cardiovascular conditions, cancer, and premature death (EPA, 2015d).

The Missing Link study area is in the Puget Sound lowland, which generally has sufficient wind most of the year to disperse air pollutants released into the atmosphere. However, CO and PM in the Puget Sound region have exceeded current federal standards in the past. A 1-hour ozone standard was also previously exceeded; however, EPA revoked its 1-hour ozone standard in 2005, and the 8-hour standard is currently being met. Therefore, CO and PM are the main criteria pollutants of concern for the project (see Table 9-2).

Table 9-2. NAAQS Maintenance Areas

NAAQS Criteria Pollutant	*Date of Nonattainment Designation*	*Date of Redesignation to Attainment*	*Affected Area*
CO 8-hour 9 ppm	11/15/1990	10/11/1996	King County
PM10 24-hour 150 µg/m^3	11/15/1990	5/14/2001	King County

Source: Ecology, 2015c.

Carbon Monoxide

CO is an odorless, tasteless, colorless gas emitted from mobile sources (e.g., autos, trucks, and buses); wood-burning stoves; open burning; and industrial combustion sources. CO reduces the blood's capacity to carry oxygen and can cause headaches, dizziness, nausea, listlessness, and, in high doses, may cause death. The federal CO standards have not been exceeded in the Puget Sound area for over 20 years and the area was redesignated to attainment in 1996 (Ecology, 2015c).

Particulate Matter

PM consists of fine particles such as soot, dust, and unburned fuel suspended in the air. It is emitted from a variety of sources, including vehicles, industry, and construction. This pollutant aggravates ailments such as bronchitis and emphysema and is especially harmful for those with chronic heart and lung diseases, as well as the very young, elderly, and pregnant women. The federal annual PM2.5 standard has not been exceeded in the Puget Sound area since monitoring began in 1990. All four counties in the PSCAA monitoring area (Kitsap, Pierce, King, and Snohomish) were below the daily and annual PM10 federal standards since the early 1990s until monitoring stopped in 2006 (PSCAA, 2016). While other areas of Puget Sound are designated maintenance areas, King County is not designated as such (Ecology, 2015c).

9.2.3 Greenhouse Gases

Greenhouse gases warm the earth by absorbing solar energy and slowing the rate at which the energy escapes to space. They act like a blanket and trap heat in the earth's atmosphere, causing climate change. The principal GHGs are carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O).

Road transportation is Seattle's largest source of GHG emissions, comprising approximately 40% of community emissions (City of Seattle, 2013). Fossil fuels burned by cars, trucks, transit, and freight vehicles as they travel throughout Seattle are responsible for the emissions. Because CH4 and N2O emissions constitute less than 0.1% of the total GHGs from these sources, CO2 is the principal GHG of concern for project construction (off-road equipment emissions) and operation (vehicle emissions) (City of Seattle, 2014).

CO2 is naturally present in the atmosphere as part of the Earth's carbon cycle (the natural circulation of carbon among the atmosphere, oceans, soil, plants, and animals). The combustion of fossil fuels such as gasoline and diesel to transport people and goods accounted for about 31% of total CO2 emissions and 26% of total GHG emissions in the United States in 2013 (EPA, 2015d).

9.2.4 Existing Emissions from Idling Vehicles

The focus of this GHG analysis is on air pollutants emitted by idling vehicles. This method is appropriate because none of the alternatives are predicted to change future traffic volumes, but only to change idling times at intersections and as drivers wait for trail users to clear before turning onto or off of roadways. Existing emissions were calculated based on existing vehicle traffic volumes on roadway segments along the alternative routes (Parametrix, 2017). Traffic volumes are described in Chapter 7, Transportation and in the Transportation Discipline Report (Parametrix, 2017).

To establish a baseline of existing conditions, the amounts of pollutant and GHG (CO2) emissions were estimated using existing traffic volumes (Parametrix, 2017) and vehicle delay data at 19 locations, as presented in the Transportation Discipline Report (Parametrix, 2017). The existing daily vehicle volumes and associated delay times were obtained during peak hours to account for worst-case circumstances. Emissions estimates tabulated in Appendix C and presented in Table 9-3 were derived by converting idling times into CO, PM10, and CO2 emission volumes using idle emission factors published by the EPA (2008). The emission estimates used separate calculations for light-duty gasoline-fueled vehicles and heavy-duty diesel trucks. Table 9-3 contains the combined total emission estimates.

Table 9-3. Existing Annual Vehicle Idling Emissions Based on Vehicle Delay and Traffic Volumes

Main Pollutant of Concern	*Total Idling Emissions*
CO (tons/year)	24.35
PM10 (tons/year)	0.02
CO2 (metric tons/year)	1,503

9.3 Potential Impacts

The organization of this impact analysis is different than in other chapters of this FEIS. This section first describes the methods and criteria used to assess air quality impacts, then presents combined results (construction and operation) for GHGs and main criteria pollutants of concern (CO and PM10). This was done in order to compare the total potential pollutant emissions of each alternative including those from construction activities, lifecycle emissions of construction materials, long-term operational maintenance of the trail, and changes in vehicle traffic and idling emissions.

9.3.1 Analysis Methods

This analysis considers the following types of potential project impacts:

- Short-term CO and PM10 emissions generated by construction equipment, vendor truck trips, and construction worker trips;
- "Lifecycle" emissions of GHG (CO2) generated during manufacturing of the concrete used to pave the new trail; paving of the trail; and maintenance of the trail throughout its expected lifespan of 30 years; and
- Potential for the trail connection to negatively impact air quality and GHG emissions by causing delays for vehicles accessing driveways at trail crossings and at intersections.

The City of Seattle SEPA GHG Emissions Worksheet (2016) was used to calculate metric tons of CO2 equivalents created during the manufacture of paving materials, construction of the trail, and maintenance of the trail pavement over its expected lifespan. Air pollutant emissions were calculated using the Road Construction Emissions Model (South Coast Air Quality Management District, 2008).

The volume of nonmotorized trail users who may use the Missing Link once it is completed was estimated using nonmotorized user counts taken near the west and east trail ends. It is assumed that the number of users would be the same across alternatives, and that user volumes would continue to grow, which could result in more delays at driveways and intersections in the study area. See Chapter 7, Transportation, and the Transportation Discipline Report for details (Parametrix, 2017).

The number of pedestrians and bicyclists in the study area may increase with the completion of the Missing Link. However, the air quality analysis was based on the full predicted growth of motorized vehicle use, which represents a more conservative estimate of emissions. This analysis does not assume motorized trip reduction associated with conversion to trail use.

The presence of trail crossings at driveways could result in delays for vehicles using the driveways, thus increasing the amount of vehicle emissions due to increased idling times (Parametrix, 2017). Different types of motorized vehicles emit air pollutants and GHGs in varying volumes, so the types of vehicles that could be delayed are also evaluated. Some of the Build Alternatives would result in signalization of intersections, which would substantially reduce existing and projected vehicle delays during the 2040 horizon year and thus reduce pollutant and GHG emissions.

The significance of potential impacts was assessed using the following criteria:

- Significant adverse impacts would occur if:
    - The project would result in construction-related GHG emissions at or above the State of Washington reporting threshold of 10,000 metric tons in a given year, and the project would not implement BMPs to reduce GHG emissions. Construction-related impacts include the generation of GHG emissions by construction equipment hauling construction materials to the site, removing spoils and debris from the site, and resurfacing, as well as other activities. Lifetime construction-related GHG emissions for each alternative were quantified using the City of Seattle GHG guidelines for SEPA evaluations (City of Seattle, 2016).
    - The project construction plus operation would exceed state GHG reporting requirements or federal de minimis thresholds of 100 tons per year applicable within King County pursuant to the 1990 amendments to the federal Clean Air Act for CO and PM10.
- Minor impacts would occur if:
    - Project construction and operation would result in an increase in GHG emissions that falls below state reporting requirements; or
    - Project construction and operation would result in an increase in CO or PM10 that falls below federal NAAQS standards.

9.3.2 **No Build Alternative**

No construction would occur under the No Build Alternative, and therefore no construction-related air pollution or GHG emissions would occur.

Under the No Build Alternative, traffic congestion and delays would continue on their current trajectory as traffic volumes increase through 2040. Table 9-4 presents the estimated increase in vehicle idling emissions in 2040 under the No Build Alternative compared to existing conditions. (See Appendix C, Table B-1 and B-2 for a tabulation of daily emissions at studied roadway segments under existing and No Build conditions.)

Table 9-4. Vehicle Idling Emissions for the No Build Alternative (Existing Conditions and 2040) Based on Vehicle Delay and Traffic Volumes

	Carbon Dioxide (CO2) Metric Tons per Year			*Carbon Monoxide (CO) Tons per Year*			*Particulate Matter (PM10) Tons per Year*		
	Existing	*2040 No Build Total*	*2040 Increase over Existing*	*Existing*	*2040 No Build Total*	*2040 Increase over Existing*	*Existing*	*2040 No Build Total*	*2040 Increase over Existing*
Total Idling Emissions along Analyzed Roadways	1,503	4,044	2,541	24.35	49.57	25.22	0.02	0.09	0.07

9.3.3 Impacts Common to All Build Alternatives

Greenhouse Gases (CO2)

CO2 emissions come from multiple sources, including the extraction, processing, transportation, construction, and disposal of materials and landscape disturbance, and transportation demands created by the development after it is completed (City of Seattle, 2016). Table 9-5 presents the estimated construction, operation, and total CO2 emissions for each Build Alternative in 2040. Quantities shown are approximate.

Table 9-6 presents the estimated change in construction, operation, and total CO2 emissions for each Build Alternative, including the Preferred Alternative, in 2040 compared to the No Build Alternative. All Build Alternatives would result in a net decrease in GHG emissions compared to the No Build Alternative, largely as a result of intersection timing upgrades proposed in conjunction with the project that would substantially lower vehicle delays at high-volume intersections. The improvements to traffic flow from these upgrades would more than offset the increased vehicle delays at driveways, as well as construction-related GHG emissions.

Criteria Air Pollutants (CO and PM10)

All of the Build Alternatives would have no adverse impacts with respect to criteria air pollutant emissions of CO and PM10, with the exception of CO levels for the Leary Alternative, as shown in Table 9-6. The Leary Alternative would result in a minor increase in total emissions of CO relative to the No Build Alternative; however, total CO emissions would be well below the 100 ton per year de minimis thresholds applicable within King County pursuant to the 1990 amendments to the federal Clean Air Act (Table 9-6).

Similar to the reasons for the CO2 reductions seen for the Build Alternatives, the reduction in the criteria air pollutants for most of the Build Alternatives compared to the No Build Alternative is due to the intersection timing upgrades proposed as part of the project, which would substantially lower vehicle delays at high-volume intersections. Specifically, the intersection at Shilshole Ave NW and 17th Ave NW would see a marked decrease in projected delay time under all of the Build Alternatives.

Table 9-5. Annual 2040 GHG and Air Quality Emissions for Each Build Alternative

Preferred Alternative	CO2 (metric tons)	CO (tons)	PM10 (tons)
Construction	353	5.1	1.6
Operation	3,303	43.41	0.07
Total	3,656	48.51	1.67
Shilshole South Alternative	CO2 (metric tons)	CO (tons)	PM10 (tons)
Construction	325	5.1	1.6
Operation	3,222	42.44	0.06
Total	3,547	47.54	1.66
Shilshole North Alternative	CO2 (metric tons)	CO (tons)	PM10 (tons)
Construction	333	5.1	1.6
Operation	3,211	42.08	0.06
Total	3,544	47.18	1.66
Ballard Avenue Alternative	CO2 (metric tons)	CO (tons)	PM10 (tons)
Construction	378	5.1	1.6
Operation	3,225	40.52	0.07
Total	3,603	45.62	1.67
Leary Alternative	CO2 (metric tons)	CO (tons)	PM10 (tons)
Construction	340	5.1	1.6
Operation	3,973	51.88	0.08
Total	4,313	56.98	1.68

Table 9-6. Change in Annual 2040 GHG and Air Quality Emissions for Each Build Alternative Compared to No Build Alternative

Preferred Alternative	CO2 (metric tons)	CO (tons)	PM10 (tons)
Change from No Build	-741	-6.16	-.02
Threshold	10,000	100	100
+/- Threshold Standard	Net Benefit	Net Benefit	Net Benefit
Shilshole South Alternative	CO2 (metric tons)	CO (tons)	PM10 (tons)
Change from No Build	-822	-7.14	-.02
Threshold	10,000	100	100
+/- Threshold Standard	Net Benefit	Net Benefit	Net Benefit
Shilshole North Alternative	CO2 (metric tons)	CO (tons)	PM10 (tons)
Change from No Build	-833	-7.49	-.02
Threshold	10,000	100	100
+/- Threshold Standard	Net Benefit	Net Benefit	Net Benefit

Ballard Avenue Alternative	CO2 (metric tons)	CO (tons)	PM10 (tons)
Change from No Build	-819	-9.05	-.02
Threshold	10,000	100	100
+/- Threshold Standard	Net Benefit	Net Benefit	Net Benefit
Leary Alternative	**CO2 (metric tons)**	**CO (tons)**	**PM10 (tons)**
Change from No Build	-71	+2.31	-.006
Threshold	10,000	100	100
+/- Threshold Standard	Net Benefit	-97.69	Net Benefit

All Build Alternatives would require the manufacture and installation of new pavement, the transportation of construction materials, and other construction-related activities. These activities cause GHG and criteria air pollutant emissions that would be absent under the No Build Alternative.

Traffic in the study area is expected to grow under all Build Alternatives (Parametrix, 2017), which would generally add to GHG and criteria air pollutant emissions. Alternatives that include transportation system upgrades that could improve traffic flow and decrease idling times could reduce operational emissions compared to the No Build Alternative, since the same improvements are not associated with the No Build Alternative. Where improvements that facilitate traffic flow and reduce delay times offset construction-related emissions, net benefits to air quality could result.

All Build Alternatives would result in a net reduction in CO, CO2, and PM10 emissions over the No Build Alternative, with one exception. The Leary Alternative would result in slightly higher CO emissions compared to the No Build Alternative due to the smaller decreases in idling emissions, which then allow for the increases in construction emissions to predominate, but would be well below the significant adverse impact threshold. The remaining Build Alternatives would result in a decrease in GHG emissions and criteria air pollutants because nonmotorized uses of the transportation corridors would generally be shifted to the trail, which would decrease the delays caused by the conflicting uses at several key intersections.

Although the Build Alternatives would result in increased delays at some intersections or driveways, the magnitude of the decrease at a few high-volume intersections caused by shifting nonmotorized uses to the trail was large enough to compensate for any increases in delay time at other intersections and driveways under the Build Alternatives. The DEIS analysis found minor impacts for these parameters for most of the Build Alternatives as compared to the No Build Alternative, although all emissions were found to be well below the significant adverse impact thresholds. Updated analysis done since the publishing of the DEIS shows a greater decrease in delay times at these high-volume intersections than what was used to calculate GHG emissions and criteria air pollutants for the DEIS, which accounts for the difference in impacts between the DEIS and the FEIS.

9.3.4 **Connector Segments**

Emissions during construction and operation of any of the connector segments would be minor compared to any of the Build Alternatives, and therefore would not cause a significant adverse environmental impact.

9.4 Avoidance, Minimization, and Mitigation Measures

The following measures could apply to all of the Build Alternatives. Although construction-related emissions would be below EPA thresholds, the City would implement BMPs to minimize PM10, CO, and CO2 emissions in the project vicinity and comply with applicable regulations for air quality. The City would require contractors to comply with the following practices:

- Use measures to control dust, such as watering exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) and covering haul trucks transporting soil, sand, or other loose material.
- Wash mud or dirt from construction equipment to prevent it from being tracked out onto public roads.
- Limit vehicle speeds on unpaved roads.
- Pave all exposed soils in areas planned for paving as soon as possible.
- Minimize vehicle and equipment idle times by shutting off when not in use.
- Maintain all construction equipment and vehicles in accordance with manufacturer specifications.

Additionally, contractors could:

- Encourage carpooling options for employees.
- Use warm-mix asphalt.
- Use reused fly ash concrete.
- Use local building materials to reduce transport distances, when possible.

CHAPTER 10: CULTURAL RESOURCES

10.1 Introduction

Changes from the DEIS

Chapter 10 includes analysis of the newly developed Preferred Alternative, which was not included in the DEIS. Additionally, potential impacts from the relocation of the SLS&E RR are evaluated.

This chapter describes cultural resources in the Missing Link study area. Cultural resources include both buried or archaeological resources and aboveground resources such as buildings and other structures.

The Cultural Resources Discipline Report (SWCA, 2016) describes in detail the methods used to identify and evaluate cultural resources in the study area as well as applicable regulations. These methods included review of the following local, state, and federal registers and databases for information about documented cultural resources:

- National Register of Historic Places (NRHP);
- Washington Heritage Register;
- City of Seattle list of Landmarks and Historic Resources Survey Database;
- King County Historic Preservation Program database; and
- Department of Archaeology and Historic Preservation (DAHP) Washington Information System for Architectural and Archaeological Records Data (WISAARD) database.

The EIS team conducted a reconnaissance-level survey of the study area to reexamine previously recorded built environment resources and identify areas or individual resources that are likely eligible for local, state, or federal registers. Information from the King County Department of Assessments and archival sources was used to determine the age of built environment resources.

Historical maps, photographs, and other documents were used to identify locations where past human activity occurred within the study area. Existing geotechnical borehole logs were used to characterize soils and identify areas where potentially significant archaeological resources could be identified during construction.

10.2 Affected Environment

The Missing Link study area for cultural resources includes the five Build Alternatives, a No Build Alternative, and six connector segments that are described from the east project terminus at the intersection of 11th Ave NW and NW 45th St to the west terminus at 30th Ave NW and the Ballard Locks. The study area includes properties directly abutting these alternatives and connector segments (Figure 10-1).

Figure 10-1. Historic Shoreline and Historic District Boundaries

10.2.1 **Setting**

The study area is located along the north shore of Salmon Bay in a glacially exposed and eroded trough. After glaciers left the region at the end of the Pleistocene, Salmon Bay was a dry valley and the shoreline was southwest of its modern position throughout most of the Holocene. Salmon Bay supported a floodplain in which a stream flowed from Lake Union west to the sea as recently as 2,500 years ago (Downing, 1983). Relative sea level in Puget Sound continued to rise throughout the Holocene. The Salmon Bay area transitioned from a floodplain environment into a brackish tidal embayment after 2,500 years ago.

Native American communities whose descendants are now part of the Duwamish, Muckleshoot, Snohomish, Snoqualmie, and Suquamish Tribes once used the project vicinity for settlement and subsistence. Archaeological evidence of Native Americans living around the Puget Sound between about 5,000 and 2,500 years ago is commonly found along modern shorelines. The traditional Native American way of life was altered in the mid-1800s when the first Euroamerican settlers arrived in the Puget Lowland on the coattails of explorers and capitalists (Bass, 1937; Watt, 1931). The historic development of Seattle and its surrounding area was influenced by access to both natural resources and a means to transport them. Land seekers initially chose property along navigable waterways, and communities grew where there were good harbors and nearby resources that could accommodate the growth of trade. Shoreline property was in particular demand, and several early claimants filed for land along a bay that extended inland to the north of the Seattle settlement. This inlet was originally shown as Shilshole Bay on the January 1856 General Land Office survey map (U.S. Surveyor General, 1856) but ultimately became known as Salmon Bay.

Deposition of industrial fill was commonplace along the Salmon Bay shoreline in the 1890s. Canal spoils were later placed along the shoreline during construction of the Ship Canal and Hiram M. Chittenden Locks between 1916 and 1934. As a result, the wetlands along the coast were filled and the Salmon Bay shoreline was extended south of its original position. Figure 10-1 depicts the shoreline of Salmon Bay in 1891 in relation to the study area. The Preferred Alternative and the Shilshole North and South Alternatives are at or adjacent to the 1891 shoreline. Mean tide elevation in Salmon Bay rose to the level of Lake Union after completion of the Ship Canal (Chrzastowski, 1983). Lake Washington was subsequently lowered approximately 10 feet to the level of Lake Union (Galster and Laprade, 1991).

Today, soils mapped in the project vicinity consist of Alderwood series soils that formed on uplands and terraces in glacial till (Snyder et al., 1973). The study area, however, does not include intact Alderwood soils because it has been fully developed and most of the area includes a considerable amount of fill. Borings completed during previous geotechnical investigations for other projects found 1 to 17 feet of mixed clayey, gravelly, silty, sandy fill across the surface of the study area. The fill is thickest along the Preferred Alternative and the Shilshole North and South Alternatives at the historical shoreline.

10.2.2 **Previously Identified Cultural and Historic Resources**

Archaeological Resources

It is possible that archaeological materials dating to the middle Holocene are present in the project vicinity. If present, they would likely be encountered along the prehistoric shoreline that is closest to the Preferred Alternative and the Shilshole North and South Alternatives. Similar to middle Holocene sites, archaeological materials dating to the late Holocene are possibly in the project vicinity. If present, late Holocene sites would likely be encountered just below the historical fill along the prehistoric shoreline that is closest to the Preferred Alternative and the Shilshole North and South Alternatives.

The previous geotechnical studies reported potential archaeological deposits within the fill material. Brick, metal, and wood debris were reported throughout the fill, and similar deposits are expected along the connector segments. It appears that two dump sites exist, one near 11th Ave NW and NW 46th St, and the other near 28th Ave NW and NW Market St. Wood and other debris were also found at the base of the fill. The deeply buried wood and debris deposits that are concentrated at the base of the fill are more likely to be culturally significant than the bricks, wood, and metal debris found scattered throughout the upper fill because the lower deposits are located on natural surfaces, are older, and are still in place.

Table 10-1 summarizes the archaeological resources recorded in the vicinity of the BGT, as well as human remains and other cultural materials that have been noted, but not recorded, in the project vicinity.

Table 10-1. Previously Recorded Archaeological Sites and Burke Museum Collections and Materials Noted in the Project Vicinity

Site No.	*Compiler/ Data*	*Age*	*Description*	*Relation to Preferred Alternative and Shilshole North and South Alternatives*	*Relation to Ballard Avenue Alternative*	*Relation to Leary Alternative*
45KI1000	Major 2010	Pre-contact	Salmon Bay midden	0.3 mile west	0.3 mile west	0.3 mile west
Burke Human Remains Site 1162	King County Database	Pre-contact	Human remains	One block north	Adjacent at 1416 NW 46th St	Two blocks south
Burke Archaeological Site 1117	King County Database	Pre-contact	Isolated projectile point	North	North	North
Burke Archaeological Site 1102	King County Database	Pre-contact	Shell midden and human remains	Adjacent to west end	Adjacent to west end	Adjacent to west end

Historic Districts

Three historic districts are located in or near the study area (Table 10-2, Figure 10-1). Two of the districts are listed in the NRHP: (1) the Ballard Avenue Historic District, and (2) the Hiram M. Chittenden Locks and Related Features of the Lake Washington Ship Canal. The third is a local historic district, but not listed in NRHP, the Ballard Avenue Landmark District, which has the same boundaries as the Ballard Avenue NRHP district. Although these two districts have the same boundary, they are distinct districts with different regulatory structures.

The historic streetscape along Ballard Ave NW from NW Market St to NW Dock Pl makes up the NRHP-listed Ballard Avenue Historic District, which includes 74 properties that belong to the period of

significance between 1890 and 1930 (Potter, 1976). Forty-one of these properties are adjacent to one or more of the alternatives or connector segments. The Ballard Avenue Alternative extends through the middle of the historic district. The contributing historic properties within this district are described further in the section on "Buildings and Structures" below. The locally designated Ballard Avenue Landmark District was established by the City of Seattle in 1975.

Eight miles of man-made channels and inland bodies of water between Puget Sound and Lake Washington have been recorded as the Hiram M. Chittenden Locks and Related Features of the Lake Washington Ship Canal (Potter, 1977). These features include the fixed dam and double locks at Salmon Bay in Ballard, the Fremont Cut between the locks and Lake Union, and the Montlake Cut between Lake Union and Lake Washington, as well as 20 accessory structures that date to the period of significance between 1906 and 1917. This district is located just west of the Missing Link study area (Figure 10-1).

Table 10-2. Historic Districts in or Adjacent to the Study Area

Description	*Age*	*Relationship to Alternatives*		
		Preferred Alternative and Shilshole North and South	Ballard Avenue	Leary
Ballard Avenue Historic District / Ballard Avenue Landmark District	1890–1930	½ block north	Within	Adjacent to ½ block south
Hiram M. Chittenden Locks and Related Features of the Lake Washington Ship Canal	1906–1917	Adjacent to west end	Adjacent to west end	Adjacent to west end

Buildings and Structures

In addition to the buildings that were recorded as part of the historic districts, a total of 54 buildings located on properties adjacent to the alternative alignments have been previously recorded. Some of these resources were evaluated for eligibility for listing in the NRHP while others were not. One resource, the 15th Ave Bridge/Ballard Bridge, is individually listed in the NRHP.

The following paragraphs summarize historic resources present along each of the Build Alternatives and connector segments.

Preferred Alternative

This alternative does not pass through any historic districts, but it is adjacent to the north edge of the Hiram M. Chittenden Locks District. This alternative does not border any contributing features of that district, but it is adjacent to three eligible or listed resources (Figure 10-2).

The NRHP-listed 15th Ave Bridge/Ballard Bridge crosses over a segment of the Preferred Alternative at NW 45th St. In addition, the Jack Johnson Beer Parlor/Lock Spot, which was evaluated and recorded locally, is adjacent to the Preferred Alternative on NW 54th St.

Along Shilshole Ave NW, the Preferred Alternative is adjacent to the NRHP-eligible Seattle Lake Shore and Eastern Railroad Grade/Ballard Terminal Railroad. For the purposes of this report, the two railroad segments are treated and discussed as a single resource (SLS&E RR).This resource is in very close proximity to the proposed trail and crosses it on Shilshole Ave NW near NW 46th St.

Shilshole South Alternative

This alternative does not pass through any of the historic districts. Although it is adjacent to the north edge of the Hiram M. Chittenden Locks District, it does not border any contributing features in that district. This alternative is adjacent to two eligible or listed resources (Figure 10-2).

The NRHP-listed 15th Ave Bridge/Ballard Bridge crosses over a segment of the Shilshole South Alternative at NW 45th St.

A large segment of the Shilshole South Alternative is adjacent to the NRHP-eligible SLS&E RR. Proposed plans for the Shilshole South Alternative indicate that this resource is located in very close proximity to the proposed trail and crosses it on Shilshole Ave NW between NW Dock Pl and 17th Ave NW.

Shilshole North Alternative

This alternative does not pass through any historic districts, but is adjacent to the north edge of the Hiram M. Chittenden Locks District. This alternative does not border any contributing features of that district, but it is adjacent to four eligible or listed resources (Figure 10-2).

The NRHP-listed 15th Ave Bridge/Ballard Bridge crosses a segment of the Shilshole North Alternative at NW 46th St. The Stimson Mill Office, which is NRHP-eligible, is adjacent to this alternative at the corner of NW Vernon Pl and Shilshole Ave NW. In addition, the Jack Johnson Beer Parlor/Lock Spot, which was evaluated and recorded locally, is adjacent to the Shilshole North Alternative on NW 54th St.

Large segments of the Shilshole North Alternative are adjacent to the NRHP-eligible SLS&E RR. Proposed plans for the Shilshole North Alternative indicate that the proposed trail crosses the railroad on NW 46th St, midway between 11th Ave NW and 14th Ave NW. The southeast end of the proposed route also crosses the railroad at the intersection of NW 45th St and 11th Ave NW.

Ballard Avenue Alternative

This alternative extends through the center of two historic districts (the NRHP-listed and local Ballard Avenue Historic Districts) and is adjacent to the north edge of a third historic district (Hiram M. Chittenden Locks District). A total of 38 eligible or listed resources are adjacent to or crossed by this alternative (Figure 10-2). See the Cultural Resources Discipline Report (SWCA, 2016) for a complete list.

The Ballard Avenue Alternative extends through the center of the Ballard Avenue Historic District from 22nd Ave NW to the southeast district boundary near NW Dock Pl. Twenty-six district resources are adjacent to this alternative alignment.

The 15th Ave Bridge/Ballard Bridge crosses the Ballard Avenue Alternative at NW 46th St, and is located immediately east of the alternative between NW Ballard Way and NW 46th St.

The plans for this alternative place the trail in close proximity to the SLS&E RR. The west end of the alternative is immediately north of the railroad, and the east end of the alternative crosses the railroad on

NW 46th St between 11th Ave NW and 14th Ave NW. The far east end of the alternative also crosses the railroad at the intersection of NW 45th St and 11th
Ave NW.

Leary Alternative

The Leary Alternative is adjacent to the north edge of the two Ballard Avenue historic districts and the north edge of the Hiram M. Chittenden Locks District. A total of 11 eligible or listed resources are adjacent to this alternative. These resources include the north end of the 15th Avenue Bridge/Ballard Bridge and the SLS&E RR, which this alternative crosses at the intersection of NW 45th St and 11th Ave NW (Figure 10-2). See the Cultural Resources Discipline Report (SWCA, 2016) for a complete list.

Connector Segments

14th Avenue NW

This connector segment is not in the vicinity of any historic districts, and no historic resources are adjacent to this alternative.

15th Avenue NW

This segment is not adjacent to any historic districts, but is adjacent to the 15th Avenue Bridge/Ballard Bridge between Shilshole Ave NW and NW 46th St.

17th Avenue NW

This segment is adjacent to one eligible building located at the northeast corner of the 17th Ave NW and NW Ballard Way intersection.

20th Avenue NW

The 20th Avenue NW segment extends through the Ballard Avenue Historic District/Ballard Avenue Landmark District and is adjacent to six district resources and the Curtiss Building (Figure 10-2).

NW Vernon Place

The northeast portion of the NW Vernon Pl segment extends into the Ballard Avenue Historic District/Ballard Avenue Landmark District. Three eligible or listed resources are adjacent to this connector segment (Figure 10-2).

Ballard Avenue NW

This segment extends through the Ballard Avenue Historic District/Ballard Avenue Landmark District and is adjacent to 16 eligible or listed resources (Figure 10-2).

Figure 10-2. Historic Resources

10.2.3 **Potential for Encountering Additional Archaeological Resources**

Based on the natural and cultural setting of the study area, significant cultural resources could be encountered. The potential for encountering significant precontact and ethnographic period archaeological materials is slightly higher than the potential for encountering historical period archaeological materials.

The Salmon Bay shoreline was accessible throughout the Holocene, and local inhabitants almost certainly passed through, camped within, processed resources throughout, and even occupied portions of the study area in the past. These activities left behind variable traces in the archaeological record. While historical filling along the shoreline of Salmon Bay during industrial development and construction of the Ballard Locks buried prehistoric and ethnographic period cultural resources that may be present in the study area, significant early historical archaeological deposits could be present within this fill material. The potential for encountering significant historical cultural materials is highest at the base of the fill along the buried shoreline.

Table 10-3 assigns a sensitivity rating to each alternative based on its potential for encountering prehistoric, ethnographic, or historic period archaeological resources. The Preferred Alternative, Shilshole North and South Alternatives, and the Ballard Avenue Alternative appear to be slightly more sensitive than the Leary Alternative, and they carry a higher risk of an archaeological find during construction. This risk is tempered by the fact that there is a significant amount of fill on top of the old shoreline, so any potentially significant cultural materials that may be present are likely deeply buried below the proposed depth of project disturbance.

Table 10-3. Sensitivity for Encountering Cultural Resources within the Missing Link Alternatives

Build Alternative	*Prehistoric Archaeological*	*Ethnographic Archaeological*	*Historic Archaeological*	*Historic Built Environment*
Preferred Alternative	High	High	High	High
Shilshole North	High	High	High	High
Shilshole South	High	High	High	High
Ballard Avenue	High	High	High	High
Leary	Moderate	Moderate	Moderate	Moderate

10.3 Potential Impacts

10.3.1 **No Build Alternative**

No construction is proposed for the No Build Alternative; as a result, there are no anticipated impacts to cultural resources.

10.3.2 **Impacts Common to All Build Alternatives**

Construction

Three major types of construction impacts on historic properties could occur due to construction of the Missing Link. First are direct physical effects, primarily consisting of vibration, noise, dust, or other temporary environmental conditions caused by construction activities. These effects could damage built environment resources or could affect the maintenance or economic viability of these buildings and structures.

Second, indirect effects could result from traffic congestion, the presence of equipment, loss of parking, and limited access during construction. Prolonged periods of traffic disruption and construction could result in the loss of the distinctive character and economic base of historic neighborhoods. However, traffic delays and parking loss from construction would be minimal (see Chapters 7 and 8). Access may be limited but would be maintained during construction.

The third type of construction impact would be potential alterations to the SLS&E RR, which could affect its historic significance. The Build Alternatives, including the Preferred Alternative, cross the SLS&E RR at various locations. Removal or relocation of rails, or irreversible treatments that cover the rails or other physical features of the railroad such as switches or sleepers could result in an impact to the SLS&E RR.

The Build Alternatives, including the Preferred Alternative, are located in an area of moderate to high probability for encountering potentially significant archaeological resources within the naturally deposited sediments of the study area. However, because there is a significant amount of fill on top of the old shoreline, the Missing Link construction would not likely affect any potentially significant cultural materials that may be present because project excavations would not extend below the fill.

Operation

No buildings would likely be altered. The streetscape would change slightly with new curb and markings, but in most areas these changes would not alter the overall character of the streetscape, except within the limits of a historic district. There would be no anticipated operational effects on pre-contact, ethnohistoric, or historical archaeological resources.

10.3.3 **Preferred Alternative**

Construction

The Preferred Alternative would cross from the north side of the SLS&E RR to the south along Shilshole Ave NW near NW 46th St. Under the Preferred Alternative, a portion of the SLS&E RR between the Hatton Marine driveway (approximately 600 feet west of 17th Ave NW) and just east of the Ballard Bridge would be relocated and replaced with new track (see Figure 1-3 in Chapter 1). Also, pavement would be added in portions of the rail line to decrease gaps between the tracks and the roadway to improve safety at driveways in the study area. These construction activities would be coordinated with the owners of SLS&E RR and DAHP. The removal or relocation of rails, or irreversible treatments that cover the rails or other physical features of the railroad such as switches or sleepers, would result in an impact to the railroad.

Operation

There are no operational impacts unique to the Preferred Alternative.

10.3.4 **Shilshole South Alternative**

Construction

The Shilshole South Alternative would cross from the north side of the SLS&E RR to the south along Shilshole Ave NW between NW Dock Pl and 17th Ave NW. Similar to the Preferred Alternative, the Shilshole South Alternative would relocate a portion of the SLS&E RR between the Hatton Marine driveway (approximately 600 feet west of 17th Ave NW) and just east of the Ballard Bridge and replace it with new track. Also, pavement would be added in portions of the rail line to decrease gaps between the tracks and the roadway to improve safety at driveways in the study area. These construction activities would be coordinated with the owners of SLS&E RR and DAHP, as appropriate. The removal or relocation of rails, or irreversible treatments that cover the rails or other physical features of the railroad such as switches or sleepers, would result in an impact to the railroad.

Operation

There are no operational impacts unique to the Shilshole South Alternative.

10.3.5 **Shilshole North Alternative**

Construction

The proposed Shilshole North Alternative would cross the SLS&E RR twice. Removal or relocation of rails or other irreversible treatments that cover the rails or other physical features of the railroad such as switches or sleepers could result in an impact to the SLS&E RR at the east end of the alternative at NW 46th St midway between 11th Ave NW and 14th Ave NW, and at the intersection of NW 45th St and 11th Ave NW.

Operation

There are no operational impacts unique to the Shilshole North Alternative.

10.3.6 **Ballard Avenue Alternative**

Construction

The Ballard Avenue Alternative would cross the SLS&E RR at NW 46th St midway between 11th Ave NW and 14th Ave NW, and at the intersection of NW 45th St and 11th Ave NW. Removal or relocation of rails, or irreversible treatments that cover the rails or other physical features of the railroad such as switches or sleepers could result in an impact to SLS&E RR.

Photo 10-1. Ballard Avenue NW

The brick pavers on streets in this alternative are noted in the Ballard Avenue Landmark District Guidelines (adopted June 4, 2015) (City of Seattle, 2016) as one of the "qualities" that contributes to the historic character of the district.

This description includes historic brick pavers that have been covered with asphalt, as well as streetcar lines that may exist beneath the current street surface. Granite curbs and hitching rings along these roads are also called out in this document as important to the district.

The pavement itself is not listed as a contributing feature within the NRHP nomination for the Ballard Avenue Historic District, but the nomination does note in the Site and Physical Features section that "brick was the earliest pavement to abut the Seattle Electric Railway tracks which ran the length of Ballard Avenue...," and that "granite curb stones, still in evidence here and there, are generally believed to have come to land as ships' ballast" (Potter, 1976).

Removal of granite curbs and brick underlying the asphalt road surface is anticipated throughout the Ballard Avenue Alternative due to changes in existing sidewalk width and construction of the trail and buffer. These changes would constitute an adverse impact to the district. Potential dust and vibrations from construction vehicles and activities could result in the physical deterioration of the buildings and structures as well as the pavers and roadway. An additional impact could be the weight of construction vehicles on the streets with brick pavers.

Operation

There are no operational impacts unique to the Ballard Avenue Alternative.

10.3.7 **Leary Alternative**

Construction

The Leary Alternative would cross the SLS&E RR at the intersection of NW 45th St and 11th Ave NW. Removal or relocation of rails, or irreversible treatments that cover the rails or other physical features of the railroad such as switches or sleepers as part of this crossing could result in an impact to SLS&E RR.

Operation

There are no operational impacts unique to the Leary Alternative.

10.3.8 **Connector Segments**

Construction

Removal or relocation of the pavers underlying the asphalt surface and granite curbs on the Ballard Avenue NW connector segment may result in an impact to the Ballard Avenue Historic District.

Operation

There are no operational impacts unique to the connector segments.

10.4 Avoidance, Minimization, and Mitigation Measures

10.4.1 **Measures Common to All Build Alternatives**

The primary impacts of the Missing Link project on the built environment would be potential effects to the rail lines and associated features of the SLS&E RR. Construction impacts along the Shilshole North,

Ballard, and Leary Alternatives and connector segments can be minimized if railroad rails are not removed or altered, and effects to other contributing features, such as switches and sleepers, are avoided. The use of surfaces that would not affect the rails or active use of the railroad would also minimize impacts. For the Preferred and Shilshole South Alternatives, impacts from relocating the SLS&E RR could be mitigated by completing DAHP Level II documentation of this segment of the rail line. An example of minimization can be seen along the existing BGT east of the Missing Link project. There, the crossing of the tracks is approached at an angle for safety, and the area between the rails was paved with asphalt. With the implementation of these minimization measures, impacts would not be significant.

Construction mitigation measures for direct and indirect impacts on historic properties would be based on the type of construction activity and the extent of the potential adverse effect on the resources. Traffic delays, loss of parking, and access problems during construction would be minor. Potential impacts could be minimized by implementing measures as outlined in the Transportation Discipline Report (Parametrix, 2017a) and Parking Discipline Report (Parametrix, 2017b). BMPs can be used to control noise, air pollution, dust, and mud and to avoid impacts to historic resources. Efforts to minimize impacts during construction would include limiting the disruptions of utility services and providing continued access to businesses and residences during construction.

The Missing Link would have limited operational impact on built environment resources and no expected impact on archaeological resources. Preparation of an Inadvertent Discovery Plan (IDP) specific to the Missing Link would avoid significant effects to archaeological resources during construction.

10.4.2 Measures Specific to Each Alternative

The construction and operation of the Ballard Avenue Alternative and the Ballard Avenue NW connector segment could have impacts on features that contribute to the historic significance of the Ballard Avenue Historic District. The design and appearance of the trail within the district would need to be compatible with its historic character and period of significance, and SDOT would need to obtain a Certificate of Approval demonstrating compatibility from the Office of Historic Preservation. Construction impacts to historic streetscapes could be minimized by reuse of the granite curbs for the expanded sidewalk design and by retention and, if necessary, resetting of the existing brick pavement that lies underneath the asphalt surfacing of the street. Any decisions about minimization or mitigation measures should be made in consultation with DAHP and the Ballard Avenue Landmark District Board.

No further measures other than those recommended for all of the alternatives in Section 10.4.1, Measures Common to All Build Alternatives, would be needed.

CHAPTER 11: CUMULATIVE IMPACTS

11.1 Introduction

Changes from the DEIS

Chapter 11 includes additional information on known or anticipated projects in the region, including updated information on the Ship Canal Water Quality Project and Sound Transit 3, which was not presented in the DEIS.

Cumulative impacts are the effects that may result from the incremental impact of an action when added to other past, present, and reasonably foreseeable actions, regardless of who undertakes them. The purpose of a cumulative impacts analysis is to identify the potential for the project to contribute to the incremental impacts to a degree that, if unmitigated, these impacts could become significant. Potential cumulative impacts are analyzed so that decision-makers can consider how impacts from actions over time "add up" to affect a resource. Analysts identified potential past, present, or reasonably foreseeable future actions that could affect or be affected by the Missing Link project, either directly or indirectly.

The Ballard area has experienced significant development and re-development in the past several years, and this trend is anticipated to continue as long as favorable economic conditions persist. This has resulted in numerous new apartments and condominiums throughout the area, and a relatively high level of construction activity. Listed below are descriptions of several large construction and development projects that are known or are reasonably expected to occur in the near future in the project vicinity.

11.2 Known or Anticipated Projects

11.2.1 Ship Canal Water Quality Project

SPU is proposing a large project to reduce Combined Sewer Overflows (CSOs) that would occur in the vicinity of the proposed Missing Link project. The project will be under construction over an approximate 6-year period, beginning in approximately 2018. Active construction would occur in phases at different locations, but would be heavy in the Ballard area over much of the construction period.

11.2.2 C.D. Stimson Development

Developer C.D. Stimson Co. plans to build a 500,000-square-foot office complex consisting of five, five-story buildings at 5423 Shilshole Ave NW. The project will start with one 105,000-square-foot building, with the remaining added in the following years. Construction of the first building is anticipated to take 2 years but has not yet been scheduled.

11.2.3 Sound Transit 3 Priority Projects

Sound Transit has developed a priority projects list as part of their planning process to expand the regional mass transit system to meet anticipated population growth by 2040. Voters approved the Sound Transit 3 Plan in November 2016. The Ballard to Downtown Light Rail project is a priority project within the study area. Sound Transit 3 also includes plans to study options for expanding light rail transit connections across northern Lake Washington, including a connection from Ballard.

Ballard to Downtown Seattle Light Rail

This project builds light rail from downtown Seattle to Ballard's Market St area. The project includes elevated light rail on 15th Ave W, a rail-only movable bridge over Salmon Bay, and a new station in Ballard. Anticipated completion date is 2035.

11.2.4 SDOT Move Seattle Transportation Strategy

Three projects in Move Seattle overlap with the study area: the Ballard to Downtown Enhanced Transit Corridor, RapidRide Corridor 6, and Market/45th Transit Improvement Project. All of these projects are proposed to be implemented by 2024.

Ballard to Downtown Enhanced Transit Corridor

In preparation for the potential inclusion of a Ballard light rail line, the Ballard to Downtown Enhanced Transit Corridor project improves the corridor's existing transit operations and adds interim safety improvements for people who bike and walk across the Lake Washington Ship Canal.

RapidRide Corridor 6

This proposed RapidRide corridor would include dedicated bus lanes on Leary Ave NW/NW Leary Way.

Market/45th Transit Improvement Project

The Market / 45th transit project enhances transit speed and reliability on of one of the city's primary east-west corridors and most chronically congested routes.

11.2.5 SDOT Move Ballard

The Move Ballard plan identifies near-term transportation improvements in the Ballard area. Three projects or studies from the Move Ballard plan overlap with the Preferred Alternative route: Shilshole Ave NW/17th Ave NW Truck Access Improvements, 17th Ave NW Greenway Connection, and the NW Market St Corridor Study. The 17th Ave NW Greenway Connection and NW Market St Corridor Study results are pending based on the outcome of this EIS process.

11.2.6 Seattle Bicycle Master Plan Projects

SDOT's Bicycle Master Plan (SDOT, 2014a) proposes a number of bicycle improvements in and near the Missing Link study area. These projects include constructing neighborhood greenways on NW 50th St, 11th Ave NW, 28th Ave NW, and NW 64th St. Bicycle lanes with minor separation are proposed for NW Market St between 24th Ave NW and 32nd Ave NW, and on 14th Ave NW.

11.2.7 Private Development

The Ballard neighborhood has been experiencing a high level of growth in the last few years, and it is anticipated that this growth will continue (City of Seattle, 2014). The types of development expected are commercial buildings, as well as residential medium and high density housing including multi-family complexes with commercial development on the ground floor, such as the Ballard Blocks II development.

11.3 Potential Cumulative Impacts

11.3.1 Geology Soils and Hazardous Materials

Adverse impacts on geology, soils, and hazardous materials from the Missing Link project are primarily minor impacts related to construction. Other projects in the Ballard neighborhood being constructed before, during, and after construction of the Missing Link project would be required to adhere to similar existing regulatory requirements regarding building code requirements and grading permit requirements. In general, geologic hazards and areas of contamination from legacy contaminants are site specific that can vary in severity over short distances. As a result, these hazards are addressed on a site-specific basis and do not combine to become cumulatively significant. Therefore, there would be no cumulative impacts related to geology, soils, and hazardous materials.

11.3.2 Fish, Wildlife, and Vegetation

There would be no cumulative impacts to fish and wildlife as no impacts would result from the Missing Link, and wildlife species are adapted to the urban environment. Impacts to fish may occur from individual projects if there is in-water work; however, the Missing Link project would not include in-water work.

There would be no cumulative effect on street trees, as no impacts are anticipated to street trees from the Missing Link. The projects considered in the cumulative impacts analysis would likely locate some portion of the development along a street and must comply with SMC 15.43 and the Street Tree Manual (SDOT, 2014b). Some of the projects may result in the removal and replacement of street trees, while others may plant trees where currently none are located.

11.3.3 Land and Shoreline Use

Cumulative construction impacts to land use would be minor and temporary, and are not expected to be significant. Combined with other projects in the study area, the construction impacts could cause potential customers to avoid businesses in the area during construction, which could result in temporarily reduced revenues for affected businesses. If the timing of construction for SPU's Ship Canal Water Quality project overlaps with the Missing Link project, there could be considerable congestion and construction-related traffic delays, dust and noise, and other effects. All projects would be required to implement mitigation measures during construction to minimize impacts to businesses. SDOT and SPU will coordinate construction activities to minimize potential impacts associated with both projects.

Operation of the projects could result in higher land utilization to accommodate projected employment and population growth, which would be consistent with adopted land use plans and policies. All projects are required to mitigate for impacts in compliance with adopted codes and plans. Light rail stations could induce demand for office, multi-family residential, restaurants, and other non-industrial uses within the vicinity of the stations. Increased residential, employment, recreational, and retail opportunities, and a general concentration of uses, are consistent with land use plans and policies. The proposed projects in addition to the multi-use trail could have a cumulative negative impact on the uses that currently rely on relatively predictable vehicular access and traffic flow, on-street parking, and loading zones. Displacement, or transformation, of existing businesses may take place as land uses in Ballard continue to change, and the operation of the Missing Link may add to those competitive pressures facing industrial businesses (ECONorthwest, 2016).

11.3.4 **Recreation**

Impacts on recreation from the Missing Link project are primarily minor impacts from construction. Other projects in the Ballard neighborhood being constructed before, during, and after construction of the Missing Link project could lead to cumulative impacts on street- and sidewalk-based recreation, such as walking, jogging, and bicycling. Construction impacts include street closures, temporary loss of access, noise, traffic, and dust. Given the high degree of recently completed and ongoing projects, construction of the Missing Link could contribute to "construction fatigue" for people living in and visiting the Ballard neighborhood.

11.3.5 **Utilities**

If construction of SPU's Ship Canal Water Quality project occurs simultaneously with construction of the Missing Link, impacts on utilities could be increased, as construction of the SPU project could require utility outages or relocations. SDOT and SPU would coordinate construction staging to minimize any potential short-term impacts on utilities.

11.3.6 **Transportation**

If construction of SPU's Ship Canal Water Quality project, the C.D. Stimson development, and/or other development projects occur simultaneously with the Missing Link project, impacts on traffic and other transportation resources could be increased. Construction activities related to these projects would interfere with roadway, rail, or trail operations, and construction of the Missing Link could add to overall transportation impacts in the Ballard area. SDOT and SPU would coordinate construction activities and staging to reduce potential short-term impacts on transportation from their respective projects.

Sound Transit's Ballard to Downtown Light Rail, SDOT's Move Seattle projects, and the Seattle Bicycle Master Plan projects would likely decrease personal vehicle use in the study area, which could reduce congestion and delay for motor vehicles in this area. The RapidRide Corridor 6 project could conflict with the Leary Alternative for the Missing Link, because there may not be enough roadway width to accommodate both projects.

11.3.7 **Parking**

If construction of the Ship Canal Water Quality project occurs simultaneously with construction of the Missing Link, impacts on parking would be increased. SDOT and SPU will coordinate construction activities to minimize the potential short-term impacts on parking.

Construction of the C.D. Stimson development could affect parking in the study area for a limited time, if construction occurs concurrently. SDOT and C.D. Stimson Co. will coordinate regarding construction activities to mitigate any potential construction impacts. In combination with the reduction of on-street parking by the Missing Link, this could result in higher utilization of available parking in the western portion of the study area. This impact would be offset to some degree following construction, because the development is proposed to include off-street parking. Construction of Sound Transit's Ballard to Downtown Light Rail, as well as SDOT's proposed Transit Improvement Projects, would increase impacts on parking if they occurred concurrently with the Missing Link project. SDOT and Sound Transit will coordinate construction activities to minimize the short-term impacts on parking that could occur. In the long term, the cumulative effect would be a loss of parking in the Ballard area.

Construction of ongoing private development could affect parking in the study area for the foreseeable future. Private developments could have an impact on on-street parking in the study area by increasing parking occupancy. In combination with the reduction of on-street parking by the Missing Link, this could result in higher use of available parking throughout the study area. This occupancy could be offset to some degree over the long term if development projects contain some parking for tenants.

11.3.8 **Air Quality and Greenhouse Gas**

There would be no significant adverse construction or operational impacts of the Missing Link project on air quality or GHG. In combination with other planned or reasonably foreseeable projects, an increase in emissions of CO and PM10 from the Missing Link could contribute to cumulative impact on air quality resulting from construction activities, including paving, material transport, and worker trips; increased emissions from traffic delays caused by road closures; emissions from construction equipment; and higher traffic volumes associated with increased development density. The resulting cumulative impact would be minor to negligible.

11.3.9 **Cultural Resources**

The five Build Alternatives would not contribute to a cumulative impact on archaeological resources. However, a few of the projects listed in Section 11.2, Known or Anticipated Projects, are likely to impact the BTR at crossings due to the removal or covering of character-defining features. The Ship Canal Water Quality project may upgrade the existing railroad tracks for use in moving construction materials and spoils, and the proposed C.D. Stimson Development would require access points that cross the tracks. If these projects propose the removal or covering of character-defining features of the BTR, they could, along with the Missing Link, contribute to a cumulative impact for cultural resources.

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Land Use		
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Ryan LeProwse, Reviewer Parametrix	B.S. Civil Engineering P.E. Washington and Oregon	18
Utilities		
Spencer Easton, Author ESA	B.A. Liberal Arts	9

CHAPTER 14: DISTRIBUTION LIST

The following parties have received printed copies of the Executive Summary or the full FEIS:

Tribal Governments

Duwamish Tribe

Muckleshoot Indian Tribe

Snoqualmie Tribe

Suquamish Tribe

Tulalip Tribes

Regional

Port of Seattle

Puget Sound Regional Council

Sound Transit

Washington State

Department of Archaeology and Historic Preservation

Department of Ecology SEPA Register

Washington State Representative Frame

Washington State Representative Tarleton

Washington State Senator Carlyle

U.S. Representative Jayapal

U.S. Senator Cantwell

U.S. Senator Murray

Libraries

Ballard Branch

Central Branch

Fremont Branch

Greenwood Branch

Magnolia Branch

Queen Anne Branch

University Branch

Wallingford Branch

University of Washington

Local

Ballard Neighborhood Customer Service Center

King County Councilmember Kohl-Welles

King County Executive Constantine

Seattle Bicycle Advisory Board

Seattle City Councilmembers

Seattle Department of Construction & Inspections

Seattle Department of Neighborhoods, Historic Preservation Program

Seattle Department of Parks and Recreation

Seattle Department of Transportation

Seattle Design Commission

Seattle Freight Advisory Board

Seattle Landmarks Preservation Board

Seattle Legislative Department

Seattle Office of Economic Development

Seattle Office of the Mayor

Seattle Pedestrian Advisory Board

Seattle Public Utilities

Seattle Transit Advisory Board

North Seattle Industrial Association

Queen Anne Chamber of Commerce

Seattle Parks Foundation

Sustainable Ballard

Washington State Bicycle Association

Other

14th Avenue Visioning Project

Ballard Chamber of Commerce

Ballard Civic Center Steering Committee

Ballard Community Center

Ballard District Council

Ballard Farmers Market

Ballard-Interbay Northend Manufacturing and Industrial Center Action Committee

Ballard Merchants Association

Ballard Rotary

Ballard Terminal Railroad

Cascade Bicycle Club

Feet First

Fremont Chamber of Commerce

Friends of the Burke-Gilman Trail

Greater Seattle Chamber of Commerce

Groundswell Northwest

Lake Union District Council

Magnolia/Queen Anne District Council

APPENDIX A
AutoTURN ANALYSIS

AutoTURN Description and Simulations

AutoTURN analyzes the swept path of vehicle maneuvers to determine the appropriate roadway design to accommodate turning vehicles. AutoTURN was used to simulate ingress and egress from driveways as well as maneuvers through intersections for large vehicles. During preliminary design of the trail, a WB-50 (a large semitrailer truck) and a single-unit truck (similar in length to a cement truck) were used to evaluate vehicle swept path. This allows trail designers to determine the appropriate width for driveways as well as the appropriate curb radii for intersections to accommodate large vehicle turning movements in the study area. AutoTURN was completed for a sample of driveways in the study area (see the following figures). During final design of the trail, AutoTURN would be completed for individual driveways, and SDOT would work with property owners to determine the most appropriate design vehicle for each individual driveway.

FILE: XPS7269001P03T301-PREF ALT - AUTOTURN LAYOUT: 26TH PATH: U:\PSO\Projects\Client\7269-ESA\554-7269-001 Burke-Gilman Trail ESI\99scv\CAD\FIGURES\Autoturn Ex PLOTTED BY: dmacedo DATE: Monday, May 15, 2017 4:25:43 PM

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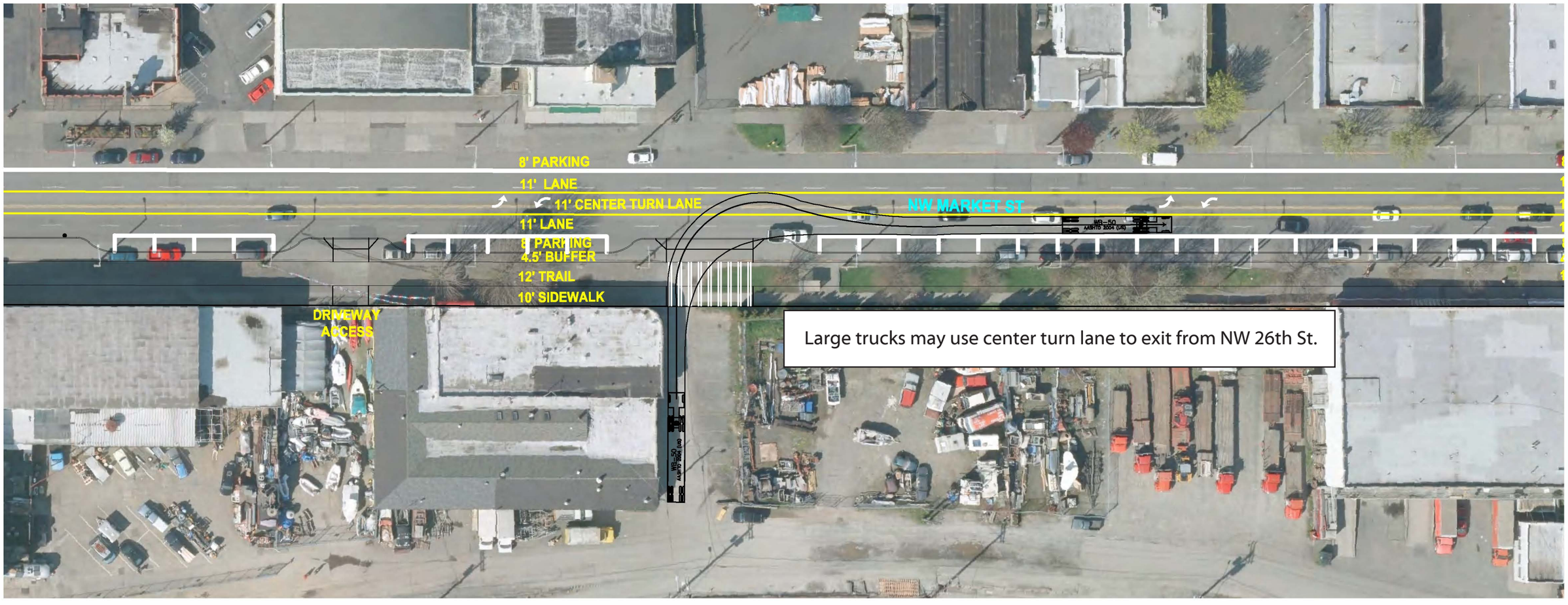
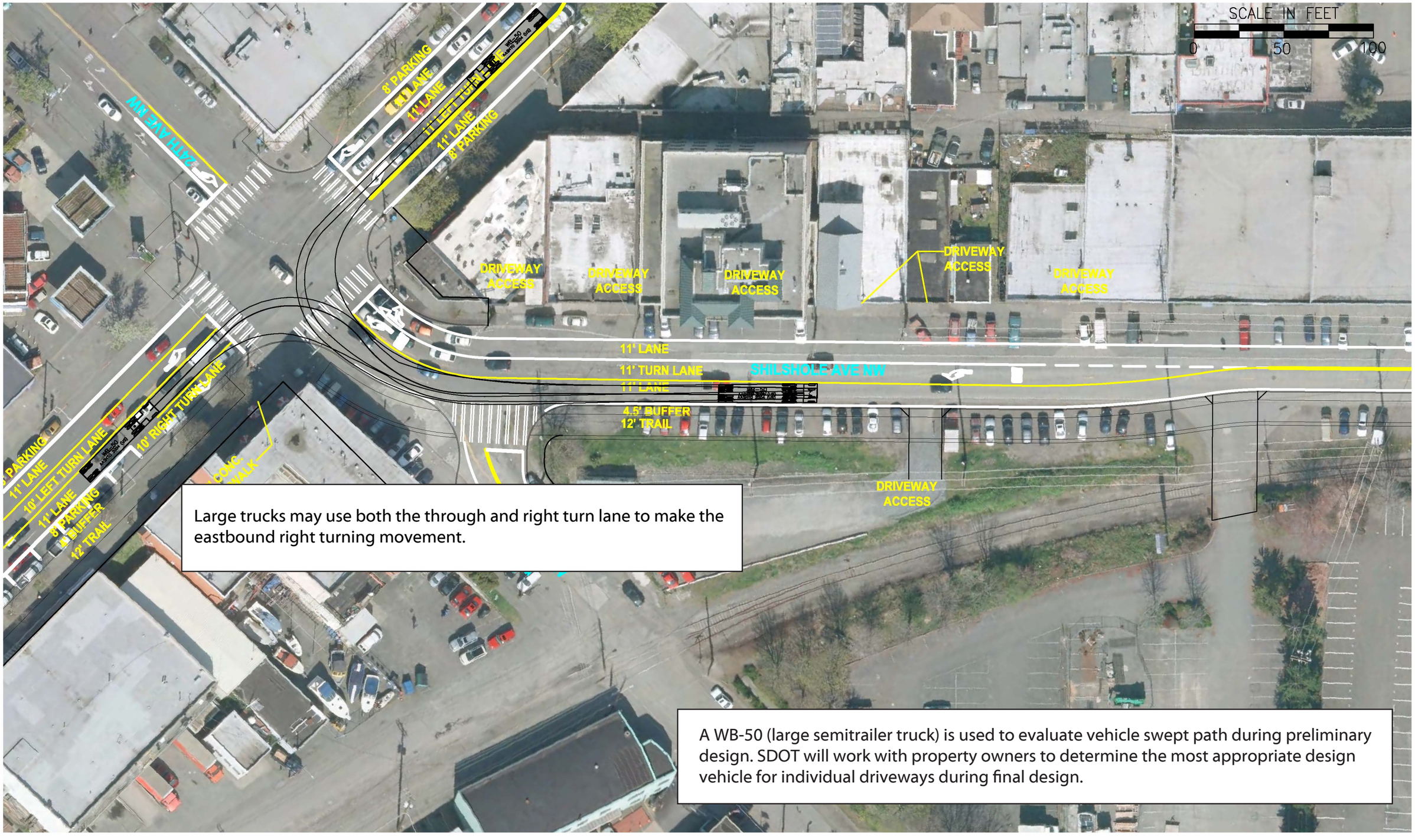


26TH–MARKET WB–50 TURNING MOTION

A WB-50 (large semitrailer truck) is used to evaluate vehicle swept path during preliminary design. SDOT will work with property owners to determine the most appropriate design vehicle for individual driveways during final design.



MARKET–SHILSHOLE WB–50 TURNING MOTION

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SHILSHOLE–MARKET WB–50 TURNING MOTION

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SHILSHOLE–24TH–54TH WB–50 TURNING MOTION

54TH–24TH–SHILSHOLE WB–50 TURNING MOTION

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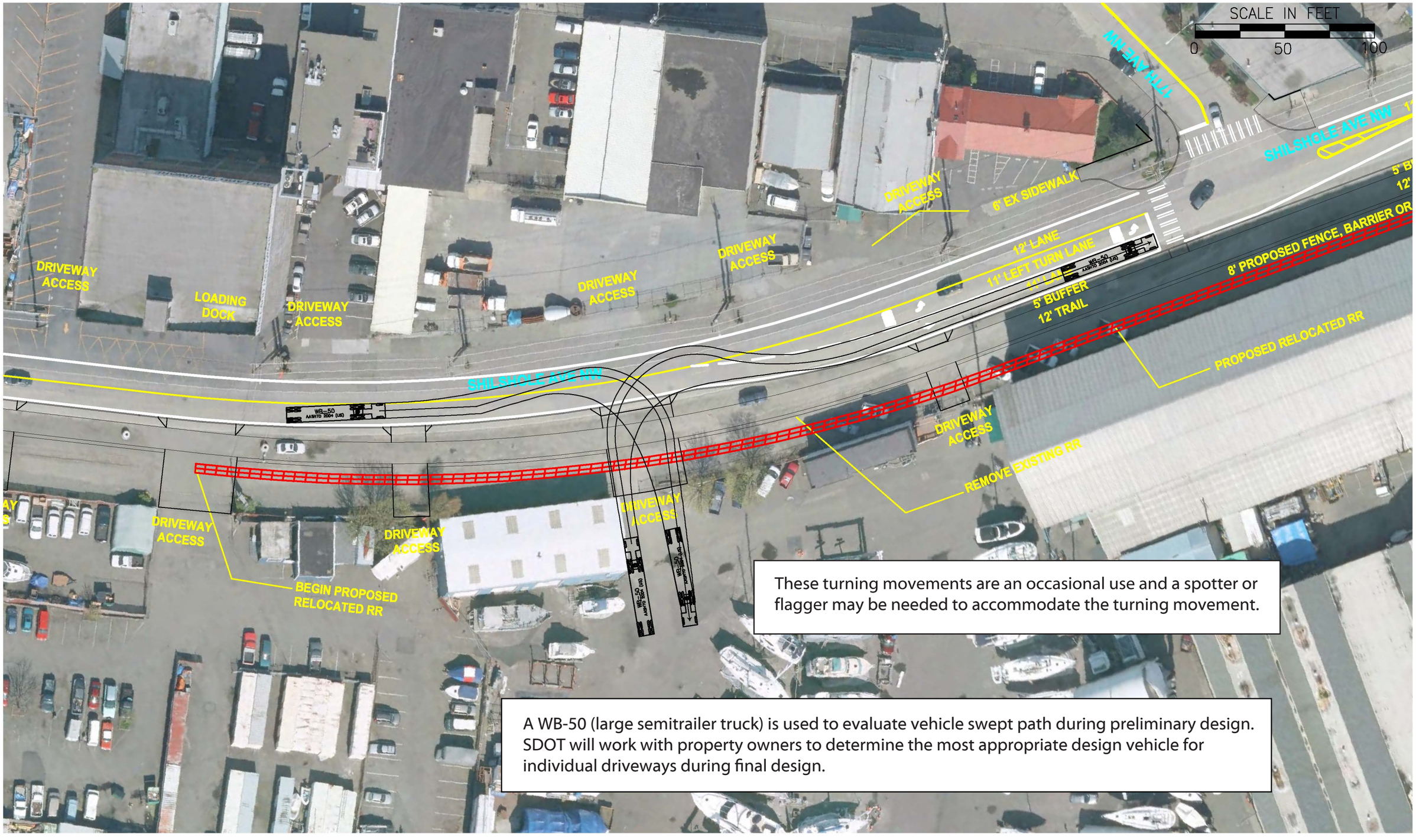

These turning movements are an occasional use and a spotter or flagger may be needed to accommodate the turning movement.

A WB-50 (large semitrailer truck) is used to evaluate vehicle swept path during preliminary design. SDOT will work with property owners to determine the most appropriate design vehicle for individual driveways during final design.

CSR MARINE–SHILSHOLE WB–50 TURNING MOTION

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FILE: K:\PS\7289001\103130\-AU\TOTURN SG SCALE LAYOUT: FIGURE (2) PATH: \\parametrix.com\pmx\PSD\Projects\Clients\7289-ESA\354-7289-001 Burke-Gilman Trail EIS\99Svcs\CADD\FIGURES\Autoturn Ex PLOTTED BY: thomsma DATE: Wednesday, May 10, 2017 10:13:33 AM

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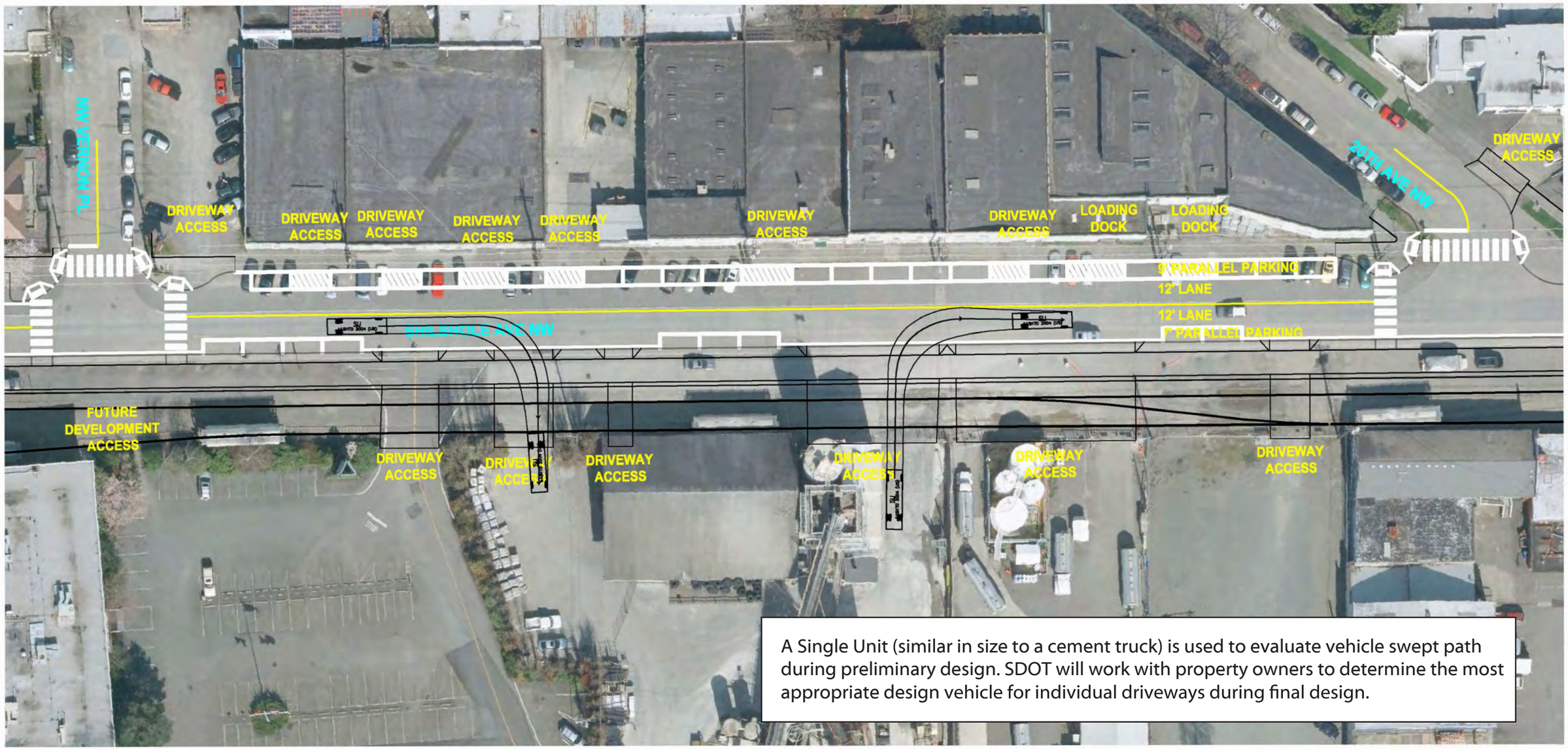

A Single Unit (similar in size to a cement truck) is used to evaluate vehicle swept path during preliminary design. SDOT will work with property owners to determine the most appropriate design vehicle for individual driveways during final design.

PREFERRED ALTERNATIVE

Salmon Bay Sand & Gravel EB Turning Movements

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LOADING DOCK

LOADING DOCK

20TH AVE NW

DRIVEWAY ACCESS

9' PARALLEL PARKING

12' LANE

12' LANE

8' PARALLEL PARKING

SHILSHOLE AVE NW

FUTURE DEVELOPMENT ACCESS

DRIVEWAY ACCESS

DRIVEWAY ACCESS

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DRIVEWAY ACCESS

A Single Unit (similar in size to a cement truck) is used to evaluate vehicle swept path during preliminary design. SDOT will work with property owners to determine the most appropriate design vehicle for individual driveways during final design.

PREFERRED ALTERNATIVE

Salmon Bay Sand & Gravel WB Turning Movements

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APPENDIX B
HAZARDOUS MATERIALS DATABASES REVIEWED

Table B-1. Database and Records Searched

St	Acronym	Full Name	Government Agency	Gov Date	Arvl. Date	Active Date
WA	AIRS (EMI)	Washington Emissions Data System	Department of Ecology	12/31/2013	02/24/2015	03/13/2015
WA	ALLSITES	Facility/Site Identification System Listing	Department of Ecology	05/04/2015	05/06/2015	05/29/2015
WA	AST	Aboveground Storage Tank Locations	Department of Ecology	04/01/2014	05/06/2014	06/04/2014
WA	BROWNFIELDS	Brownfields Sites Listing	Department of Ecology	07/21/2015	07/22/2015	08/20/2015
WA	CDL	Clandestine Drug Lab Contaminated Site List	Department of Health	04/03/2015	05/14/2015	06/18/2015
WA	COAL ASH	Coal Ash Disposal Site Listing	Department of Ecology	09/10/2014	09/11/2014	10/15/2014
WA	CSCSL	Confirmed and Suspected Contaminated Sites List	Department of Ecology	07/21/2015	07/22/2015	08/20/2015
WA	CSCSL NFA	Confirmed and Contaminated Sites - No Further Action	Department of Ecology	07/21/2015	07/22/2015	08/20/2015
WA	DRYCLEANERS	Drycleaner List	Department of Ecology	12/31/2014	05/01/2015	05/22/2015
WA	Financial Assurance 1	Financial Assurance Information Listing	Department of Ecology	02/24/2012	02/24/2012	03/27/2012
WA	Financial Assurance 2	Financial Assurance Information Listing	Department of Ecology	05/18/2015	05/19/2015	06/18/2015
WA	Financial Assurance 3	Financial Assurance Information Listing	Department of Ecology	02/01/2001	03/06/2007	04/19/2007
WA	HIST CDL	List of Sites Contaminated by Clandestine Drug Labs	Department of Health	02/08/2007	06/26/2007	07/19/2007
WA	HSL	Hazardous Sites List	Department of Ecology	02/19/2015	03/13/2015	03/20/2015
WA	ICR	Independent Cleanup Reports	Department of Ecology	12/01/2002	01/03/2003	01/22/2003
WA	INACTIVE DRYCLEANERS	Inactive Drycleaners	Department of Ecology	12/31/2014	05/01/2015	05/29/2015
WA	INST CONTROL	Institutional Control Site List	Department of Ecology	07/21/2015	07/22/2015	08/20/2015
WA	LUST	Leaking Underground Storage Tanks Site List	Department of Ecology	05/19/2015	05/22/2015	06/18/2015
WA	NPDES	Water Quality Permit System Data	Department of Ecology	07/21/2015	07/22/2015	08/20/2015
WA	RGA HWS	Recovered Government Archive State Hazardous Waste Facilities	Department of Ecology		07/01/2013	12/24/2013
WA	RGA LF	Recovered Government Archive Solid Waste Facilities List	Department of Ecology		07/01/2013	01/10/2014
WA	RGA LUST	Recovered Government Archive Leaking Underground Storage Tan	Department of Ecology		07/01/2013	12/24/2013
WA	SPILLS	Reported Spills	Department of Ecology	06/08/2015	06/09/2015	07/13/2015
WA	SPILLS 90	SPILLS90 data from FirstSearch	FirstSearch	05/23/2006	01/03/2013	03/06/2013
WA	SWF/LF	Solid Waste Facility Database	Department of Ecology	03/12/2015	03/13/2015	03/20/2015
WA	SWRCY	Recycling Facility List	Department of Ecology	07/27/2015	07/28/2015	08/20/2015
WA	SWTIRE	Solid Waste Tire Facilities	Department of Ecology	11/01/2005	03/16/2006	04/13/2006
WA	UIC	Underground Injection Wells Listing	Department of Ecology	05/19/2015	05/22/2015	06/30/2015
WA	UST	Underground Storage Tank Database	Department of Ecology	05/27/2015	05/29/2015	06/19/2015
WA	VCP	Voluntary Cleanup Program Sites	Department of Ecology	07/21/2015	07/22/2015	08/20/2015
WA	WA MANIFEST	Hazardous Waste Manifest Data	Department of Ecology	12/31/2014	05/01/2015	05/29/2015

St	Acronym	Full Name	Government Agency	Gov Date	Arvl. Date	Active Date
US	2020 COR ACTION	2020 Corrective Action Program List	Environmental Protection Agency	04/22/2013	03/03/2015	03/09/2015
US	BRS	Biennial Reporting System	EPA/NTIS	12/31/2011	02/26/2013	04/19/2013
US	CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System	EPA	10/25/2013	11/11/2013	02/13/2014
US	CERCLIS-NFRAP	CERCLIS No Further Remedial Action Planned	EPA	10/25/2013	11/11/2013	02/13/2014
US	COAL ASH DOE	Steam-Electric Plant Operation Data	Department of Energy	12/31/2005	08/07/2009	10/22/2009
US	COAL ASH EPA	Coal Combustion Residues Surface Impoundments List	Environmental Protection Agency	07/01/2014	09/10/2014	10/20/2014
US	CONSENT	Superfund (CERCLA) Consent Decrees	Department of Justice, Consent Decree Library	12/31/2014	04/17/2015	06/02/2015
US	CORRACTS	Corrective Action Report	EPA	03/10/2015	03/31/2015	06/11/2015
US	DEBRIS REGION 9	Torres Martinez Reservation Illegal Dump Site Locations	EPA, Region 9	01/12/2009	05/07/2009	09/21/2009
US	DOD	Department of Defense Sites	USGS	12/31/2005	11/10/2006	01/11/2007
US	DOT OPS	Incident and Accident Data	Department of Transportation, Office of Pipeline	07/31/2012	08/07/2012	09/18/2012
US	Delisted NPL	National Priority List Deletions	EPA	03/26/2015	04/08/2015	06/22/2015
US	EDR MGP	EDR Proprietary Manufactured Gas Plants	EDR, Inc.			
US	EDR US Hist Auto Stat	EDR Exclusive Historic Gas Stations	EDR, Inc.			
US	EDR US Hist Cleaners	EDR Exclusive Historic Dry Cleaners	EDR, Inc.			
US	EPA WATCH LIST	EPA WATCH LIST	Environmental Protection Agency	08/30/2013	03/21/2014	06/17/2014
US	ERNS	Emergency Response Notification System	National Response Center, United States Coast	03/30/2015	03/31/2015	06/02/2015
US	FEDERAL FACILITY	Federal Facility Site Information listing	Environmental Protection Agency	03/26/2015	04/08/2015	06/11/2015
US	FEDLAND	Federal and Indian Lands	U.S. Geological Survey	12/31/2005	02/06/2006	01/11/2007
US	FEMA UST	Underground Storage Tank Listing	FEMA	01/01/2010	02/16/2010	04/12/2010
US	FINDS	Facility Index System/Facility Registry System	EPA	01/18/2015	02/27/2015	03/25/2015
US	FTTS	FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fu	EPA/Office of Prevention, Pesticides and Toxins	04/09/2009	04/16/2009	05/11/2009
US	FTTS INSP	FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fu	EPA	04/09/2009	04/16/2009	05/11/2009
US	FUDS	Formerly Used Defense Sites	U.S. Army Corps of Engineers	06/06/2014	09/10/2014	09/18/2014
US	HIST FTTS	FIFRA/TSCA Tracking System Administrative Case Listing	Environmental Protection Agency	10/19/2006	03/01/2007	04/10/2007
US	HIST FTTS INSP	FIFRA/TSCA Tracking System Inspection & Enforcement Case Lis	Environmental Protection Agency	10/19/2006	03/01/2007	04/10/2007
US	HMIRS	Hazardous Materials Information Reporting System	U.S. Department of Transportation	03/30/2015	03/31/2015	06/11/2015
US	ICIS	Integrated Compliance Information System	Environmental Protection Agency	01/23/2015	02/06/2015	03/09/2015
US	INDIAN LUST R1	Leaking Underground Storage Tanks on Indian Land	EPA Region 1	02/03/2015	04/30/2015	06/22/2015
US	INDIAN LUST R10	Leaking Underground Storage Tanks on Indian Land	EPA Region 10	02/03/2015	02/12/2015	03/13/2015

St	Acronym	Full Name	Government Agency	Gov Date	Arvl. Date	Active Date
US	INDIAN LUST R4	Leaking Underground Storage Tanks on Indian Land	EPA Region 4	09/30/2014	03/03/2015	03/13/2015
US	INDIAN LUST R5	Leaking Underground Storage Tanks on Indian Land	EPA, Region 5	04/30/2015	05/29/2015	06/22/2015
US	INDIAN LUST R6	Leaking Underground Storage Tanks on Indian Land	EPA Region 6	03/17/2015	05/01/2015	06/22/2015
US	INDIAN LUST R7	Leaking Underground Storage Tanks on Indian Land	EPA Region 7	03/30/2015	04/28/2015	06/22/2015
US	INDIAN LUST R8	Leaking Underground Storage Tanks on Indian Land	EPA Region 8	04/30/2015	05/05/2015	06/22/2015
US	INDIAN LUST R9	Leaking Underground Storage Tanks on Indian Land	Environmental Protection Agency	01/08/2015	01/08/2015	02/09/2015
US	INDIAN ODI	Report on the Status of Open Dumps on Indian Lands	Environmental Protection Agency	12/31/1998	12/03/2007	01/24/2008
US	INDIAN RESERV	Indian Reservations	USGS	12/31/2005	12/08/2006	01/11/2007
US	INDIAN UST R1	Underground Storage Tanks on Indian Land	EPA, Region 1	02/03/2015	04/30/2015	06/22/2015
US	INDIAN UST R10	Underground Storage Tanks on Indian Land	EPA Region 10	05/06/2015	05/19/2015	06/22/2015
US	INDIAN UST R4	Underground Storage Tanks on Indian Land	EPA Region 4	09/30/2014	03/03/2015	03/13/2015
US	INDIAN UST R5	Underground Storage Tanks on Indian Land	EPA Region 5	04/30/2015	05/26/2015	06/22/2015
US	INDIAN UST R6	Underground Storage Tanks on Indian Land	EPA Region 6	03/17/2015	05/01/2015	06/22/2015
US	INDIAN UST R7	Underground Storage Tanks on Indian Land	EPA Region 7	09/23/2014	11/25/2014	01/29/2015
US	INDIAN UST R8	Underground Storage Tanks on Indian Land	EPA Region 8	04/30/2015	05/05/2015	06/22/2015
US	INDIAN UST R9	Underground Storage Tanks on Indian Land	EPA Region 9	12/14/2014	02/13/2015	03/13/2015
US	INDIAN VCP R1	Voluntary Cleanup Priority Listing	EPA, Region 1	09/29/2014	10/01/2014	11/06/2014
US	INDIAN VCP R7	Voluntary Cleanup Priority Listing	EPA, Region 7	03/20/2008	04/22/2008	05/19/2008
US	LEAD SMELTER 1	Lead Smelter Sites	Environmental Protection Agency	11/25/2014	11/26/2014	01/29/2015
US	LEAD SMELTER 2	Lead Smelter Sites	American Journal of Public Health	04/05/2001	10/27/2010	12/02/2010
US	LIENS 2	CERCLA Lien Information	Environmental Protection Agency	02/18/2014	03/18/2014	04/24/2014
US	LUCIS	Land Use Control Information System	Department of the Navy	05/28/2015	05/29/2015	06/11/2015
US	MLTS	Material Licensing Tracking System	Nuclear Regulatory Commission	03/31/2015	04/09/2015	06/11/2015
US	NPL	National Priority List	EPA	03/26/2015	04/08/2015	06/22/2015
US	NPL LIENS	Federal Superfund Liens	EPA	10/15/1991	02/02/1994	03/30/1994
US	ODI	Open Dump Inventory	Environmental Protection Agency	06/30/1985	08/09/2004	09/17/2004
US	PADS	PCB Activity Database System	EPA	07/01/2014	10/15/2014	11/17/2014
US	PCB TRANSFORMER	PCB Transformer Registration Database	Environmental Protection Agency	02/01/2011	10/19/2011	01/10/2012
US	PRP	Potentially Responsible Parties	EPA	10/25/2013	10/17/2014	10/20/2014
US	Proposed NPL	Proposed National Priority List Sites	EPA	03/26/2015	04/08/2015	06/22/2015
US	RAATS	RCRA Administrative Action Tracking System	EPA	04/17/1995	07/03/1995	08/07/1995
US	RADINFO	Radiation Information Database	Environmental Protection Agency	04/07/2015	04/09/2015	06/11/2015
US	RCRA NonGen / NLR	RCRA - Non Generators / No Longer Regulated	Environmental Protection Agency	03/10/2015	03/31/2015	06/11/2015

St	Acronym	Full Name	Government Agency	Gov Date	Arvl. Date	Active Date
US	RCRA-CESQG	RCRA - Conditionally Exempt Small Quantity Generators	Environmental Protection Agency	03/10/2015	03/31/2015	06/11/2015
US	RCRA-LQG	RCRA - Large Quantity Generators	Environmental Protection Agency	03/10/2015	03/31/2015	06/11/2015
US	RCRA-SQG	RCRA - Small Quantity Generators	Environmental Protection Agency	03/10/2015	03/31/2015	06/11/2015
US	RCRA-TSDF	RCRA - Treatment, Storage and Disposal	Environmental Protection Agency	03/10/2015	03/31/2015	06/11/2015
US	RMP	Risk Management Plans	Environmental Protection Agency	02/01/2015	02/13/2015	03/25/2015
US	ROD	Records Of Decision	EPA	11/25/2013	12/12/2013	02/24/2014
US	SCRD DRYCLEANERS	State Coalition for Remediation of Drycleaners Listing	Environmental Protection Agency	03/07/2011	03/09/2011	05/02/2011
US	SSTS	Section 7 Tracking Systems	EPA	12/31/2009	12/10/2010	02/25/2011
US	TRIS	Toxic Chemical Release Inventory System	EPA	12/31/2013	02/12/2015	06/02/2015
US	TSCA	Toxic Substances Control Act	EPA	12/31/2012	01/15/2015	01/29/2015
US	UMTRA	Uranium Mill Tailings Sites	Department of Energy	09/14/2010	10/07/2011	03/01/2012
US	US AIRS (AFS)	Aerometric Information Retrieval System Facility Subsystem (	EPA	10/16/2014	10/31/2014	11/17/2014
US	US AIRS MINOR	Air Facility System Data	EPA	10/16/2014	10/31/2014	11/17/2014
US	US BROWNFIELDS	A Listing of Brownfields Sites	Environmental Protection Agency	03/23/2015	03/24/2015	06/02/2015
US	US CDL	Clandestine Drug Labs	Drug Enforcement Administration	02/25/2015	03/10/2015	03/25/2015
US	US ENG CONTROLS	Engineering Controls Sites List	Environmental Protection Agency	03/16/2015	03/17/2015	06/02/2015
US	US FIN ASSUR	Financial Assurance Information	Environmental Protection Agency	03/09/2015	03/10/2015	03/25/2015
US	US HIST CDL	National Clandestine Laboratory Register	Drug Enforcement Administration	02/25/2015	03/10/2015	03/25/2015
US	US INST CONTROL	Sites with Institutional Controls	Environmental Protection Agency	03/16/2015	03/17/2015	06/02/2015
US	US MINES	Mines Master Index File	Department of Labor, Mine Safety and Health	12/30/2014	12/31/2014	01/29/2015
US	US MINES 2	Ferrous and Nonferrous Metal Mines Database Listing	USGS	12/05/2005	02/29/2008	04/18/2008
US	US MINES 3	Active Mines & Mineral Plants Database Listing	USGS	04/14/2011	06/08/2011	09/13/2011
CT	CT MANIFEST	Hazardous Waste Manifest Data	Department of Energy & Environmental Protection	07/30/2013	08/19/2013	10/03/2013
NY	NY MANIFEST	Facility and Manifest Data	Department of Environmental Conservation	08/01/2015	08/06/2015	08/24/2015
PA	PA MANIFEST	Manifest Information	Department of Environmental Protection	12/31/2014	07/24/2015	08/18/2015
WI	WI MANIFEST	Manifest Information	Department of Natural Resources	12/31/2014	03/19/2015	04/07/2015

Oil/Gas Pipelines

Source:
PennWell
Corporation
Telephone:
281-546-1505

Petroleum Bundle (Crude Oil, Refined Products, Petrochemicals, Gas Liquids (LPG/NGL), and Specialty Gases (Miscellaneous)) N = Natural Gas Bundle (Natural Gas, Gas Liquids (LPG/NGL), and Specialty Gases (Miscellaneous)). This map includes information copyrighted by PennWell Corporation. This information

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Electric Power Transmission Line Data

Source:
PennWell
Corporation
Telephone:
800-823-6277

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US	AHA Hospitals	Sensitive Receptor: AHA Hospitals	American Hospital Association, Inc.
US	Medical Centers	Sensitive Receptor: Medical Centers	Centers for Medicare & Medicaid Services
US	Nursing Homes	Sensitive Receptor: Nursing Homes	National Institutes of Health
US	Public Schools	Sensitive Receptor: Public Schools	National Center for Education Statistics
US	Private Schools	Sensitive Receptor: Private Schools	National Center for Education Statistics
WA	Daycare Centers	Sensitive Receptor: Daycare Center Listing	Department of Social & Health Services

STREET AND ADDRESS INFORMATION

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APPENDIX C
EMISSIONS ESTIMATES TABULATIONS

Table C-1. Existing Vehicle Idling Emissions based on Vehicle Delay and Traffic Volumes along Analyzed Roadways

Roadway Segment	Daily CO Emissions (tons/year)	PM10 Emissions (tons/year)	CO2 Emissions (metric tons per year)
NW 54th St west of NW Market St	0.827457	0.000962	54.83589
28th Ave NW north of MW Market St	0.057002	7.36E-05	3.971354
NW Market St west of 24th Ave NW	4.021325	0.004071	250.5763
NW 56th St west of 24th Ave NW	0.307128	0.000166	15.30761
NW 56th St east of 24th Ave NW	1.276639	0.000795	66.43823
NW Market St west of 24th Ave NW	4.021325	0.004071	250.5763
Shilshole Ave NW southeast of 24th Ave NW	1.174177	0.000886	65.18178
22nd Ave NW south of NW 56th St	1.658834	0.000961	84.41996
22nd Ave NW south of NW Market St	0.898459	0.000636	48.77418
Leary Ave NW south of NW Market St	4.539198	0.005432	304.9285
Ballard Ave NW southeast of 22nd Ave NW	0	0	0
NW Vernon Pl northwest of Shilshole Ave NW	0.184797	0.000172	11.1115
17th Ave NW north of Shilshole Ave NW	1.206679	0.002624	112.1736
Shilshole Ave NW west of NW 46th St	0.594262	0.000505	34.49605
NW Ballard Way east of 17th Ave NW	0	0	0
NW 46th St west of 15th Ave NW	0.547299	0.000505	32.8231
NW Leary Way west of 15th Ave NW	0.944013	0	33.62891
NW 45th St west of 14th Ave NW	0.212568	0.000153	11.61561
14th Ave NW south of NW Ballard Way	0.297886	0.000353	19.92728
NW Leary Way east of 14th Ave NW	1.015516	0.001266	69.55692
11th Ave NW north of NW 46th Ave NW	0.563838	0.000475	32.60362
Total Idling Emissions along Analyzed Roadways	**24.3484**	**0.024106**	**1502.947**

Table C-2. Tabulation of Annual Vehicle Idling Emissions for the No Build Alternative based on Forecasted Vehicle Delay and Traffic Volumes in 2040

Roadway Segment	CO Emissions (tons/year)	CO Increase over Existing	PM10 Emissions (tons/year)	PM10 Increase over Existing	CO_2 Emissions (metric tons/year)	CO_2 Increase over Existing
NW 54th St west of NW Market St	1.32	0.49	0.0026	0.0016	114.43	59.59
28th Ave NW north of MW Market St	0.07	0.01	0.0001	0.0001	6.19	2.22
NW Market St west of 24th Ave NW	5.04	1.02	0.0086	0.0045	405.12	154.54
NW 56th St west of 24th Ave NW	1.92	1.61	0.0018	0.0016	114.59	99.28
NW 56th St east of 24th Ave NW	7.97	6.69	0.0084	0.0076	505.54	439.10
NW Market St west of 24th Ave NW	5.04	1.02	0.0086	0.0045	405.12	154.54
Shilshole Ave NW southeast of 24th Ave NW	2.04	0.87	0.0019	0.0010	123.67	58.49
22nd Ave NW south of NW 56th St	3.10	1.44	0.0030	0.0021	190.61	106.19
22nd Ave NW south of NW Market St	1.75	0.85	0.0020	0.0014	115.28	66.51
Leary Ave NW south of NW Market St	8.58	4.04	0.0172	0.0117	758.35	453.43
Ballard Ave NW southeast of 22nd Ave NW	0.00	0.00	0.0000	0.0000	0.00	0.00
NW Vernon Pl northwest of Shilshole Ave NW	0.27	0.08	0.0004	0.0002	20.72	9.61
17th Ave NW north of Shilshole Ave NW	6.80	5.59	0.0244	0.0218	885.72	773.54
Shilshole Ave NW west of NW 46th St	0.69	0.10	0.0010	0.0005	50.84	16.34
NW Ballard Way east of 17th Ave NW	0.00	0.00	0.0000	0.0000	0.00	0.00
NW 46th St west of 15th Ave NW	0.64	0.09	0.0010	0.0005	48.92	16.09
NW Leary Way west of 15th Ave NW	1.36	0.41	0.0000	0.0000	48.34	14.71
NW 45th St west of 14th Ave NW	0.27	0.06	0.0003	0.0002	18.42	6.81
14th Ave NW south of NW Ballard Way	0.44	0.14	0.0009	0.0005	38.40	18.48
NW Leary Way east of 14th Ave NW	1.49	0.47	0.0031	0.0018	134.96	65.40
11th Ave NW north of NW 46th Ave NW	0.80	0.24	0.0011	0.0007	58.65	26.04
Total Idling Emissions along Analyzed Roadways	**49.57**	**25.23**	**0.0864**	**0.0623**	**4043.86**	**2540.91**

Table C-3. Tabulation of Annual Vehicle Idling Emissions for the Preferred Alternative based on Forecasted Vehicle Delay and Traffic Volumes in 2040

Roadway Segment	CO Emissions (tons/year)	CO Increase over Existing	PM10 Emissions (tons/year)	PM10 Increase over Existing	CO_2 Emissions (metric tons/year)	CO_2 Increase over Existing
NW 54th St west of NW Market St	1.80	0.48	0.0035	0.0009	156.58	42.16
28th Ave NW north of MW Market St	0.20	0.13	0.0004	0.0003	18.57	12.38
NW Market St west of 24th Ave NW	5.37	0.34	0.0091	0.0006	432.12	27.01
NW 56th St west of 24th Ave NW	0.78	-1.14	0.0007	-0.0010	46.46	-68.12
NW 56th St east of 24th Ave NW	3.23	-4.74	0.0034	-0.0050	205.00	-300.55
NW Market St west of 24th Ave NW	5.37	0.34	0.0091	0.0006	432.12	27.01
Shilshole Ave NW southeast of 24th Ave NW	2.48	0.44	0.0023	0.0004	150.18	26.50
22nd Ave NW south of NW 56th St	3.10	0.00	0.0030	0.0000	190.61	0.00
22nd Ave NW south of NW Market St	1.75	0.00	0.0020	0.0000	115.28	0.00
Leary Ave NW south of NW Market St	8.58	0.00	0.0172	0.0000	758.35	0.00
Ballard Ave NW southeast of 22nd Ave NW	0.00	0.00	0.0000	0.0000	0.00	0.00
NW Vernon Pl northwest of Shilshole Ave NW	0.38	0.11	0.0006	0.0002	29.00	8.29
17th Ave NW north of Shilshole Ave NW	0.34	-6.46	0.0012	-0.0232	44.69	-841.02
Shilshole Ave NW west of NW 46th St	3.03	2.34	0.0043	0.0033	222.42	171.58
NW Ballard Way east of 17th Ave NW	0.00	0.00	0.0000	0.0000	0.00	0.00
NW 46th St west of 15th Ave NW	2.80	2.16	0.0043	0.0033	214.00	165.09
NW Leary Way west of 15th Ave NW	1.36	0.00	0.0000	0.0000	48.34	0.00
NW 45th St west of 14th Ave NW	0.30	0.02	0.0004	0.0000	20.10	1.67
14th Ave NW south of NW Ballard Way	0.44	0.00	0.0009	0.0000	38.40	0.00
NW Leary Way east of 14th Ave NW	1.49	0.00	0.0031	0.0000	134.96	0.00
11th Ave NW north of NW 46th Ave NW	0.62	-0.18	0.0009	-0.0003	45.32	-13.33
Total Idling Emissions along Analyzed Roadways	**43.41**	**-6.16**	**0.0666**	**-0.0198**	**3302.53**	**-741.33**

Table C-4. Tabulation of Annual Vehicle Idling Emissions for the Shilshole South Alternative based on Forecasted Vehicle Delay and Traffic Volumes in 2040

Roadway Segment	CO Emissions (tons/year)	CO Increase over Existing	PM10 Emissions (tons/year)	PM10 Increase over Existing	CO_2 Emissions (metric tons/year)	CO_2 Increase over Existing
NW 54th St west of NW Market St	1.66	0.35	0.0032	0.0007	144.54	30.11
28th Ave NW north of MW Market St	0.08	0.01	0.0002	0.0000	7.22	1.03
NW Market St west of 24th Ave NW	5.04	0.00	0.0086	0.0000	405.12	0.00
NW 56th St west of 24th Ave NW	0.78	-1.14	0.0007	-0.0010	46.46	-68.12
NW 56th St east of 24th Ave NW	3.23	-4.74	0.0034	-0.0050	205.00	-300.55
NW Market St west of 24th Ave NW	5.04	0.00	0.0086	0.0000	405.12	0.00
Shilshole Ave NW southeast of 24th Ave NW	2.48	0.44	0.0023	0.0004	150.18	26.50
22nd Ave NW south of NW 56th St	3.10	0.00	0.0030	0.0000	190.61	0.00
22nd Ave NW south of NW Market St	1.75	0.00	0.0020	0.0000	115.28	0.00
Leary Ave NW south of NW Market St	8.58	0.00	0.0172	0.0000	758.35	0.00
Ballard Ave NW southeast of 22nd Ave NW	0.00	0.00	0.0000	0.0000	0.00	0.00
NW Vernon Pl northwest of Shilshole Ave NW	0.33	0.06	0.0005	0.0001	25.69	4.97
17th Ave NW north of Shilshole Ave NW	0.34	-6.46	0.0012	-0.0232	44.69	-841.02
Shilshole Ave NW west of NW 46th St	3.03	2.34	0.0043	0.0033	222.42	171.58
NW Ballard Way east of 17th Ave NW	0.00	0.00	0.0000	0.0000	0.00	0.00
NW 46th St west of 15th Ave NW	2.80	2.16	0.0043	0.0033	214.00	165.09
NW Leary Way west of 15th Ave NW	1.36	0.00	0.0000	0.0000	48.34	0.00
NW 45th St west of 14th Ave NW	0.30	0.02	0.0004	0.0000	20.10	1.67
14th Ave NW south of NW Ballard Way	0.44	0.00	0.0009	0.0000	38.40	0.00
NW Leary Way east of 14th Ave NW	1.49	0.00	0.0031	0.0000	134.96	0.00
11th Ave NW north of NW 46th Ave NW	0.62	-0.18	0.0009	-0.0003	45.32	-13.33
Total Idling Emissions along Analyzed Roadways	**42.44**	**-7.14**	**0.0649**	**-0.0215**	**3221.80**	**-822.06**

Table C-5. Tabulation of Annual Vehicle Idling Emissions for the Shilshole North Alternative based on Forecasted Vehicle Delay and Traffic Volumes in 2040

Roadway Segment	CO Emissions (tons/year)	CO Increase over Existing	PM10 Emissions (tons/year)	PM10 Increase over Existing	CO_2 Emissions (metric tons/year)	CO_2 Increase over Existing
NW 54th St west of NW Market St	1.66	0.35	0.0032	0.0007	144.54	30.11
28th Ave NW north of MW Market St	0.20	0.13	0.0004	0.0003	18.57	12.38
NW Market St west of 24th Ave NW	5.26	0.22	0.0089	0.0004	423.12	18.01
NW 56th St west of 24th Ave NW	0.78	-1.14	0.0007	-0.0010	46.46	-68.12
NW 56th St east of 24th Ave NW	3.23	-4.74	0.0034	-0.0050	205.00	-300.55
NW Market St west of 24th Ave NW	5.26	0.22	0.0089	0.0004	423.12	18.01
Shilshole Ave NW southeast of 24th Ave NW	1.68	-0.36	0.0016	-0.0003	101.59	-22.08
22nd Ave NW south of NW 56th St	3.10	0.00	0.0030	0.0000	190.61	0.00
22nd Ave NW south of NW Market St	1.75	0.00	0.0020	0.0000	115.28	0.00
Leary Ave NW south of NW Market St	8.58	0.00	0.0172	0.0000	758.35	0.00
Ballard Ave NW southeast of 22nd Ave NW	0.00	0.00	0.0000	0.0000	0.00	0.00
NW Vernon Pl northwest of Shilshole Ave NW	0.25	-0.02	0.0004	0.0000	19.06	-1.66
17th Ave NW north of Shilshole Ave NW	0.34	-6.46	0.0012	-0.0232	44.69	-841.02
Shilshole Ave NW west of NW 46th St	3.03	2.34	0.0043	0.0033	222.42	171.58
NW Ballard Way east of 17th Ave NW	0.00	0.00	0.0000	0.0000	0.00	0.00
NW 46th St west of 15th Ave NW	2.80	2.16	0.0043	0.0033	214.00	165.09
NW Leary Way west of 15th Ave NW	1.36	0.00	0.0000	0.0000	48.34	0.00
NW 45th St west of 14th Ave NW	0.30	0.02	0.0004	0.0000	20.10	1.67
14th Ave NW south of NW Ballard Way	0.44	0.00	0.0009	0.0000	38.40	0.00
NW Leary Way east of 14th Ave NW	1.49	0.00	0.0031	0.0000	134.96	0.00
11th Ave NW north of NW 46th Ave NW	0.58	-0.22	0.0008	-0.0003	42.65	-16.00
Totals	**42.08**	**-7.49**	**0.0649**	**-0.0215**	**3211.28**	**-832.58**

Table C-6. Tabulation of Annual Vehicle Idling Emissions for the Ballard Avenue Alternative based on Forecasted Vehicle Delay and Traffic Volumes in 2040

Roadway Segment	CO Emissions (tons/year)	CO Increase over Existing	PM10 Emissions (tons/year)	PM10 Increase over Existing	CO_2 Emissions (metric tons/year)	CO_2 Increase over Existing
NW 54th St west of NW Market St	1.66	0.35	0.0032	0.0007	144.54	30.11
28th Ave NW north of MW Market St	0.07	0.00	0.0001	0.0000	6.19	0.00
NW Market St west of 24th Ave NW	5.49	0.45	0.0093	0.0008	441.13	36.01
NW 56th St west of 24th Ave NW	0.11	-1.81	0.0001	-0.0017	6.30	-108.29
NW 56th St east of 24th Ave NW	0.44	-7.53	0.0005	-0.0079	27.80	-477.75
NW Market St west of 24th Ave NW	5.49	0.45	0.0093	0.0008	441.13	36.01
Shilshole Ave NW southeast of 24th Ave NW	1.68	-0.36	0.0016	-0.0003	101.59	-22.08
22nd Ave NW south of NW 56th St	3.10	0.00	0.0030	0.0000	190.61	0.00
22nd Ave NW south of NW Market St	1.75	0.00	0.0020	0.0000	115.28	0.00
Leary Ave NW south of NW Market St	8.58	0.00	0.0172	0.0000	758.35	0.00
Ballard Ave NW southeast of 22nd Ave NW	0.00	0.00	0.0000	0.0000	0.00	0.00
NW Vernon Pl northwest of Shilshole Ave NW	0.22	-0.05	0.0003	-0.0001	16.57	-4.14
17th Ave NW north of Shilshole Ave NW	1.93	-4.87	0.0069	-0.0175	251.90	-633.82
Shilshole Ave NW west of NW 46th St	3.03	2.34	0.0043	0.0033	222.42	171.58
NW Ballard Way east of 17th Ave NW	0.00	0.00	0.0000	0.0000	0.00	0.00
NW 46th St west of 15th Ave NW	2.80	2.16	0.0043	0.0033	214.00	165.09
NW Leary Way west of 15th Ave NW	1.36	0.00	0.0000	0.0000	48.34	0.00
NW 45th St west of 14th Ave NW	0.30	0.02	0.0004	0.0000	20.10	1.67
14th Ave NW south of NW Ballard Way	0.44	0.00	0.0009	0.0000	38.40	0.00
NW Leary Way east of 14th Ave NW	1.49	0.00	0.0031	0.0000	134.96	0.00
11th Ave NW north of NW 46th Ave NW	0.62	-0.18	0.0009	-0.0003	45.32	-13.33
Total Idling Emissions along Analyzed Roadways	**40.52**	**-9.05**	**0.0676**	**-0.0188**	**3224.93**	**-818.93**

Table C-7. Tabulation of Daily Vehicle Idling Emissions for the Leary Alternative based on Forecasted Vehicle Delay and Traffic Volumes in 2040

Roadway Segment	CO Emissions (tons/year)	CO Increase over Existing	PM10 Emissions (tons/year)	PM10 Increase over Existing	CO_2 Emissions (metric tons/year)	CO_2 Increase over Existing
NW 54th St west of NW Market St	1.66	0.35	0.0032	0.0007	144.54	30.11
28th Ave NW north of MW Market St	0.20	0.13	0.0004	0.0003	18.57	12.38
NW Market St west of 24th Ave NW	5.26	0.22	0.0089	0.0004	423.12	18.01
NW 56th St west of 24th Ave NW	0.78	-1.14	0.0007	-0.0010	46.46	-68.12
NW 56th St east of 24th Ave NW	3.23	-4.74	0.0034	-0.0050	205.00	-300.55
NW Market St west of 24th Ave NW	5.26	0.22	0.0089	0.0004	423.12	18.01
Shilshole Ave NW southeast of 24th Ave NW	1.68	-0.36	0.0016	-0.0003	101.59	-22.08
22nd Ave NW south of NW 56th St	3.10	0.00	0.0030	0.0000	190.61	0.00
22nd Ave NW south of NW Market St	1.75	0.00	0.0020	0.0000	115.28	0.00
Leary Ave NW south of NW Market St	8.58	0.00	0.0172	0.0000	758.35	0.00
Ballard Ave NW southeast of 22nd Ave NW	0.00	0.00	0.0000	0.0000	0.00	0.00
NW Vernon Pl northwest of Shilshole Ave NW	0.22	-0.05	0.0003	-0.0001	16.57	-4.14
17th Ave NW north of Shilshole Ave NW	1.93	-4.87	0.0069	-0.0175	251.90	-633.82
Shilshole Ave NW west of NW 46th St	3.03	2.34	0.0043	0.0033	222.42	171.58
NW Ballard Way east of 17th Ave NW	0.00	0.00	0.0000	0.0000	0.00	0.00
NW 46th St west of 15th Ave NW	2.80	2.16	0.0043	0.0033	214.00	165.09
NW Leary Way west of 15th Ave NW	4.75	3.39	0.0000	0.0000	169.20	120.85
NW 45th St west of 14th Ave NW	0.30	0.02	0.0004	0.0000	20.10	1.67
14th Ave NW south of NW Ballard Way	1.53	1.09	0.0030	0.0022	134.42	96.01
NW Leary Way east of 14th Ave NW	5.21	3.72	0.0109	0.0078	472.35	337.39
11th Ave NW north of NW 46th Ave NW	0.62	-0.18	0.0009	-0.0003	45.32	-13.33
Total Idling Emissions along Analyzed Roadways	**51.88**	**2.31**	**0.0806**	**-0.0058**	**3972.93**	**-70.93**

Table C-8. GHG and Air Quality Assumptions for Each Alternative

Alternative	Estimated Pavement Width (feet)	Trail Length (linear feet)	Pavement (square feet)	Project Life (years)
Preferred Alternative	30	7,100	213,000	30
Shilshole South Alternative	30	6,500	195,000	30
Shilshole North Alternative	30	6,650	199,500	30
Ballard Avenue Alternative	30	7,550	226,500	30
Leary Alternative	30	6,800	204,000	30