

4.3 Ballard Link Extension

4.3.1 Acquisitions, Displacements, and Relocations

4.3.1.1 Affected Environment

The Ballard Link Extension study area for acquisitions, displacements, and relocations includes parcels within the project limits. The project limits include areas that would potentially be acquired for track alignments, stations, and related facilities and to support construction activities for each alternative. All parcels are within the city of Seattle.

The study area for the Ballard Link Extension includes commercial, industrial, public, and some vacant and residential properties. Properties within the SODO and Chinatown-International District segments are mainly commercial and industrial development with a few mixed-use buildings with office and residential uses. Within the Downtown Segment, properties are primarily office, retail, and high-rise mixed-use buildings. Properties within the South Interbay Segment include single- and multi-family residences, public facilities, and open spaces, as well as some commercial and industrial areas along major arterials. Within the Interbay/Ballard Segment, properties are primarily commercial and industrial bordered by residential areas. Section 4.3.2, Land Use, describes current and projected future land uses along each Ballard Link Extension alternative.

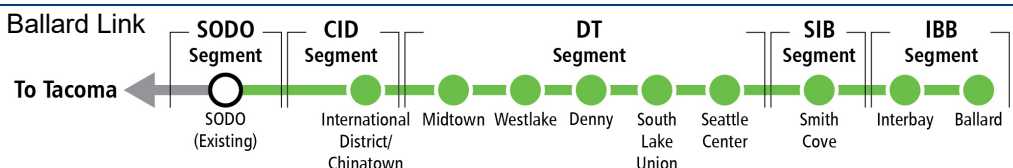
4.3.1.2 Environmental Impacts of the No Build Alternative

The No Build Alternative would not acquire any properties. No displacements or relocations would occur.

4.3.1.3 Environmental Impacts of the Build Alternatives during Operation

All segments and alternatives for the Ballard Link Extension would acquire property, and would displace and relocate some uses for operation of the light rail. During construction, additional property would be needed for staging areas and construction access. Tables 4.3.1-1 to 4.3.1-5 summarize the number of parcels affected and displacements by alternative, and include parcels needed both for operation and construction. Acquisitions and displacements for alternatives within a segment often vary depending on which alternative it connects to in adjacent segments. This variation is represented by the range of acquisitions and displacements shown in these tables. The following discussion highlights the key differences between alternatives and includes information on the M.O.S.

The City of Seattle adopted Mandatory Housing Affordability (M.H.A.), an affordable housing incentive program for new development, in the City Code in 2017 and 2019 in the Ballard Link Extension project area. There are currently no M.H.A. properties that would be permanently displaced by the project. If any are developed on properties to be acquired, these would be mitigated as required by the City. There would be affected parcels that currently have income-restricted housing under the Multifamily Tax Exemption Program or that are managed by the Seattle Housing Authority.



4.3.1 Acquisitions, Displacements, and Relocations

Table 4.3.1-1. Number of Potential Parcels Affected and Displacements by Alternative – SODO Segment, Ballard

Alternative	Parcels Affected							Displacements	
	Single-Family	Multi-Family	Commercial and Industrial	Mixed-Use	Public and Institutional	Vacant	Total	Business	Residential
Preferred At-Grade (SODO-1a) ^a	0	0	3 to 7	0	0	0	3 to 7	3 to 15	0
At-Grade South Station Option (SODO-1b) ^a	0	0	3 to 7	0	0	0	3 to 7	3 to 15	0
Mixed Profile (SODO-2) ^a	0	0	7	0	0	0	7	14	0

Note: Ranges reflect differences between alternatives and connection options. The total impacts are based on individual alternatives and connection options and not the high and low numbers of each impact type shown in the table.

^a The Ballard Link Extension-only M.O.S. would result in 12 to 18 commercial and industrial parcels and 0 to 1 public and institutional parcels affected and 2 to 5 business displacements as part of the Ballard Link Extension instead of being affected with the West Seattle Link Extension in the Duwamish Segment. It would also affect the properties shown in Table 4.2.1-1 for the West Seattle Link Extension, SODO Segment.

Table 4.3.1-2. Number of Potential Parcels Affected and Displacements by Alternative – Chinatown-International District Segment

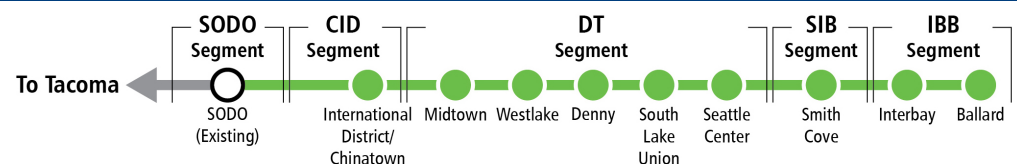
Alternative	Parcels Affected							Displacements	
	Single-Family	Multi-Family	Commercial and Industrial	Mixed-Use	Public and Institutional	Vacant	Total	Business	Residential ^a
4th Avenue Shallow (CID-1a)*	0	0	12 to 13	2	9 to 11	2	25 to 28	5 to 8	120
4th Avenue Deep Station Option (CID-1b)*	0	0	5	1	2	0	8	5	0
5th Avenue Shallow (CID-2a)	0	0	13 to 15	1	3	0	17 to 19 ^b	19 to 27 ^b	0
5th Avenue Deep Station Option (CID-2b)	0	0	10	1	3	1	15	18	0

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Note: Ranges reflect differences between alternatives and connection options. The total impacts are based on individual alternatives and connection options and not the high and low numbers of each impact type shown in the table.

^a Number of residential displacements is based on the number of dwelling units, not the number of buildings.

^b Range is based on station configuration and construction methods. These include potential temporary displacements of less than a year during construction.



4.3.1 Acquisitions, Displacements, and Relocations

Table 4.3.1-3. Number of Potential Parcels Affected and Displacements by Alternative – Downtown Segment

Alternative	Parcels Affected							Displacements	
	Single-Family	Multi-Family	Commercial and Industrial	Mixed-Use	Public and Institutional	Vacant	Total	Business	Residential ^a
Preferred 5th Avenue/Harrison Street (DT-1)	0	0	22 to 25	3	6 to 7	0	31 to 35	44 to 46	26
6th Avenue/Mercer Street (DT-2)	0	2	27	2	3	0	34	47	167

Note: Ranges reflect differences between construction methods, alternatives, and connection options. The total impacts are based on individual alternatives and connection options and not the high and low numbers of each impact type shown in the table.

^a Number of residential displacements is based on the number of dwelling units, not the number of buildings.

Table 4.3.1-4. Number of Potential Parcels Affected and Displacements by Alternative – South Interbay Segment

Alternative	Parcels Affected							Displacements	
	Single-Family	Multi-Family	Commercial and Industrial	Mixed-Use	Public and Institutional	Vacant	Total	Business	Residential ^a
Preferred Galer Street Station/Central Interbay (SIB-1) ^b	1	7	44 ^c	1	8	4	65	33	174
Prospect Street Station/15th Avenue (SIB-2)	3	12	43 ^c	1	15	2	76	35 ^c	123
Prospect Street Station/Central Interbay (SIB-3)	0	2	19	0	20	2	43	25	5

^a Number of residential displacements is based on the number of dwelling units, not the number of buildings.

^b Residential displacements for the Preferred Galer Street Station/Central Interbay Alternative (SIB-1) include a temporary tiny house community located on land owned by the Port of Seattle. These residential displacements include the 46 existing and additional 30 planned tiny homes.

^c With the West Seattle and Ballard Link Extensions M.O.S., there would be five additional commercial/industrial parcels and two additional vacant parcels affected, and three additional business displacements.



Table 4.3.1-5. Number of Potential Parcels Affected and Displacements by Alternative – Interbay/Ballard Segment

Alternative	Parcels Affected							Displacements	
	Single-Family	Multi-Family	Commercial and Industrial	Mixed-Use	Public and Institutional	Vacant	Total	Business	Residential ^a
Preferred Elevated 14th Avenue (IBB-1a)	7	17 to 20	46 to 48	0	0 to 1	3	73 to 79	64 to 71	94 to 105
Elevated 14th Avenue Alignment Option (from Prospect Street Station/15th Avenue) (IBB-1b)	15	41	43	0	0	9	108	57	151
Preferred Tunnel 14th Avenue (IBB-2a)*	4	4	29	0	1	4	42	41	14
Preferred Tunnel 15th Avenue Station Option (IBB-2b)*	0	2	39	0	1	4	46	43	21
Elevated 15th Avenue (IBB-3)	4	16	41	0	3	1	65	51	25

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Note: Ranges reflect differences between alternatives and connection options. The total impacts are based on individual alternatives and connection options and not the high and low numbers of each impact type shown in the table.

^a Number of residential displacements is based on the number of dwelling units, not the number of buildings.



In addition to the potential property acquisitions described in this section, some of the alternatives would require subterranean easements. These easements would not require displacements of the surface uses, and the area of the easements is not included in the data presented here. The project would also require use of public rights-of-way owned by the City of Seattle and WSDOT. Subterranean easements and public right-of-way are not included in tables in this section.

Properties that would be difficult to relocate based on their size or use are also noted. Appendix L4.1, Acquisitions, Displacements, and Relocations, provides tables and maps to identify the potentially affected parcels by parcel number and address for each alternative.

4.3.1.3.1 SODO Segment

Affected properties in the SODO Segment are either commercial or industrial. There would be no residential displacements in this segment.

Specific affected parcels and displacements in the SODO Segment would depend on the connection to the Chinatown-International District Segment. Alternatives in the SODO Segment would have the least displacements when connecting to Alternative CID-1a*. The Ballard Link Extension-only M.O.S. would affect the parcels identified in the SODO Segment for the West Seattle Link Extension (see Section 4.2.1.3.1), as well as 12 to 18 commercial/industrial properties and one institutional property in the Duwamish Segment with the connection to the existing Operations and Maintenance Facility Central. If the Ballard Link Extension-only M.O.S. is constructed, these properties would no longer be affected by the West Seattle Link Extension when it is built, as shown in Table L4.1-12 in Appendix L4.1.

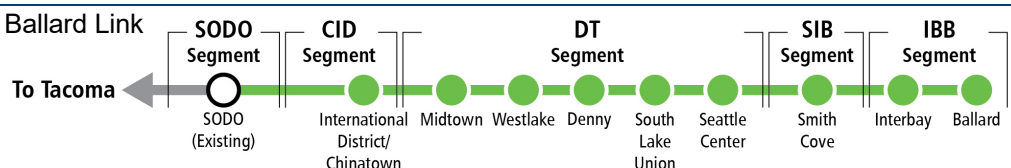
4.3.1.3.2 Chinatown-International District Segment

As shown in Table 4.3.1-2, most of the affected properties in the Chinatown-International District Segment are commercial or industrial. Alternative CID-1a* is the only alternative in this segment with residential displacements. These displacements would occur at the ICON Apartments due to a loss of access during construction. While these displacements are considered a long-term impact, the building would remain and could be used for housing following construction. These displacements are included in Table 4.3.1-2.

Alternative CID-2a and Option CID-2b would have the most business displacements. These would occur south of I-90 for the tunnel portal and on the east side of 5th Avenue South for the entrance to new the International District/Chinatown Station. Alternative CID-1a* would have the least number of business displacements; they would occur south of I-90 for the tunnel portal and along 4th Avenue South. All alternatives in this segment would require acquisition of part of Metro properties, but Option CID-1b* would displace the Ryerson Bus Base. More information on the Ryerson Bus Base can be found in Chapter 3, Transportation. All of the alternatives in this segment would require acquisition of land owned by the BNSF Railway.

4.3.1.3.3 Downtown Segment

Most of the affected properties in the Downtown Segment are commercial or industrial. Some institutional and public properties and mixed-use buildings would also be affected. As shown in Table 4.3.1-3, Preferred Alternative DT-1 would have the fewest residential displacements and the fewest business displacements. The number of business displacements for Preferred Alternative DT-1 may vary depending on the connection to the Chinatown-International District Segment. Residential displacements for both Preferred Alternative DT-1 and Alternative DT-2 would occur primarily in Uptown due to construction staging at the Seattle Center Station.



Business displacements for both alternatives would occur for station entrances and construction staging near the entrances.

Preferred Alternative DT-1 would acquire part of the Seattle Repertory Theatre parcel for the Seattle Center Station entrance but would not displace the use. Both Downtown Segment alternatives would displace one to two hotels. Preferred Alternative DT-1 would displace the Civic Hotel, which has about 50 guest rooms. Alternative DT-2 would displace the Four Points by Sheraton Hotel, which has about 150 guest rooms.

Alternative DT-2 could also temporarily displace the Hotel Vintage Park, which has about 120 guest rooms, due to construction noise. It could also require temporary relocation of about 120 residential tenants and the emergency shelter at the Y.W.C.A. on 5th Avenue as a result of construction noise. Some of these units receive M.H.A. funding from the City. While these displacements would be considered long-term impacts, these buildings would remain and use of them could be restored after construction activities. Construction impacts related to noise are described in Section 4.3.7, Noise and Vibration. These displacements are reflected in Table 4.3.1-3.

4.3.1.3.4 South Interbay Segment

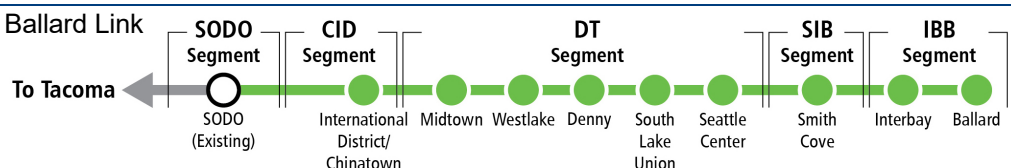
Most affected properties in the South Interbay Segment are commercial or industrial and public or institutional. As shown in Table 4.3.1-4, Preferred Alternative SIB-1 would have the most residential displacements, including the Interbay Village Tiny House Site, with 46 living units and 30 additional planned units, on a property owned by the Port of Seattle. Alternative SIB-3 would have the least number of residential displacements, because it would connect to the downtown tunnel portal at the north end of Kinnear Park instead of on Republican Street.

Alternative SIB-2 would have the most business displacements, and Alternative SIB-3 would have the least. Businesses displaced for all alternatives would primarily be along Elliott Avenue West. The number of business displacements for Preferred Alternative SIB-1 may vary depending on tunnel construction methods and the connection to the Interbay/Ballard Segment.

Preferred Alternative SIB-1 would acquire part of the Seattle Armory property but would not displace the Army National Guard Recruitment Center. Alternative SIB-2 would acquire part of the United States Postal Service Interbay Post Office and Carrier Annex property along 15th Avenue West but would not displace it. Alternative SIB-3 would displace the United States Postal Service Interbay Post Office and Carrier Annex and would require relocation in the same service area.

All alternatives would acquire parts of Kinnear Park and the Interbay Golf Center, and Preferred Alternative SIB-1 and Alternative SIB-3 would acquire part of the Interbay Athletic Complex. Alternative SIB-2 and Alternative SIB-3 would acquire part of the Southwest Queen Anne Greenbelt. See Section 4.3.17, Parks and Recreational Resources, for more information on impacts to parks. Alternative SIB-3 would also displace the Seattle Parks and Recreation West Central Grounds maintenance facility, which would require relocation in the same service area. Alternative SIB-2 would acquire part of the Seattle Parks and Recreation West Central Grounds maintenance facility property but would not displace the facility. See Section 4.3.14, Public Services, for more information on impacts to the Seattle Parks and Recreation maintenance facility.

As shown in Table 4.1-8, under the West Seattle and Ballard Link Extensions M.O.S., all South Interbay Segment alternatives would need to acquire additional parcels and displace businesses for bus facilities on the east side of Elliott Avenue West.



4.3.1.3.5 Interbay/Ballard Segment

Most of the affected properties in the Interbay/Ballard Segment are commercial, industrial, or multi-family. Smaller numbers of single-family residential, mixed-use, and public or institutional properties would be affected.

As shown in Table 4.3.1-5, Option IBB-1b would displace the most residential units. Nearly all of the residential displacements are multi-family residential units, including three condominium complexes. Preferred Alternative IBB-2a*, Preferred Option IBB-2b*, and Alternative IBB-3 would have the fewest residential displacements. Alternative IBB-3 would be elevated through mostly industrial and commercial areas, and Preferred Alternative IBB-2a* and Preferred Option IBB-2b* would not affect residential property along 15th Avenue West, south of Salmon Bay.

Preferred Alternative IBB-1a would displace the most businesses. Preferred Alternative IBB-2a* and Preferred Option IBB-2b* would have the least business displacements because these alternatives are in a tunnel from north of Interbay Station (between 15th Avenue West and Thorndyke Avenue West) to Ballard Station, which is also in a tunnel. There would be some business displacements for the Interbay Station and south tunnel portal, the Ballard Station entrance, tail track, and construction staging with the tunnel alternatives.

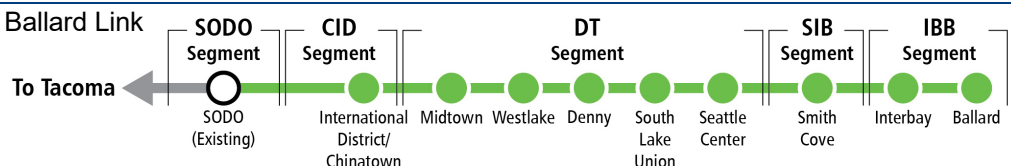
Preferred Alternative IBB-1a and Option IBB-1b would require acquisition of part of the Salmon Bay Terminals property on the south side of Salmon Bay and would displace the businesses on this property, as well as some water-dependent businesses on the north side of Salmon Bay. Alternative IBB-3 would acquire part of a Port of Seattle property and Fishermen's Terminal and would displace one water-dependent business there, as well as some water-dependent businesses on the north side of Salmon Bay.

4.3.1.4 Environmental Impacts of the Build Alternatives during Construction

During construction, property would be needed for staging areas and construction access. Most of the area needed for construction would be accommodated within areas required for permanent right-of-way, although some additional properties would need to be acquired for construction and are accounted for in estimated acquisitions and in the construction limits depicted in Appendix J, Conceptual Design Drawings.

Temporary construction easements provide for temporary use of a property during construction. These easements might be needed along the project corridor. Once construction is complete, the property would be restored to its previous condition, and the easement would be terminated. These parcels are not included in Appendix L4.1 because the exact locations where these easements might be needed are not known at the current level of design. With the exception of potential temporary relocations needed for construction of the Alternative CID-2a diagonal station configuration, temporary construction easements would not permanently displace existing uses and are not anticipated to substantially disrupt existing uses, except where noted in Section 4.3.1.3.

The diagonal station configuration for Alternative CID-2a in the Chinatown-International District Segment could require temporary relocation of eight businesses for less than a year during construction. Consistent with the Uniform Relocation Act, Sound Transit will make every effort to minimize the duration of temporary relocations. The businesses could also choose to permanently relocate. If construction were to last longer than a year, the relocations would be considered permanent. Although these are expected to be temporary displacements, they are included in the impacts in Table 4.3.1-2 because the business could choose to permanently relocate.



4.3.1.5 Indirect Impacts of the Build Alternatives

Consistent with Sound Transit policy and local land use regulations, some parcels initially acquired for a project use, such as construction staging, could be redeveloped to accommodate TOD. The potential indirect impacts associated with TOD are discussed in Section 4.3.2, Land Use. The potential indirect impacts associated with displacement of industrial and maritime uses are discussed in Section 4.3.3, Economics.

4.3.1.6 Mitigation Measures

Sound Transit's policies and procedures comply with the Federal Uniform Relocation Act and the Washington state relocation and property acquisition requirements. In some cases, Sound Transit provides advisory services to property owners above the minimum requirements of federal and state law. Sound Transit would compensate affected property owners according to the provisions specified in Sound Transit's adopted *Real Property Acquisition and Relocation Policy, Procedures, and Guidelines* (2017; see Section 4.2.1.7, Sound Transit Real Property Acquisition and Relocation Policy, Procedures, and Guidelines Summary). Benefits would depend on the level of impact, available relocation options, and other factors.

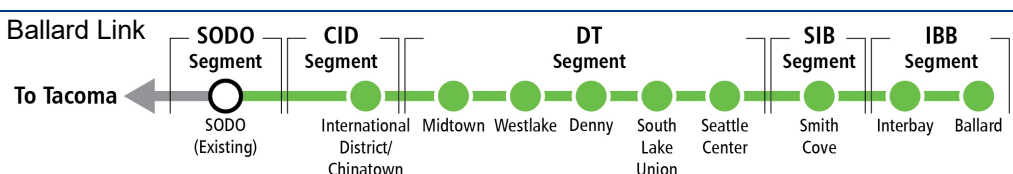
In coordination with the United States Postal Service, Sound Transit would identify a replacement property for the United States Postal Service Interbay Post Office and Carrier Annex for Alternative SIB-3 and replacement parking adjacent to the facility for Alternative SIB-2. Sound Transit would be responsible for environmental review, design, and construction of a replacement facility acceptable to the United States Postal Service. The replacement facility would meet all facility requirements identified by United States Postal Service. Postal operations would be relocated to the replacement facility prior to the project impacting the existing facility. Relocation would occur in accordance with the Uniform Relocation Assistance and Real Property Acquisitions Policies Act of 1970 and the Sound Transit *Real Property Acquisition and Relocation Policy, Procedures and Guidelines* (Sound Transit 2017).

4.3.1.7 Sound Transit Real Property Acquisition and Relocation Policy, Procedures, and Guidelines Summary

Acquisition and relocation procedures for properties affected by the Ballard Link Extension would be the same as those described for the West Seattle Link Extension in Section 4.2.1.7, Sound Transit Real Property Acquisition and Relocation Policy, Procedures, and Guidelines Summary.

4.3.1.8 Relocation Opportunities

Sound Transit researched market conditions for available residential and commercial real estate in the city of Seattle. Property availability will change over time, but research indicates that there are adequate opportunities for most residents and businesses to successfully relocate within the project vicinity. Some affected properties with unique characteristics or uses, such as water-dependent uses, assisted living and supportive housing, and public facilities could be difficult to relocate and may require construction of new facilities. Some water-dependent facilities may not be able to be relocated. Displaced hotel operators would have to find a property that is for sale or a substitute site on which to construct a new hotel. There is currently adequate retail, office, and industrial space available in the Seattle area to accommodate the spaces that could be



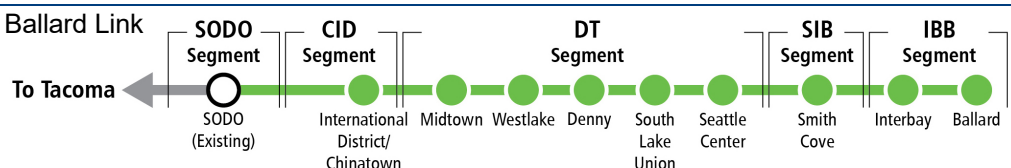
displaced by the project. In some instances, zoning restrictions may make it difficult for some businesses to relocate in the same area, particularly industrial and maritime businesses.

Currently available residential units in Seattle also exceed the number of units potentially displaced, and there is a sufficient supply of relocation housing similar in size and quality for renters in the study area; however, depending on market conditions and individual circumstances, the replacements property may cost more. Section 4.2.1.7 describes how Sound Transit would accommodate this difference. Additional information on relocation opportunities is provided in Appendix L4.1.

Sound Transit would offer relocation assistance that includes compensation and supporting services that consider the needs of those being relocated, to help reduce inconveniences or hardships. Sound Transit would also satisfy federal and state requirements for residential relocation, which define a “comparable replacement dwelling” as follows (42 United States Code 4601(10)):

- Decent, safe, and sanitary;
- Adequate in size to accommodate the occupants;
- Within the financial means of the displaced person;
- Functionally equivalent;
- In an area not subject to unreasonable adverse environmental conditions; and
- In a location generally not less desirable than the location of the displaced person’s dwelling with respect to public utilities, facilities, services, and the displaced person’s place of employment.

To meet these requirements, Sound Transit may identify relocation properties that are in better condition and of higher value than the properties being acquired. If so, tenants may be eligible for a rent supplement.



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4.3.2 Land Use

4.3.2.1 Affected Environment

This section describes existing and potential future land uses in each segment and summarizes overarching land use policies as they relate to the Ballard Link Extension. The land use study area for the Ballard Link Extension is the area within 0.5 mile of the project limits, which include permanent project improvements and areas needed for project construction. Land uses in the areas within 0.5 mile of the potential stations have the greatest potential to be affected, both directly and indirectly. The study area is within the city of Seattle. Neighborhoods and communities identified in this section are mapped and described in more detail in Section 4.3.4, Social Resources, Community Facilities, and Neighborhoods.

Existing land uses are generalized into dominant land use categories (i.e., single-family residential, multi-family residential, commercial, institutional/public, mixed use, downtown office, downtown harbor front, parks and open space, industrial, vacant land, and other). Existing land uses shown are based on current King County assessor data and are shown in Appendix L4.2, Land Use (King County 2019). Future land uses shown on Figure 4.3.2-1 are based on current municipal data (City of Seattle 2020). Mandatory Housing Affordability zoning is in the study area and applies to a variety of zoning designations. Mandatory Housing Affordability requires developers to provide affordable housing in their project or pay into a fund that supports affordable housing (City of Seattle 2019).

Much of the study area falls within areas designated in the City of Seattle Comprehensive Plan (2018) as urban centers or urban villages. The City has the goal of concentrating most of the expected future growth in these areas.

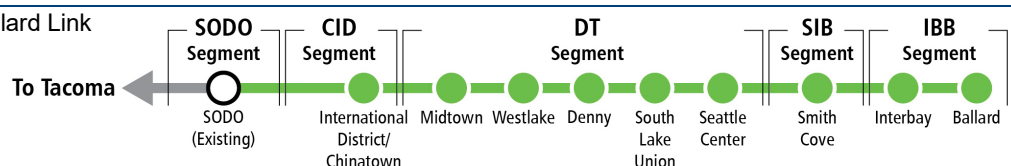
4.3.2.1.1 SODO Segment

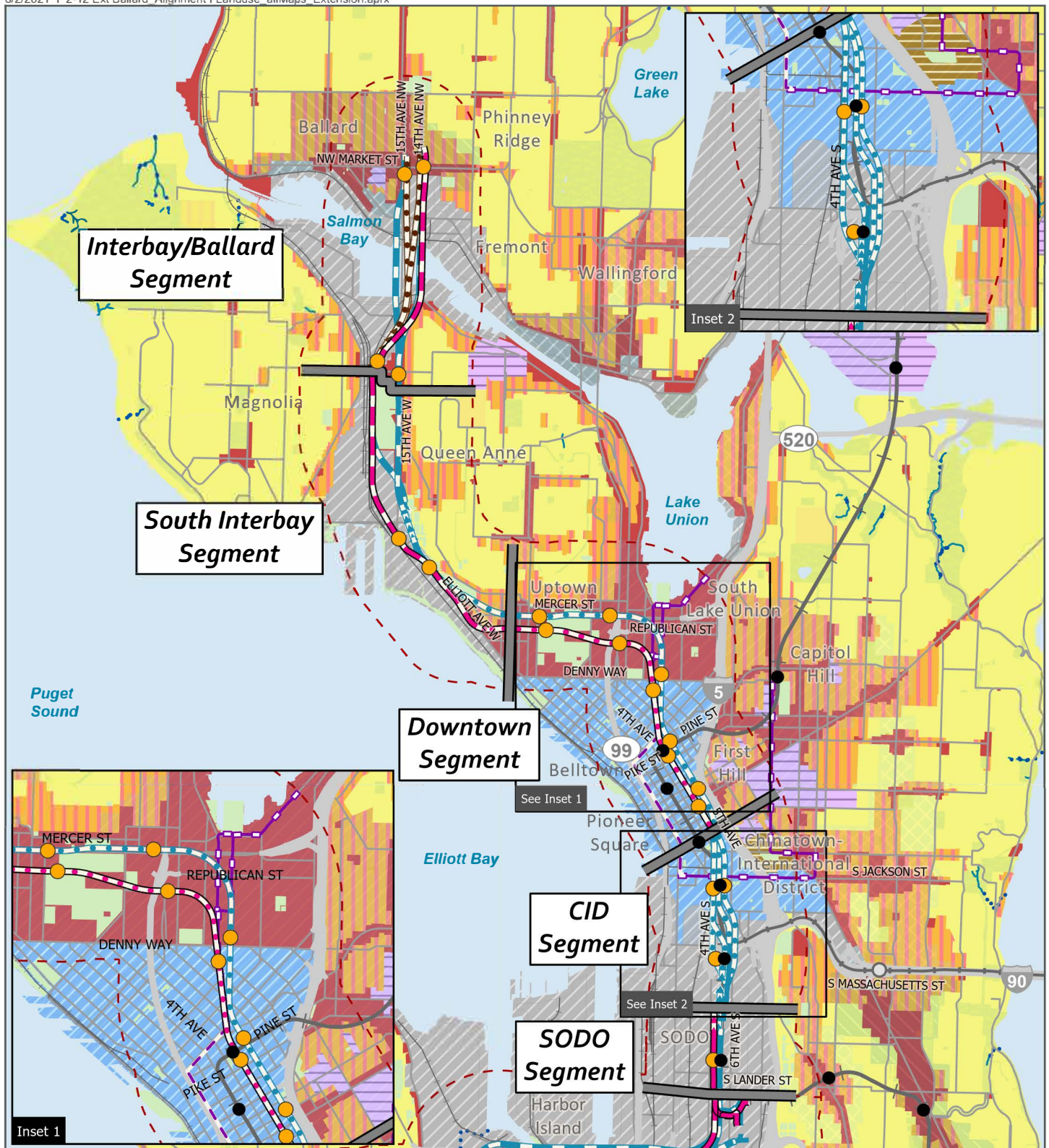
The primary neighborhood in the SODO Segment is the Industrial District, which is an area designated by both the Puget Sound Regional Council and the City of Seattle as the Duwamish Manufacturing/Industrial Center. Land uses are predominantly industrial with limited commercial development.

The Seattle Public Schools' central office, the John Stanford Center for Educational Excellence, and Starbucks headquarters are in this segment. Port terminals and port-related uses are along the East Duwamish Waterway (also known as the Duwamish River). Transportation maintenance and storage facilities (owned by Metro, Sound Transit, and BNSF Railway) are also in this segment. The City has identified the industrial nature of SODO in the manufacturing/industrial center designation and has plans and policies in place to protect existing industrial land uses. As a result, potential future land uses are similar to existing land uses in this segment. The Greater Duwamish Manufacturing/Industrial Center Plan in the Neighborhood Plans chapter of the *Seattle 2035 Comprehensive Plan* (City of Seattle 2018) promotes employment and industrial use in the manufacturing/industrial center. One of the City's goals for this area is to provide a transportation network that minimizes conflicts between different travel modes while emphasizing mobility of freight and goods.

4.3.2.1.2 Chinatown-International District Segment

The Chinatown-International District Segment includes parts of the Industrial District and Downtown neighborhoods. It includes the City's Downtown urban center, with dense development and a mix of uses. The Industrial District is within the Duwamish





Source: City of Seattle, King County (2019, 2020, 2021).

Alternatives

- Preferred Alternative
- Preferred Alternative with Third-party Funding
- Other Alternatives

Alternative Profile

- Elevated
- Tunnel
- At-Grade
- Retained Cut

Station

- New
- Existing

- Segment Line
- Existing Link Light Rail
- East Link Light Rail (Under Construction)
- Existing Streetcar
- Center City Connector Streetcar (Construction Paused)
- Railroad
- Stream
- ... Piped Stream
- Park

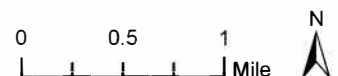
Future Land Use

- Urban Center
- Hub Urban Village
- Residential Urban Village
- Manufacturing Industrial Center
- Single Family Residential Areas

- Multi-Family Residential Areas
- Commercial / Mixed Use Areas
- Industrial Areas
- Major Institutions
- Cemetery
- City-Owned Open Space

FIGURE 4.3.2-1
Future Land Use
Ballard Link Extension

*West Seattle and
Ballard Link Extensions*



Manufacturing/Industrial Center, where land is mostly industrial and warehousing. There are also some commercial uses and sports stadiums. Port terminals have entrance points here and are interconnected by the BNSF Railway system. Land in the Chinatown-International District and Pioneer Square communities are a mix of commercial businesses (office and retail) and residential housing.

The Chinatown-International District Segment is a unique area of the city and contains two historic districts, the Pioneer Square Preservation District and the International Special Review District. Both have housing, many community-serving businesses, services, social/cultural facilities, and local and tourist destinations. Potential future land uses are similar to existing land uses, but zoning allows for additional mixed-use development and higher-density housing.

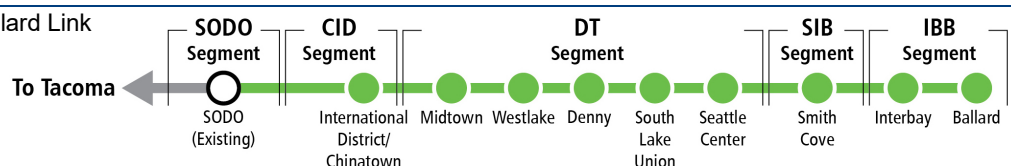
The Downtown Plan in the Neighborhood Plans chapter of the City of Seattle Comprehensive Plan recognizes and promotes the historic nature of the Pioneer Square Preservation District, and encourages mixed-use development compatible with existing development in the area. This chapter also recognizes and promotes the unique social character, mix of use, and urban design character of the International Special Review District and encourages a wide range of uses, housing above the street-level, and rehabilitation of existing buildings in order to both preserve the historic area and allow flexibility for present and future conditions.

Much of the Chinatown-International District study area has Mandatory Housing Affordability zoning. The City's goal for this area is to provide accessible, inviting neighborhoods that have an efficient transportation system that encourages less dependence on cars (City of Seattle 2018).

4.3.2.1.3 Downtown Segment

The Downtown Segment contains much of the Downtown and South Lake Union neighborhoods, as well as small areas of the Capitol Hill and Queen Anne neighborhoods. The Central Business District is a major employment hub, shopping area, and regional center for cultural and entertainment activity with a large residential community. Many of the buildings are high-rise offices and mixed-use structures. East of Interstate 5, the First Hill area mostly consists of multi-family housing and institutional land uses including Harborview Medical Center, Swedish Medical Center, Virginia Mason Hospital, and Seattle University. The Pike Market area includes the historic Pike Place Market, an important tourist attraction and the oldest continuously operating public market in the area. Belltown is Seattle's densest residential community and is mostly mixed use. South Lake Union has seen rapid redevelopment and increased density in recent years and contains multi-family residential housing, mixed use, and offices. Uptown, previously known as Lower Queen Anne, contains a mix of single- and multi-family housing, commercial uses, and office buildings. The Seattle Center recreational area, arts hub, and tourist destination is also located in the Uptown neighborhood and includes many attractions such as the Climate Pledge Arena, Space Needle, McCaw Hall, Seattle Repertory Theatre, and other venues. West Queen Anne mainly consists of single- and multi-family housing, although there are some retail and office uses along the western edge of this neighborhood.

Potential future land uses are similar to existing land uses. The City of Seattle's future land use designations categorize the majority of uses in this segment as urban center, including Seattle Center. The Downtown Segment study area has Mandatory Housing Affordability zoning, where affordable housing is a priority. The City's goals for these areas include improving access, safety, and circulation while accommodating growth primarily by transit to allow people to live, work, shop, and play without a car (City of Seattle 2018). The future land use for Seattle Center



is not expected to change, while other areas around stations could have redevelopment consistent with zoning.

4.3.2.1.4 South Interbay Segment

The South Interbay Segment includes the Interbay, Queen Anne (with Uptown, West Queen Anne, and North Queen Anne communities), and Magnolia neighborhoods. The West Queen Anne and North Queen Anne communities contain residential uses and some commercial land. There is also some industrial development near the railroad. West of the railroad tracks, in a small part of the Southeast Magnolia community, single- and multi-family residential uses border industrial uses along the waterfront and rail yard. This segment includes the Ballard Interbay Northend Manufacturing/Industrial Center, located in a valley between Queen Anne Hill on the east and Magnolia on the west. While the West Queen Anne and North Queen Anne communities are mostly residential housing and neighborhood commercial, the Interbay neighborhood is primarily industrial uses centered around the rail yard, along with limited retail and residential uses near Dravus Street. The segment also includes several park and open space uses. Potential future land uses are similar to existing land uses in this segment. Some of the study area has Mandatory Housing Affordability zoning. The City's goals for this area include improving industrial flow and enhancing intermodal connections (City of Seattle 2018).

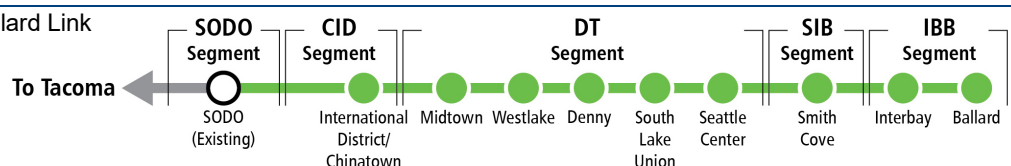
4.3.2.1.5 Interbay/Ballard Segment

The Interbay/Ballard Segment primarily includes the Ballard neighborhood, but also includes small areas of the Interbay, Magnolia, and Queen Anne neighborhoods. This segment includes the Ballard Interbay Northend Manufacturing/Industrial Center near the Lake Washington Ship Canal, where there are mostly industrial uses, and the Ballard Urban Village, where there is an active mixed-use area serving the surrounding residential areas.

Industrial land uses surrounding the Lake Washington Ship Canal at Salmon Bay in each of the neighborhoods support a strong commercial fishing community, which is anchored by Fishermen's Terminal where numerous fishing vessels homeport and draw on the surrounding network of suppliers and trades. South of the Ship Canal, the North Queen Anne community is mostly residential uses with some commercial and industrial uses along 15th Avenue West and Nickerson Street. North of the Ship Canal, the East Ballard and West Woodland communities are mostly industrial and commercial uses surrounded by single- and multi-family residential uses. The Adams community includes a mix of uses, including commercial and industrial uses south of Northwest 57th Street and residential uses north of Northwest Market Street. The area around Northwest Market Street and Ballard Avenue is generally densely developed mixed use. Potential future land uses are similar to existing land uses, although some land east of 14th Avenue Northwest is identified for denser development. Much of the study area has Mandatory Housing Affordability zoning. The City's goals for this area include improving industrial traffic flow and enhancing intermodal connections (City of Seattle 2018).

4.3.2.2 Environmental Impacts of the No Build Alternative

The No Build Alternative includes the existing transportation system and future employment and population growth assumed in adopted plans, but without the Ballard Link Extension (see Section 2.2, No Build Alternative). Proposed and planned development would continue to move through permitting procedures consistent with adopted land use plans and would be constructed.



This alternative is inconsistent with many regional land use and transportation policies because it would not develop and expand upon the high-capacity-transit system and would not connect the region's highest growth centers. It is also not consistent with many local plans and policies that call for increased density and TOD. The *Seattle 2035 Comprehensive Plan* estimates that between 2015 and 2035, the population in the city of Seattle will grow by 120,000 people, adding 115,000 jobs and 70,000 households (City of Seattle 2018). With the No Build Alternative, population growth in the study area would not be supported by TOD near high-capacity transportation options. Under the No Build Alternative, a major transportation investment that is called for in local and regional plans to accommodate transportation demand from existing land uses and anticipated growth would not be in place. As such, the No Build Alternative would limit transportation options, increasing traffic congestion and slowing the rate of denser development in Seattle.

4.3.2.3 Environmental Impacts of the Build Alternatives during Operation

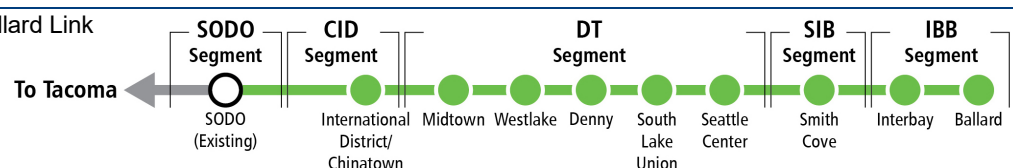
This section discusses the consistency of the Build Alternatives with regional, state, and local land use policies and the direct and indirect operational impacts on planned future land uses. Sound Transit's property acquisitions are detailed in Section 4.2.1, Acquisitions, Displacements, and Relocations. The land use analysis also considers findings from other environmental elements including Chapter 3, Transportation Environment and Consequences; Section 4.3.3, Economics; Section 4.3.5, Visual and Aesthetic Resources; Section 4.3.6, Air Quality; Section 4.3.7, Noise and Vibration; and Section 4.3.17, Parks and Recreational Resources.

Long-term direct impacts would occur in locations where the light rail alternatives would require private or public property acquisitions for the new project facilities. These acquisitions would convert property to a transportation-related use. Direct impacts also include proximity impacts (e.g., visual, noise, and traffic impacts) that could cause changes in adjacent land uses. The following discussion highlights the key differences between alternatives and includes information on the West Seattle and Ballard Link Extensions M.O.S..

4.3.2.3.1 Impacts Common to All Build Alternatives

Consistency with Land Use Plans and Policies

Improving transit accessibility and encouraging transit use are goals shared by regional, state, and local land use plans in the study area. The Ballard Link Extension would connect residential and commercial areas to Seattle's major economic centers and create uninterrupted access among several neighborhoods within the corridor. All alternatives would enhance a regional transit system serving a growing transportation need in planned high-density areas. The project would support the 2020 Puget Sound Regional Council VISION 2050 strategies of focusing growth within regional growth centers and high-capacity-transit station areas, reducing greenhouse gas emissions through mobility options, building the region's planned high-capacity-transit system to support growth in designated growth centers, and building more diverse and affordable housing near transit. The project would also support Puget Sound Regional Council's *Regional Transportation Plan* (2018) and *Growing Transit Communities Strategy* (2013) and Sound Transit's *Regional Transit Long-Range Plan* (2014a) by developing safe and efficient high-capacity transit to improve mobility within and among the region's major cities and urban areas. In addition, the Sound Transit Transit-Oriented Development (TOD) Strategic Plan Update (2014b), Equitable Transit Oriented Development Policy (Board Resolution No. R2018-10) (2018), and *Real Property Excess, Surplus, and Disposition Policy* (2013) would be followed



as land acquisitions and disposition occurs. Also relevant are the *Seattle 2035 Comprehensive Plan* goals and policies seeking integrated land use and transportation planning strategies. A detailed analysis of the project's consistency with adopted applicable plans is provided in Appendix L4.2, Land Use.

The project is a "regional transit authority facility" and is, therefore, explicitly recognized as an essential public facility in the Growth Management Act (Revised Code of Washington 36.70A.200). Once a Ballard Link Extension alternative is selected, jurisdictions have a duty to accommodate the project in their land use plans and development regulations.

Conversion of Land Uses to Transportation Uses

Direct land use impacts occur where Sound Transit would acquire property for the project. Most of this property would be permanently converted to a transportation use for the light rail tracks, stations, or ancillary facilities. Properties that are already public right-of-way for transportation use or are a nonpublic transportation use, such as the Metro Ryerson Bus Base, railroad properties, and the Sound Transit Operations and Maintenance Facility Central, are not included in this analysis because they would remain a transportation use. The Ballard Link Extension alternatives generally follow existing transportation corridors, limiting the amount of land that would be converted to a transportation use. Property acquisitions are discussed in Section 4.3.1, Acquisitions, Displacements, and Relocations, and listed in Appendix L4.1, Acquisitions, Displacements, and Relocations.

Land acquired for the Ballard Link Extension would account for less than 0.1 percent of the total land in Seattle. Tables 4.3.2-1 through 4.3.2-5 summarize the approximate amount of land that would be permanently converted to a transportation use with each segment.

In areas where the project would acquire property for construction staging, the land could be restored to its previous land use or redeveloped with an allowed use under current zoning. Redevelopment would be consistent with the City's zoning and Sound Transit's Equitable Transit Oriented Development Policy. Sound Transit's TOD policy includes goals for prioritizing affordable housing when redeveloping suitable agency-owned properties, as supported by zoning. These properties may also be used for joint development of transit facilities with other compact residential or commercial development done in partnership with others. Development and redevelopment potential in station areas are discussed in Section 4.3.2.5, Indirect Impacts of the Build Alternatives.

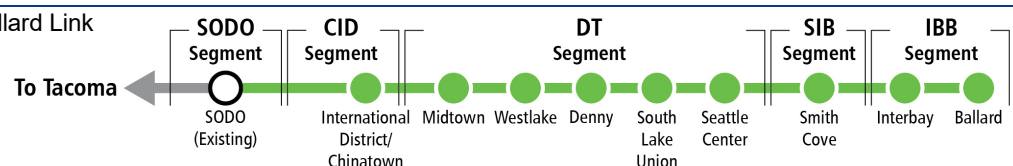


Table 4.3.2-1. Potential Permanent Conversion of Land Use to a Transportation-Related Land Use – SODO Segment, Ballard Link Extension

Alternative	City-owned Open Space (acres)	Commercial/ Mixed-Use Areas (acres)	Hub Urban Village (acres)	Manufacturing Industrial Center (acres) ^a	Multi-family Residential (acres)	Single-family Residential (acres)	Urban Center (acres)	Total Acres Affected ^b
Preferred At-Grade (SODO-1a) ^c	0	0	0	0.2	0	0	0	0.2
At-Grade South Station Option (SODO-1b) ^c	0	0	0	0.9 to 1.1	0	0	0	0.9 to 1.1
Mixed Profile (SODO-2) ^c	0	0	0	1.2	0	0	0	1.2

Note: Future land use types were developed using City of Seattle Future Land Use 2035 dataset (2020).

^a Shown as a range if the number of acres changes depending on connections in adjacent segments or options.

^b Totals reflect the high and low values in component ranges.

^c The Ballard Link Extension-only M.O.S. would convert 1 to 2 acres of Manufacturing Industrial Center land of as part of the Ballard Link Extension instead of being affected with the West Seattle Link Extension in the Duwamish Segment. It would also affect the same properties that are shown in Table 4.2.2-1 for the West Seattle Link Extension SODO Segment.

Table 4.3.2-2. Potential Permanent Conversion of Land Use to a Transportation-Related Land Use – Chinatown-International District Segment

Alternative	City-owned Open Space (acres)	Commercial/ Mixed-Use Areas (acres)	Hub Urban Village (acres)	Manufacturing Industrial Center (acres) ^a	Multi-family Residential (acres)	Single-family Residential (acres)	Urban Center (acres)	Total Acres Affected ^b
4th Avenue Shallow (CID-1a)*	0	0	0	1.1	0	0	2.5	3.6
4th Avenue Deep Station Option (CID-1b)*	0	0	0	1.5	0	0	2.9	4.4
5th Avenue Shallow (CID-2a)	0	0	0	1.0 to 2.0	0	0	3.4	4.4 to 5.4
5th Avenue Deep Station Option (CID-2b)	0	0	0	1.0	0	0	3.5	4.5

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement, some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Note: Future land use types were developed using City of Seattle Future Land Use 2035 dataset (2020).

^a Shown as a range if the number of acres changes depending on connections in adjacent segments or options.

^b Totals reflect the high and low values in component ranges.



Table 4.3.2-3. Potential Permanent Conversion of Land Use to a Transportation-Related Land Use – Downtown Segment

Alternative	City-owned Open Space (acres)	Commercial/Mixed-Use Areas (acres)	Hub Urban Village (acres)	Manufacturing Industrial Center (acres)	Multi-family Residential (acres)	Single-family Residential (acres)	Urban Center (acres) ^{a, b}	Total Acres Affected ^c
Preferred 5th Avenue/Harrison Street (DT-1)	0	0	0	0	0	0	4.1 to 4.2	4.1 to 4.2
6th Avenue/Mercer Street (DT-2)	0	0	0	0	0	0	5.3	5.3

Note: Future land use types were developed using City of Seattle Future Land Use 2035 dataset (2020).

^a Shown as a range if the number of acres changes depending on connections in adjacent segments or options.

^b The City of Seattle's future land use designations categorize the majority of uses in this segment as urban center, including Seattle Center.

^c Totals reflect the high and low values in component ranges.

Table 4.3.2-4. Potential Permanent Conversion of Land Use to a Transportation-Related Land Use – South Interbay Segment

Alternative	City-owned Open Space (acres) ^a	Commercial/Mixed-Use Areas (acres)	Hub Urban Village (acres)	Manufacturing Industrial Center (acres) ^a	Multi-family Residential (acres)	Single-family Residential (acres)	Urban Center (acres) ^a	Total Acres Affected ^b
Preferred Galer Street Station/Central Interbay (SIB-1)	3.0	0.2	0	9.7 ^c	<0.1	0	2.3	15.1
Prospect Street Station/15th Avenue (SIB-2)	0.9 to 1.0	0.4	0	5.6 to 5.7 ^c	<0.1	0.5	2.3 to 2.4	9.8 to 10.0
Prospect Street Station/Central Interbay (SIB-3)	5.1	0.2	0	6.9 ^c	0	0.8	0.4	13.4

Note: Future land use types were developed using City of Seattle Future Land Use 2035 dataset (2020).

^a Shown as a range if the number of acres changes depending on connections in adjacent segments or options.

^b Totals reflect the high and low values in component ranges.

^c With the West Seattle and Ballard Link Extensions M.O.S., there would be 1.9 additional acres of manufacturing/industrial center land converted to a transportation use.



Table 4.3.2-5. Potential Permanent Conversion of Land Use to a Transportation-Related Land Use – Interbay/Ballard Segment

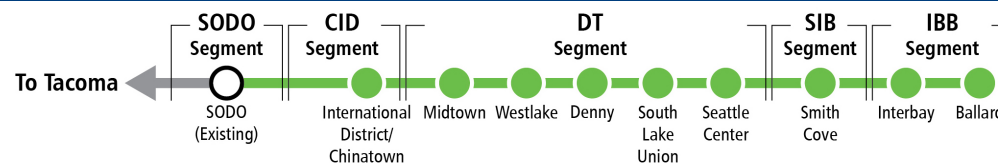
Alternative	City-owned Open Space (acres)	Commercial/Mixed-Use Areas (acres) ^a	Hub Urban Village (acres)	Manufacturing Industrial Center (acres) ^a	Multi-family Residential (acres)	Single-family Residential (acres)	Urban Center (acres)	Total Acres Affected ^b
Preferred Elevated 14th Avenue (IBB-1a)	<0.1	0.4 to 0.6	2.6	8.5 to 9.4	0.4	0	0	12.2 to 12.9
Elevated 14th Avenue Alignment Option (from Prospect Street Station/15th Avenue) (IBB-1b)	<0.1	2.4	2.6	2.3	0.7	0	0	7.9
Preferred Tunnel 14th Avenue (IBB-2a)*	0	0	2.1	5.8	0	0	0	7.8
Preferred Tunnel 15th Avenue Station Option (IBB-2b)*	0	0	2.5	6.3	0	0	0	8.8
Elevated 15th Avenue (IBB-3)	0	2.3	2.9	3.8	<0.1	0	0	9.0

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement, some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Note: Future land use types were developed using City of Seattle Future Land Use 2035 dataset (2020).

^a Shown as a range if the number of acres changes depending on connections in adjacent segments or options.

^b Totals reflect the high and low values in component ranges.



4.3.2.3.2 SODO Segment

The alternatives in the SODO Segment would convert manufacturing/industrial center land to a transportation use. The amount of land converted would depend on the connection to the Chinatown-International District Segment. When connecting to Alternative CID-1a* or Alternative CID-2a, the most land would be converted. The land that would be converted does not include the area described for the West Seattle Link Extension SODO Segment impacts because each of the two Link extensions would have unique improvements associated with them. Alternative SODO-2 would convert the most manufacturing/industrial center land to a transportation use.

The Ballard Link Extension-only M.O.S. would convert land identified in this section (for the Ballard Link Extension in the SODO Segment) as well as land identified in Section 4.2.2.3.2 for the SODO Segment of the West Seattle Link Extension, and would convert between 1 and 2 acres of Manufacturing Industrial Center land to a transportation use in the Duwamish Segment to connect to the existing Operations and Maintenance Facility Central. If the Ballard Link Extension-only M.O.S. is constructed, this land would not be affected again by the West Seattle Link Extension when it is built.

4.3.2.3.3 Chinatown-International District Segment

The alternatives in the Chinatown-International District Segment would convert manufacturing/industrial center land and urban center land to a transportation use. When connecting to Alternative SODO-2, Alternative CID-2a would convert the most manufacturing/industrial land and the most overall land to a transportation use. Alternative CID-1a* would convert the least amount of land to a transportation use. Much of the manufacturing/industrial center land that would be converted is currently vacant.

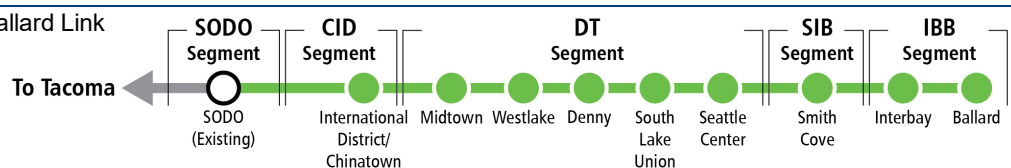
4.3.2.3.4 Downtown Segment

Alternatives in the Downtown Segment would convert urban center land to a transportation use. When connecting to the 4th Avenue alternatives (Alternative CID-1a* and Option CID-1b*) or Option CID-2b, Preferred Alternative DT-1 would convert less land to a transportation use than the other alternative. Alternative DT-2 would convert the most land to a transportation use regardless of connection option.

4.3.2.3.5 South Interbay Segment

Alternatives in the South Interbay Segment would convert City-owned open space, commercial/mixed-use areas, manufacturing and industrial areas, urban center areas, and residential areas to a transportation use. Preferred Alternative SIB-1 would convert the most land to a transportation use. It would also convert the most industrial land. Alternative SIB-2 would convert less land to a transportation use than other alternatives in this segment. Alternative SIB-3 would convert the most City-owned open space land to a transportation use. Preferred Alternative SIB-1 would include a station in an industrial zone near Elliott Avenue West. The station structure would be approximately 90 feet high, which would be consistent with the General Industrial 2 zoning which has no height limit for noncommercial projects. Stations associated with other Build Alternatives in this segment would be consistent with zoning height limits.

As shown in Table 4.3.2-4, under the West Seattle and Ballard Link Extensions M.O.S., all South Interbay Segment Alternatives would convert additional manufacturing/industrial land to a



transportation use for the additional bus layover spaces needed on the east side of Elliott Avenue West between West Galer Street and West Garfield Street.

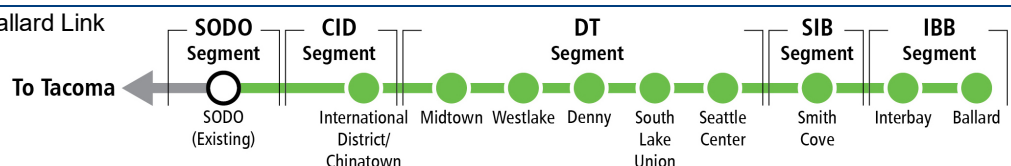
4.3.2.3.6 Interbay/Ballard Segment

Alternatives in the Interbay/Ballard Segment would convert commercial/mixed-use areas, hub urban village land, manufacturing and industrial areas, and multi-family residential areas to a transportation use. Most of this land is manufacturing/industrial center land located within the Ballard Interbay Northend Manufacturing/Industrial Center. Preferred Alternative IBB-1a would convert the most manufacturing/industrial center land and the most overall land to a transportation use. Option IBB-1b and Alternative IBB-2a* would convert the least amount of land. Option IBB-1b would convert the most commercial/mixed-use land and multi-family residential land to a transportation use. Alternative IBB-3 would convert the most hub urban village land and the most Port of Seattle-owned property to a transportation use.

Alternative IBB-3 and Option IBB-1b would have a station near West Dravus Street that would be within a mixed-use zone (SM-D 95 (M)). The station height would be approximately 80 feet, which is within the height limit of 95 feet. Preferred Alternative IBB-1a would also have a station near West Dravus Street, but this station would be within a General Industrial 2 zone which has no height limit for noncommercial projects. Alternative IBB-3 would also include a station near 15th Avenue West and Northwest 54th Street that would be within commercial zones (NC3P-75 (M) and C1-75 (M)) with a 75-foot height limit. The station height would be approximately 80 feet. Preferred Alternative IBB-1a and Option IBB-1b would include a station near 14th Avenue West and Northwest Market Street that would be within commercial zones (NC3P-75 (M) and NC2-55 (M)). The station height would be approximately 80 feet, which is over the height limit of 55 feet for one of the neighborhood commercial zones. The Seattle Department of Construction and Inspection's Director has the authority to waive or modify applicable development standards based on certain conditions.

4.3.2.4 Environmental Impacts of the Build Alternatives during Construction

Potential impacts to existing land uses include temporary impacts from construction staging areas; easements; noise, air emissions, and visual changes; and traffic congestion. These impacts would not affect the land use types unless the property became vacant, and are not anticipated to be severe enough to cause vacancies after mitigation, as described in Section 4.3.2.6, Mitigation Measures. Proximity and construction impacts were determined based on the findings of other environmental elements. For more information, see Section 4.3.3, Economics, and Section 4.3.7, Noise and Vibration.



4.3.2.5 Indirect Impacts of the Build Alternatives

4.3.2.5.1 Transit-oriented Development Potential Common to All Alternatives

Improvements in transportation systems can influence changes to nearby land uses. Although the Ballard Link Extension would directly affect land use through property acquisitions, the project would not directly change surrounding land use designations. Cities and counties control land use regulations, including zoning, and property owners make decisions about developing or redeveloping their property. The Ballard Link Extension could indirectly affect land use by acting as a catalyst for others to develop or redevelop land near project facilities consistent with city land use and zoning requirements. This type of development could increase availability and density of housing options, including affordable housing units. Alternatively, this could result in the indirect effect of increased housing prices and business rent around desirable station areas.

TOD is a pattern of land use and development that includes a mix of uses at higher density or intensity in the vicinity of transit stations. TOD generally occurs when stations are in prime regional or community centers, areas attractive to typical market forces, areas with active regional and local real estate markets with willing investors, and jurisdictions where public policies and regulations such as zoning encourage intensive development in station areas. There is also the potential for joint development of transit facilities like station entrances and concourses, as well redevelopment of surplus properties no longer needed after construction.

The Sound Transit Board adopted the Equitable Transit Oriented Development Policy in 2018 (Board Resolution No. R2018-10). The policy addresses how the agency should consider potential for TOD near transit facilities being planned and studied, and provides guidance on implementing and integrating equitable TOD throughout transit projects.

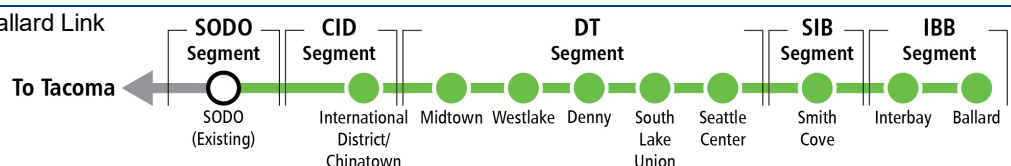
The policy supports land use changes and economic development that would maximize ridership while supporting achievement of comprehensive and regional plans and improving quality of life. During alternatives development and design, this policy guides Sound Transit to incorporate TOD criteria as a decision-making factor that considers local and regional comprehensive plans. Sound Transit's TOD policy promotes TOD within station areas and on Sound Transit property that is no longer needed for transit, and seeks proposals from developers that support various income levels and family sizes. It also provides guidance to engage communities equitably in planning for TOD, particularly for low-income communities and communities of color, and contains goals to support and encourage equitable economic development and opportunities for existing residences and businesses. Notably, the policy also supports exploration of development potential of transit project decisions, and pursuit of joint or co-development of transit facilities where and when appropriate. There is specific priority placed on partnerships that deliver affordable housing,

Transit-oriented Development

TOD is a pattern of development that includes a mix of residential, commercial, and civic uses near a high-capacity transit station. TOD helps to harmonize the relationship between land use and transit, with more residences and jobs accessible from transit, and vice versa. TOD is influenced through real estate markets, infrastructure investment, and zoning, and is implemented through individual decisions by property owners and developers.

Agency TOD

"Agency TOD" refers to TOD that Sound Transit facilitates on property it owns. Agency TOD could occur on property purchased for construction staging that Sound Transit does not need in the long-term, or through joint development. Agency TOD is implemented through partnerships with public, non-profit, or private developers. Sound Transit's Equitable Transit Oriented Development Policy prioritizes partnerships with developers of affordable housing.



responding to a state statute that requires Sound Transit to first offer at least 80 percent of surplus property suitable for housing to qualified developers of affordable housing, who are then obligated to ensure 80 percent of housing units constructed are affordable to those earning 80 percent or less of the area median income for the county.

Sound Transit prepared a study, *Station Area Development Opportunities Evaluation* (2021), to identify and assess specific potential TOD opportunities associated with the West Seattle and Ballard Link Extensions' stations. This study provides more information and analysis to supplement the summary discussion below.

4.3.2.5.2 Transit-Oriented Development Potential by Alternative

The International District/Chinatown Station alternatives under 5th Avenue (Alternative CID-2a and Option CID-2b) have TOD potential, which could include affordable housing or other kinds of equitable TOD per Sound Transit's 2018 Equitable Transit Oriented Development Policy. Alternative CID-2a and the CID-2a diagonal station configuration have considerable potential for a large-scale integrated joint development. The 4th Avenue alternatives (Alternative CID-1a* and Option CID-1b*) have lower potential for future TOD, because the construction staging areas for this alternative are within the public right-of-way and do not result in any surplus property that may be redeveloped.

In the Downtown Segment at Westlake and South Lake Union, Preferred Alternative DT-1 would have the highest potential for future TOD due to the larger size of the anticipated surplus property and supportive zoning that would support overbuild of station entries. Preferred Alternative DT-1 has considerable potential for a large-scale integrated joint development. Although zoning is also supportive for Preferred Alternative DT-1 at Midtown, Denny, and Seattle Center, there is less surplus property associated with these stations and less TOD potential. For Alternative DT-2, there is TOD potential at all station locations.

At the Smith Cove Station, Preferred Alternative SIB-1 is surrounded by major infrastructure with industrial zoning and narrow parcels that would be difficult to develop. The Smith Cove Station for the Prospect Street station alternatives (Alternatives SIB-2 and SIB-3) also lack TOD potential as both station alternatives are confined between 15th Avenue Northwest and the steep western slope of Queen Anne Hill. Both Smith Cove alternatives would primarily serve established or future destinations in the walkshed.

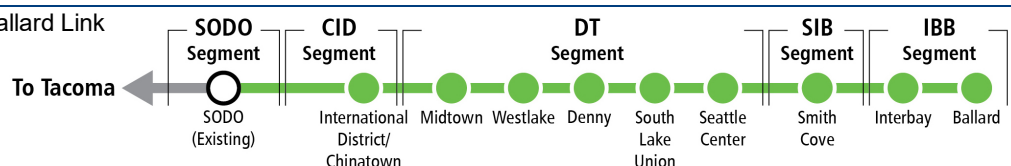
While potential for TOD exists around the Interbay station alternatives, the current industrial zoning designation, soil conditions, and proximity to major infrastructure, such as the railyard and 15th Avenue Northwest, make these locations more challenging to develop. Preferred Alternative IBB-2a* and Preferred Option IBB-2b* have some potential for a larger-scale

Joint Development

Joint development refers to a type of Agency TOD (see above definition) that has a direct, integral physical interface with a transit project, and is often designed and constructed along with the transit project. FTA defines joint development (FTA 2014) as "a public transportation project that integrally relates to, and often co-locates with commercial, residential, mixed-use, or other non-transit development. Joint development may include partnerships for public or private development associated with any mode of transit system that is being improved through new construction, renovation, or extension. Joint development may also include intermodal facilities, intercity bus and rail facilities, transit malls, or historic transportation facilities."

Equitable Transit-oriented Development

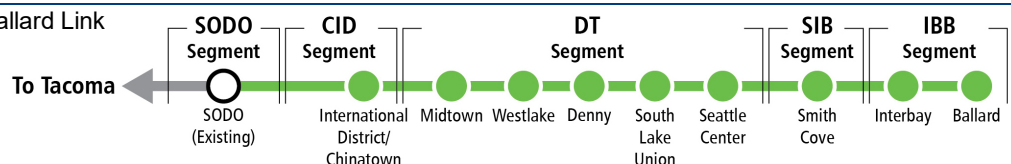
Equitable TOD explicitly advances a mission of social, racial, and/or economic equity in its use, programming, or ownership structure. Equitable TOD can include affordable housing, cooperative or affordable commercial space and uses, childcare and human development, and community-based management or stewardship of property. Sound Transit supports Equitable TOD objectives through its 2018 Equitable Transit Oriented Development Policy.



integrated joint development. The highest potential for future TOD is adjacent to the Interbay/Ballard Segment Ballard Station alternatives. The Ballard tunnel station alternatives (Preferred Alternative IBB-2a* and Preferred Option IBB-2b*) are well-suited for TOD, with anticipated surplus property and supportive zoning allowing for overbuild of tunnels and station entries, and fewer permanent impacts due to the guideway.

4.3.2.6 Mitigation Measures

No mitigation would be required for land use impacts during operation or construction of the Ballard Link Extension. In general, the Ballard Link Extension would not result in inconsistencies with adopted land use plans. During construction, Sound Transit would minimize disturbances to surrounding land uses as described in Section 2.6, Construction Approach; Section 4.3.5, Visual and Aesthetic Resources; Section 4.3.6, Air Quality; and Section 4.3.7, Noise and Vibration. Therefore, impacts are not expected to cause substantial changes to land use during construction.



4.3.3 Economics

4.3.3.1 Affected Environment

Demographic and economic trends in the study area were assessed by using Forecast Analysis Zone estimates (a map of the zones is shown on Figure L4.3-2 in Appendix L4.3). Forecast Analysis Zones are geographic units used to delineate future socio-economic conditions to support transportation planning. Table L4.3-6 in Appendix L4.3 shows the population, household, and employment forecast trends for the Forecast Analysis Zones associated with each segment area in the Ballard Link Extension from 2015 to 2040. Tables L4.3-7, L4.3-8, and L4.3-9 in Appendix L4.3 provide a closer look at employment forecast trends since 2000 and by employment sector.

This analysis includes an assessment of potential adverse and beneficial economic effects of the proposed project alternatives across three different scales:

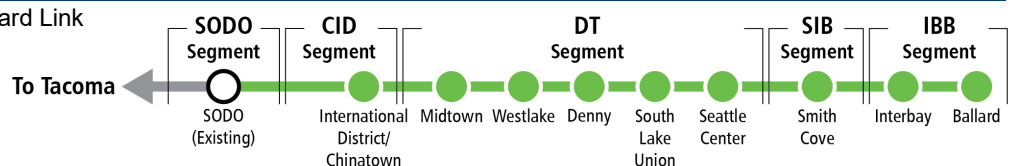
- **Segment:** Site-specific business and employment impacts were evaluated from potential displacement of business activity.
- **City:** Potential impacts to tax revenues were evaluated within the city of Seattle.
- **Regional:** Broader potential impacts to regional economic activity, including the effects on jobs, labor, income, and gross regional product and labor, were assessed for project construction. Broader economic considerations were assessed for King, Kitsap, Pierce, and Snohomish counties (referred to as the Puget Sound region study area) stemming from project operation. The regional study area encompasses the four-county area to account for shifts in the population's demand for goods and services within and outside the project corridor study area.

4.3.3.1.1 Regional Demographic and Economic Trends

Over the last 20 years, employment increased from 1.9 million to 2.3 million jobs in the Puget Sound region. Along with employment, the median household income increased regionally (Puget Sound Regional Council 2020). This trend of economic growth is forecasted to continue for the next few decades.

Population, household, and employment forecasts for the Puget Sound region and associated counties in the region are provided in Appendix L4.3, Table L4.3-1. The forecast population data for the Puget Sound region shows regional growth between 2015 and 2040 (the forecast period) of over 1 million people, which would result in a population of over 5 million people in the region by 2040. This represents a 0.8 percent increase in population per year (Puget Sound Regional Council 2018). Puget Sound Regional Council data from 2017 shows that King County's population will grow at a slower pace of 0.7 percent per year over the same time period (Puget Sound Regional Council 2017). The number of households in the Puget Sound region is predicted to grow by approximately 575,000 households over the 2015 to 2040 period—or by 1.1 percent a year—which is greater than the regional population growth rate (0.8 percent). This reflects faster growth in smaller households. Travel demand typically tracks more closely to growth in the number of households than to population; consequently, the forecasted household growth suggests a potentially faster increase in demand for highway and transit service.

Median household incomes in the Puget Sound region study area are higher than that of the state overall, which is about \$74,000. King County had the highest median household income within the region, at about \$95,000 in 2018 (Puget Sound Regional Council 2018). From 2013 to



2018, incomes in King County grew by about 33 percent, while statewide incomes increased by about 21 percent. Employment in the region is expected to grow at an approximate annual average rate of 1.1 percent through 2040, which is equivalent to about 816,000 additional jobs over the forecast period (Puget Sound Regional Council 2018). King County is predicted to expand employment by 1.2 percent, with much of that growth centered in urban Seattle. Between 2015 and 2035, approximately 115,000 jobs are expected to be added in the city of Seattle (City of Seattle 2018). These trends in income and employment growth support forecasts for increasing travel demand in the region and the project corridor.

4.3.3.1.2 Segment Demographic and Economic Trends

The Downtown Segment is forecasted to have the largest growth rates for population, households, and jobs in comparison to other Ballard Link Extension segments and to the Puget Sound region overall, as shown in Table L4.3-6 in Appendix L4.3. Projected annual job growth ranges from 0.1 percent in the Interbay/Ballard Segment to 2 percent in the Downtown Segment between 2015 and 2040. The average household growth is projected to be at 3.1 percent between 2015 and 2040 for the forecast analysis zone that covers the Downtown Segment and 1.8 percent in the Chinatown-International District Segment. These average annual growth rates are faster than the growth rates for the South Interbay and Interbay/Ballard segments.

4.3.3.1.3 Tax Revenue Sources

The Ballard Link Extension would be within the city of Seattle, where property, sales, utility, and business and occupation taxes represent the largest contribution to the general fund's taxes.

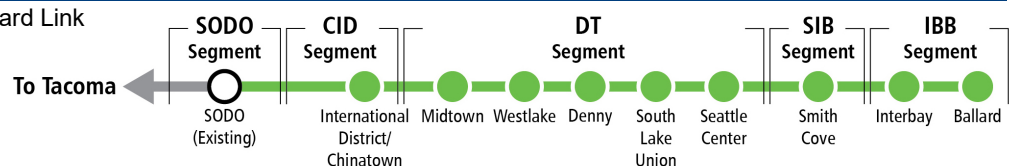
Table 4.3.3-1 shows the breakdown of different tax revenues and their share in the City's general fund. These taxes, combined with other sources of funding, such as license fees, grants, and fines, help fund a range of general City services, including police and fire, human, general government, and transportation services (City of Seattle 2019). The City has a range of district-based (or dedicated funding sources) for certain uses such as the Metropolitan Park District property tax levy to fund park and recreation services and the Transportation Benefit District sales tax to fund transportation services that are included under the respective property and sales taxes in Table 4.3.3-1.

Table 4.3.3-1. Percent of Total General Fund Revenues for the City of Seattle

Tax	General Fund Total (\$ millions)	General Fund Percent
Property Tax	\$345.9	23.5
Sales Tax	\$296.3	20.2
Utility Tax	\$220.6	15.0
Business and Occupation Tax	\$296.9	20.2
Other	\$309.6	21.1
Total	\$1,469.3	100.0

Source: City of Seattle 2019, 2020.

Note: "Other" represents revenue garnered through licenses, federal and state grants, state entitlements and impact programs, external service charges, court fines, and other miscellaneous investments, earnings, and charges.



4.3.3.1.4 Seattle Comprehensive Plan

The *Seattle 2035 Comprehensive Plan: Managing Growth to Become an Equitable and Sustainable City 2015-2035* (Seattle Comprehensive Plan) outlines goals to concentrate anticipated job and housing growth in urban centers and urban villages (City of Seattle 2018). The Urban Village Strategy within the plan promotes housing and employment development in specific locations by supporting compact, pedestrian-oriented development and reliable transit access accommodations. The strategy identifies four different types of growth areas: urban centers, hub urban villages, residential urban villages, and manufacturing and industrial centers. The Ballard Link Extension study area includes five Puget Sound Regional Council regional centers that are included as part of the Comprehensive Plan. These areas include the Downtown Urban Center, Uptown Urban Center, South Lake Union Urban Center, the Ballard Urban Village, and the Ballard Interbay Northend Manufacturing/Industrial Center. Figure 4.3.2-1 in Section 4.3.2, Land Use, shows the locations of the regional centers and villages.

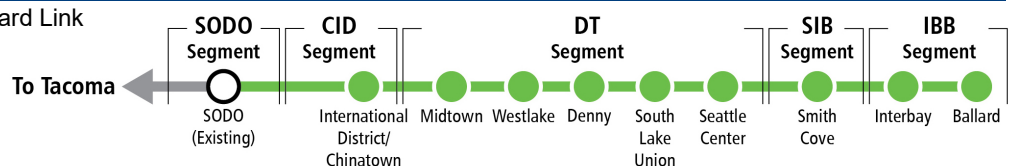
4.3.3.1.5 Regional Transportation of Goods and Services

As one of the most trade-dependent states in the nation (City of Seattle 2016), the economy of Washington and the need for effective freight mobility are closely related. Both consumers and businesses in the region depend on the efficient and safe movement of goods by truck, rail, and water modes. The primary truck freight corridors in the state for regional and interstate commerce are Interstate 5 and Interstate 90. Substantial freight traffic also uses State Route 99. All three routes can be heavily congested during peak travel times. This congestion leads to longer travel times, increased operating costs, and decreased pick-up and delivery reliability. As a result, some businesses have shifted their delivery to non-peak hours and others have chosen to use alternate routes.

In addition, the Ballard Link Extension study area contains one of Seattle's major BNSF Railway yards. At the south end of the Ballard Interbay Northend Manufacturing/Industrial Center is Terminal 91 (a large general cargo terminal complex that also services cruise ships) and Pier 86 (an export grain terminal). At the north end of the center is Salmon Bay and the Lake Washington Ship Canal, which connects Puget Sound to Lake Union and Lake Washington.

4.3.3.1.6 Industrial Centers

The Duwamish Manufacturing/Industrial Center in the SODO Segment is described in Section 4.3.2.1. The Chinatown-International District Segment also includes part of this manufacturing and industrial center and has the same characteristics as described for the SODO Segment. Smith Cove, which is in the South Interbay Segment, includes Terminal 91 (a large Port of Seattle commercial vessel and cruise terminal complex) and Pier 86 (a Port of Seattle export grain terminal) along Elliott Bay. The South Interbay and Interbay/Ballard segments are partially in the Ballard Interbay Northend Manufacturing/Industrial Center (see Figure 4.3.2-1 in Section 4.3.2), which includes working waterfronts (both fresh and saltwater), wharfs, shipyards, and major railroad yards. This center supports nearly 2,000 jobs, primarily within the services, manufacturing, and wholesale/transportation/utilities sectors and represents 3.1 percent of the city employment base (Puget Sound Regional Council 2013). In 2017, the commercial fishing industry in this area supported over 11,000 jobs, including direct, indirect, and induced jobs throughout the state. This equates to approximately \$540 million in labor income and \$1.4 billion in business output in 2017 (Northwest Seaport Alliance 2019).



4.3.3.2 Environmental Impacts of the No Build Alternative

The No Build Alternative would have fewer transportation options and longer travel times for transit riders, potentially resulting in increased road congestion and less transit usage. Chapter 3, Transportation Environment and Consequences, provides additional information. This may deter or slow some investment in the study area, and the development that occurs could be more dispersed and of lower density than with the Ballard Link Extension.

The No Build Alternative would likely result in a different pattern of economic development and property development than with the project. Business and employee displacements could occur as part of the natural process of changing business dynamics and land development.

4.3.3.3 Environmental Impacts of the Build Alternatives during Operation

The Ballard Link Extension has the potential to advance local and regional plans by expanding transportation infrastructure and modal options available, thus increasing the efficiency of transportation and strengthening the local and regional economy. There would also be a small increase in long-term transit employment (train operators and maintenance staff) once new Ballard Link Extension light rail service begins in 2037.

Changes to the local business environment and surrounding neighborhoods might occur as a result of the Ballard Link Extension. Direct economic impacts include business and employee displacements, as well as associated potential tax impacts from changes in land use, regional freight mobility, or maritime operations resulting from land acquisition for the project.

All Build Alternatives could result in some change in economic activity at or near the project corridor. Some alternatives could result in changes in economic activity for the broader region if the economic activity could not be relocated within the region. These changes might include business displacements when property is acquired for the project, along with corresponding effects on employees and property taxes that could shift the tax burden to other businesses and residents. If businesses are displaced outside of the region, business and occupation taxes and retail sales taxes could also be affected.

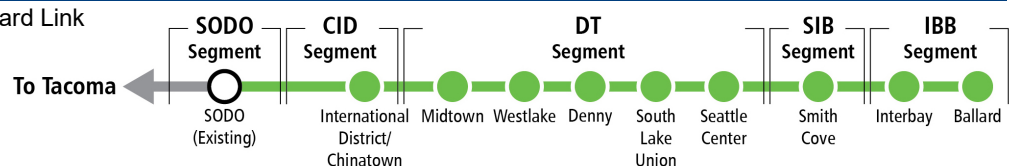
Potential maritime industry impacts that would have broader supply-chain impacts in the region and potential impacts on Tribal treaty-protected fishing are discussed for the Interbay/Ballard Segment where the project would cross Salmon Bay.

4.3.3.3.1 Impacts Common to all Alternatives

This section describes impacts common to all alternatives, including business and employee displacements, the impact of acquisitions and displacements on the tax base of the city, and includes information on the M.O.S. Additional detail on displacements is also provided by segment, along with impacts to the regional transportation of goods and services and freight mobility and access.

Business and Employee Displacements

The Ballard Link Extension would require acquisition of commercial, industrial, and institutional properties that might result in the disruption or displacement of businesses along the project corridor. Substantial displacement of local businesses can affect residents and businesses by altering the scale and mix of land uses and economic activity.



Often the direct impacts for displaced businesses are financial, but this does not capture the broader dynamics associated with displacement. Businesses are affected differently based on their characteristics, such as firm size, community importance, and employment impact. For example, businesses that rely on a localized customer base might have more difficulty finding a suitable new location to serve the same population. Businesses that use machinery or hazardous substances might require large parcels or have perceived negative costs to the public (such as waste and pollution) that make relocation difficult. Moving to a new location could also restrict their labor pool.

Potentially displaced businesses generate local tax revenues, provide employment opportunities, and contribute to the local economy. Table 4.3.3-2 indicates the number of business and employee displacements that would be required by each Build Alternative within each Ballard Link Extension segment.

Build Alternatives with the least amount of such displacements and acquisitions would generally be expected to have a smaller negative effect on the local economy. The analysis considers impacts to specific industries that are dependent on critical waterways or infrastructure for operations by assessing if those businesses would be directly acquired.

Some businesses might relocate to other areas or permanently close when their property is purchased, thereby causing a loss of associated jobs. However, it is anticipated that most displaced businesses and jobs would not be lost permanently because Sound Transit would provide relocation assistance to displaced businesses. Potential business displacements that affect specific populations are evaluated in Section 4.3.4, Social Resources, Community Facilities, and Neighborhoods.

Industrial Properties Acquired

As described in Section 4.3.2, Land Use, the South Interbay and Interbay/Ballard segments would convert the most Manufacturing/Industrial Center land to a transportation use. Notable displacements include King County Metro Transit Ryerson Bus Base (Option CID-1b*), a large industrial employer (GM Nameplate) (Alternative SIB-2), and maritime uses associated with displacements at Fishermen's Terminal along Salmon Bay (Alternative IBB-3) and Coastal Transportation Inc. (Preferred Alternative IBB-1a and Option IBB-1b). Section 4.3.1, Acquisitions, Displacements, and Relocations, cites an industrial vacancy rate of 4.3 percent, which indicates some land availability for relocations. However, industrial business replacements can be challenging when unique land features, such as access to rail or water, are required for business operation.

Impact of Acquisitions and Displacements on Tax Base of City

All of the Ballard Link Extension Build Alternatives would require acquisition of parcels that have existing commercial or industrial activity and businesses that pay a sales and/or business and occupation tax. Acquisition of these parcels would result in the initial reduction of sales and business and occupation taxes from the displacement of existing businesses. Determining the potential reduction for such taxes is not possible because it is not known if businesses would relocate within the city. If displaced businesses were to relocate within the city, they would resume paying sales and business and occupation taxes and there would be no effect on the city tax base.

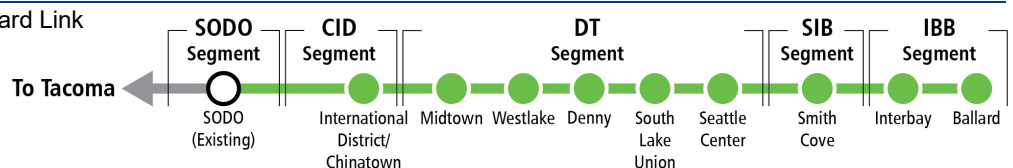


Table 4.3.3-2. Estimated Property Acquisition Impacts on Businesses and Employees for the Ballard Link Extension

Segment	Alternative	Business Displacements ^a	Employee Displacements ^a
SODO	Preferred At-Grade (SODO-1a)	3 to 15 ^{b, c}	20 to 110 ^{b, c}
	At-Grade South Station Option (SODO-1b)	3 to 15 ^{b, c}	20 to 110 ^{b, c}
	Mixed Profile (SODO-2)	14 ^c	100 ^c
Chinatown-International District	4th Avenue Shallow (CID-1a)*	5 to 8	120
	4th Avenue Deep Station Option (CID-1b)*	5	200
	5th Avenue Shallow (CID-2a)	19 to 27 ^d	170 to 230 ^d
	5th Avenue Deep Station Option (CID-2b)	18	170
Downtown	Preferred 5th Avenue/Harrison Street (DT-1)	44 to 46	480 to 490
	6th Avenue/Mercer Street (DT-2)	47	440
South Interbay	Preferred Galer Street Station/Central Interbay (SIB-1)	33 ^e	280 ^e
	Prospect Street Station/15th Avenue (SIB-2)	35 ^e	290 to 300 ^e
	Prospect Street Station/Central Interbay (SIB-3)	25 ^e	320 ^e
Interbay/Ballard	Preferred Elevated 14th Avenue (IBB-1a)	64 to 71	540 to 610
	Elevated 14th Avenue Alignment Option (from Prospect Street Station/15th Avenue) (IBB-1b)	57	400
	Preferred Tunnel 14th Avenue (IBB-2a)*	41	380
	Preferred Tunnel 15th Avenue Station Option (IBB-2b)*	43	370
	Elevated 15th Avenue (IBB-3)	51	620

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Data Sources: King County Assessments Department 2019; United States Department of Energy Information Administration 2016.

Note: The employee numbers are estimates and rounded to the nearest 10 digit. The number of employee displacements is based on an accepted formula used by the United States Department of Energy (2016); this estimate is based on the building area for the predominant business within each parcel.

^a Ranges reflect differences from connecting to different alternatives in adjacent segments.

^b Specific affected parcels and displacements in the SODO Segment would depend on the connection to the Chinatown-International District Segment. Alternatives in the SODO Segment would have the least displacements when connecting to Alternative CID-1a*.

^c The Ballard Link Extension-only M.O.S. would result in two to five business displacements and 20 to 40 employee displacements in the Duwamish Segment to connect to the existing Operations and Maintenance Facility Central. It would also displace the same businesses and employees that are shown in Table 4.2.3-2 for the West Seattle Link Extension, SODO Segment.

^d For Alternative CID-2a, the range is based on station configuration and construction methods. These include potential temporary displacements of less than a year during construction.

^e With the West Seattle and Ballard Link Extensions M.O.S., there would be three additional business displacements and 50 additional employee displacements.



Like sales and business and occupation taxes, specific property tax impacts are not possible to calculate because of the structure of property taxes in Washington. Potential acquisitions would not initially reduce property taxes in Seattle due to the budget-based system that limits the growth of property tax revenues (Initiative 747 and subsequent legislative action to cap city property tax revenues at 1 percent per year, plus some add-on value from new construction). This means the overall amount of tax collected is determined by statute and not directly determined by changes in assessed valuation. The amount of tax is then distributed across taxable property on the basis of assessed valuation. If the amount of taxable property is reduced via acquisition and made exempt, the same tax amount is redistributed to the remaining taxable properties within the jurisdiction. However, the conversion of property from taxable to tax-exempt would shift the property tax burden to other non-exempt property taxpayers. The impact is expected to be minimal given the reduction in taxable assessed valuation of acquired properties in relation to the city's overall tax base. For example, the total taxable assessed valuation of real property for Ballard Link Extension acquisitions is equal to 1.1 percent of the city of Seattle's overall assessed valuation in 2019.

Some of the initial tax revenue displacement would be offset by future construction elsewhere in Seattle. Not all the land required by Sound Transit would be needed permanently, and the unused land could be redeveloped after project completion. The long-term implications of the project fiscal impacts depend on business location decisions. Some displaced businesses might choose to relocate to another site in the local area. Retaining those displaced businesses could reduce the effect on local sales taxes. In addition, if the project were to promote future development and investment in the local vicinity, property tax assessments could increase. However, the project could also result in shifting demand across the region, so that while assessments near the stations increase, property tax assessments in other areas of the city might be reduced. Overall, long-term property tax impacts are expected to be small, and it is difficult to determine if the result on property tax assessments would be a net positive or negative to the region.

4.3.3.3.2 SODO Segment

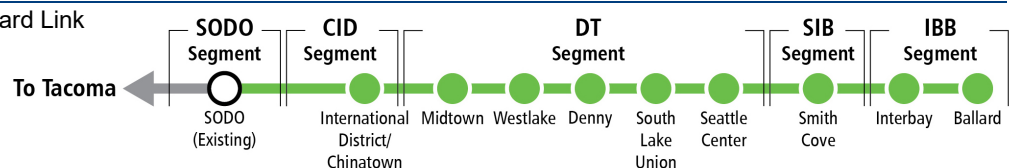
Business and Employee Displacements

The properties that would be affected in the SODO Segment are commercial or industrial. The impacts identified in the Ballard Link Extension SODO Segment would be in addition to the West Seattle Link Extension impacts. The businesses affected include a local electrical supply business and auto services company.

The Ballard Link Extension-only M.O.S. would displace the same businesses and employees as identified in this section for the Ballard Link Extension in the SODO Segment, and businesses and employees identified in SODO for the West Seattle Link Extension (see Section 4.2.3.3.2). It would also displace 2 to 5 businesses and 20 to 40 employees in the Duwamish Segment to connect to the existing Operations and Maintenance Facility Central. If the Ballard Link Extension-only M.O.S. were constructed, these properties would no longer be affected by the West Seattle Link Extension when that project is built.

Impacts to Regional Transportation of Goods and Services and Freight Mobility and Access

All alternatives would build new vehicle overpasses over the existing and future light rail tracks on South Holgate Street, which is a major truck street, and would improve truck mobility by eliminating conflict and delay with the existing light rail crossings. These mobility improvements



could support industrial businesses by making the local freight system more efficient by reducing delay.

4.3.3.3 Chinatown-International District Segment

Business and Employee Displacements

The properties that would be affected in the Chinatown-International District Segment are mostly commercial or institutional. Alternative CID-1a* and Option CID-1b* would have the least business displacements. Alternative CID-2a would have the most business displacements, and more employee displacements compared to Option CID-2b. Businesses displaced with either Alternative CID-2a or Option CID-2b would include some retail and service businesses that serve the local community. Option CID-1b* would displace the King County Metro Transit Ryerson Bus Base, a Goodwill outlet, and warehouse businesses.

Impacts to Regional Transportation of Goods and Services and Freight Mobility and Access

No impacts are expected to affect the truck, rail, or marine freight movement.

4.3.3.4 Downtown Segment

Business and Employee Displacements

Most of properties that would be affected in the Downtown Segment are commercial or industrial. Some institutional and public properties and mixed-use buildings would also be affected. Preferred Alternative DT-1 would have fewer business displacements than Alternative DT-2 but more employee displacements. Preferred Alternative DT-1 would displace a mid-rise office tower, retail businesses, a hotel, and a bank while Alternative DT-2 would displace several retail businesses, personal services, restaurants, hotels, and banks. Alternative DT-2 could also temporarily displace an additional hotel business due to construction noise.

Impacts to Regional Transportation of Goods and Services and Freight Mobility and Access

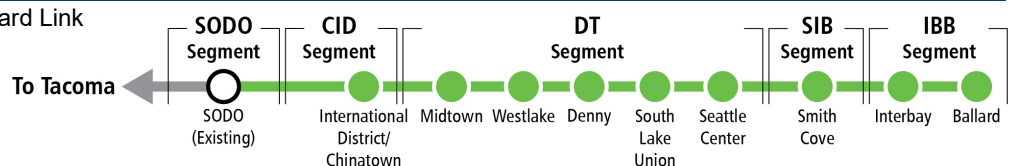
No impacts are expected to affect the truck, rail, or marine freight movement.

4.3.3.5 South Interbay Segment

Business and Employee Displacements

Most properties that would be affected in the South Interbay Segment are commercial or industrial and public or institutional. Preferred Alternative SIB-1 would displace the fewest employees. Alternative SIB-2 would displace the most businesses, including retail and office buildings as well as a large industrial employer. Alternative SIB-3 would have the fewest business displacements, but the most employee displacements.

As shown in Table 4.3.3-2, under the West Seattle and Ballard Link Extensions M.O.S., all South Interbay Segment alternatives would need to acquire additional commercial/industrial parcels and would displace businesses and employees for the bus layover on the east side of Elliott Avenue West between West Galer Street and West Garfield Street.



Impacts to Regional Transportation of Goods and Services and Freight Mobility and Access

A constructed median along Elliott Avenue West for Preferred Alternative SIB-1 and Alternative SIB-2 would restrict left-turn access. Alternative SIB-2 would also place guideway columns within the median of 15th Avenue Northwest from West Newton Street to West Barrett Street. Freight access could be restricted because trucks would be required to turn at signalized intersections or use alternative routes to reach the businesses where access is limited. Access to the Port of Seattle's Terminal 91 and cruise ship operations would not be affected by this alternative. None of the alternatives would affect railroad or marine facilities.

4.3.3.3.6 Interbay/Ballard Segment

Business and Employee Displacements

The properties affected in the Interbay/Ballard Segment would primarily be commercial or industrial. Preferred Alternative IBB-1a would have the most business displacements because of its location within an area primarily supporting manufacturing/industrial and commercial land uses along 14th Avenue Northwest, where there is a concentration of businesses. Alternative IBB-3 would have the most employee displacements. Preferred Alternative IBB-2a* and Preferred Option IBB-2b* would displace the fewest businesses and employees because these alternatives would be in a tunnel north of Interbay Station.

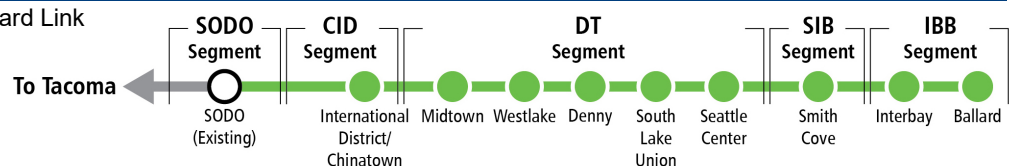
Preferred Alternative IBB-1a and Option IBB-1b would displace maritime businesses on the east side of the Ballard Bridge along Salmon Bay, and Alternative IBB-3 would displace businesses near and within Fishermen's Terminal along Salmon Bay west of the Ballard Bridge. The effects of these displacements on the maritime industry are discussed below under Impacts to Maritime Industry. These displacements could also be harder to relocate due to their need for water access.

Impacts to Regional Transportation of Goods and Services and Freight Mobility and Access

Preferred Alternative IBB-1a and Option IBB-1b would locate guideway columns in the median of 14th Avenue Northwest, and the left-turn pocket would be removed at the 14th Avenue Northwest/Northwest 49th Street intersection. There could be some truck access impacts to local business because 14th Avenue Northwest provides local access for businesses in the Ballard Interbay Northend Manufacturing/Industrial Center.

Preferred Alternative IBB-1a and Option IBB-1b would displace Coastal Transportation Inc., which is involved in regional waterway transportation and freight movement. Coastal Transportation Inc. has a critical role in maintaining waterway transportation and frequent freight services to and from southwest Alaska. It offers domestic and local shipping services, long-haul cargo movement, international shipment, and inter-port (port-to-port) services and fills an important role for the state of Alaska as laid out in the Aleutian Trade Act of 1990. The business would be displaced with Preferred Alternative IBB-1a and Option IBB-1b.

Alternative IBB-3 would construct medians for guideway columns in the center-turn lane of 15th Avenue Northwest that could affect truck access to local businesses. This alternative would also have columns on the south side of Salmon Bay that could affect access and circulation within Fishermen's Terminal, as well as displace some uses on the property. Businesses at Fishermen's Terminal are involved in regional waterway transportation and freight movement.



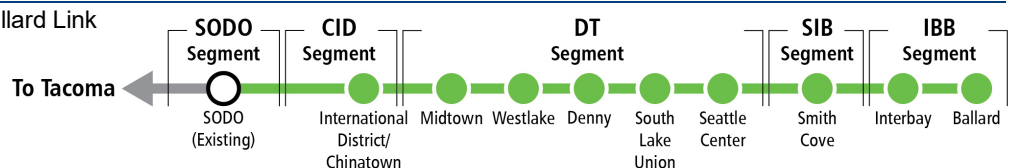
All elevated alternatives (Preferred Alternative IBB-1a, Option IBB-1b, and Alternative IBB-3) would include in-water guideway columns and pier protection. As described in Section 3.17, Ballard Link Extension Affected Environment and Impacts during Operation-Navigation, this would reduce the area available for commercial vessels to maneuver and hold outside the Army Corps of Engineers-maintained Lake Washington Ship Canal navigation channel. This would increase congestion in the waterway; however, it is not expected to result in large economic disruptions.

Impacts to Maritime Industry

Along Salmon Bay, maritime businesses would be displaced by some of the Interbay/Ballard Segment alternatives. If the businesses have cargo operations or waterfront-dependent functions, they could be difficult to relocate. Where feasible, Sound Transit would work with the maritime businesses to explore ways to maintain the operations. Maritime businesses could also be impacted by Ballard Link Extension alternatives that would affect direct access to the water or the docks used by those businesses.

Preferred Alternative IBB-1a and Option IBB-1b would displace water-dependent businesses, including:

- Bowman Refrigeration – This business is highly dependent on their current location to serve their maritime customer base. Bowman Refrigeration requires a moderate size warehouse close to a port to install and service the refrigeration and heating, ventilation, and air conditioning systems of fishing and other vessels.
- Ballard Marina – This marina is predominantly used by recreational vessels. It operates one covered berth and four docks. It provides amenities to boaters such as parking, water hook-ups, and power. It is dependent on its existing location because it can host vessels from 30 feet to more than 100 feet in length and has direct access to vessels coming through the Lake Washington Ship Canal. Its proximity to other complementary maritime-related businesses is beneficial.
- Ballard Insulation – This business is a maritime insulation service company that supports fishing vessels, boat builders, and a variety of other ship types. Ballard Insulation is somewhat dependent on their current location to serve their maritime customer base.
- Northern Lights – This business is a diesel generator manufacturer for the maritime industry and a warehouse and retail outlet for generators and other marine services and parts. Northern Lights is somewhat dependent on their current location to serve their maritime customer base. The company benefits from direct access to ships coming through the channel and would require similar geographic advantage if it were to relocate.
- Motion & Flow Control Products – This business is a master distributor of maritime machinery and equipment that provides design and build services and full-service repair and fabrication of hydraulic pumps, valves, and motors. They are somewhat dependent on their current location to serve their maritime customer base. Proximity to other complementary service providers is beneficial and highlights the area as a destination for repairs.
- Coastal Transportation Inc. – This business is a maritime cargo transportation company that operates five vessels year-round transporting critical goods and services from Seattle to ports in Western Alaska and the Aleutian Islands. According to Coastal Transportation, they are the only Aleutian Trade Act company that provides year-round service to these communities, and impacts to this business could affect rural and Alaska Native village communities in this part of Alaska. Their operation includes a private seafood handling



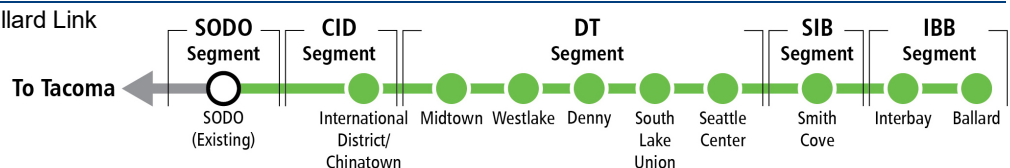
terminal located in an area of freshwater near the Ballard Bridge, staging areas, supplies, and construction equipment, as well as access to rail, long-haul, and customer vessel offload services with direct access to the marine terminal. All of this infrastructure complicates relocation for this business, thus increasing the cost of re-investment. If displacement cannot be avoided, a new location would need to maintain access to ports and the existing rail network, which may be difficult to find. The relocation process could impact shipping schedules in the near- and long-term, which could affect the delivery of critical goods and services to rural and Alaska Native village communities in Alaska.

In addition, the 14th Avenue Northwest Boat Ramp, located at the end of 14th Avenue Northwest, would need to be relocated with Preferred Alternative IBB-1a and Option IBB-1b. The public access site is operated by Seattle Parks and Recreation and includes two piers and two launch lanes for launching watercraft into Salmon Bay. It serves commercial, recreational, and Tribal vessels. As an access point, it is fully dependent on proximity to water but would be relocated east near 11th Avenue Northwest prior to construction, so there would be no loss of access.

Alternative IBB-3 would displace water-dependent businesses, including:

- **Lake Union Boat Repair** – This business includes a boatyard and repair shop and provides interior, exterior, and electrical services for boats. It also provides consulting services to assist other boat yards manage repair and finishing projects. It is highly dependent on its existing property because of its maritime customer base and reliance on dock access. Its proximity to other complementary maritime-related businesses is beneficial. This business requires adequate dock and warehousing space to complete repairs.
- **Fishermen’s Terminal Dock 3** – The displacement of this dock would negatively impact operations at Fishermen’s Terminal as well as other businesses that rely on its services. Overall operations could continue at other docks, but business would be impacted.
- **Shipyards and marine ways recently vacated by Fishing Vessel Owners Marine Ways** – This is a full-service shipyard with a marine railway that services a wide range of boat types and sizes. It is an integral part of the Fishermen’s Terminal overall infrastructure and service of the commercial fishing fleet. The shipyard is highly dependent on their current location within Fishermen’s Terminal, where it has operated for more than 100 years.
- **AMC Cliffv’s Marine Service** – This business is a maritime wholesaler of products that include air conditioning, heating, and refrigeration. AMC Cliffv’s Marine Service has several locations throughout the Seattle area where it markets its marine products and parts. The Ballard site, however, is the sole location for services and repairs. Due to this, AMC Cliffv’s Marine Services is moderately dependent on their current location to serve their maritime customer base.
- **Branchflower Marina**: This marina is located on the northern bank of Salmon Bay and typically services recreational vessels. Several smaller buildings and boat slips would be displaced. There are multiple other marinas serving recreation vessels along Salmon Bay.

Impacts to the commercial fishing businesses and other supporting businesses could affect the number of jobs available in this industry. As described above, Alternative IBB-3 would displace the most water-dependent businesses. Preferred Alternative IBB-1a, Option IBB-1b, and Alternative IBB-3 would create the first vertical restriction on the Lake Washington Ship Canal upstream of Shilshole Bay, limiting the vertical clearance over the navigation channel to 136 feet. A double-leaf bascule moveable bridge type for Alternative IBB-3 would not restrict the vertical clearance over the navigation channel. Based on the navigation survey of waterway



users performed by Sound Transit in 2020, a small percentage of vessels that currently use the waterway exceed the proposed vertical clearance of the bridge alternatives. These vessels would not be able to travel under the bridge. In the survey, waterway users expressed concerns about impacts to future business opportunities from the vertical clearance restriction. They would like to be able to provide services to superyacht sailboats and other taller vessels; however, height restrictions with the elevated alternatives could limit these opportunities.

Impacts to Tribal Treaty-Protected Fishing

The Muckleshoot Indian Tribe, signatory to the Treaty of Point Elliott and the Treaty of Medicine Creek, has treaty-protected fishing rights and Usual and Accustomed Areas in the Puget Sound region, including Salmon Bay. The Suquamish Tribe of the Port Madison Reservation (the Suquamish Tribe) is signatory to the Treaty of Point Elliott, has treaty-protected fishing rights, and uses Salmon Bay to access its Usual and Accustomed Areas. Placement of guideway columns in the water could interfere with Tribal treaty-protected fishing rights of the Muckleshoot Indian Tribe. Guideway columns in the water could also interfere with Tribal treaty-protected access to the Usual and Accustomed Areas of the Suquamish Tribe.

4.3.3.4 Environmental Impacts of the Build Alternatives during Construction

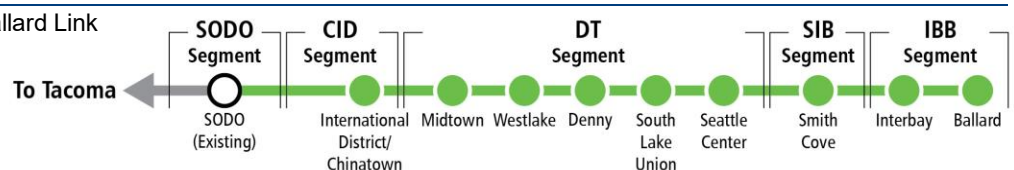
This section describes potential beneficial and adverse economic impacts common to all alternatives, and then describes impacts on businesses and freight during construction by segment. Segment-specific impacts discussed following Section 4.3.3.4.1, Impacts Common to All Alternatives, are focused on road closures that would result from the Ballard Link Extension construction. This type of impact affects cultural, retail, and service businesses most directly because they generally rely on easy customer access. For some, the nearby construction activities could make the businesses less accessible to customers and ultimately affect business revenue as well as downstream tax revenues (such as sales tax revenues). The extent and duration of the interference, the location of competitors, and the type of affected business would all influence the degree of economic effects to local businesses from project construction. Potential impacts on Tribal treaty-protected fishing during construction are also discussed for the Interbay/Ballard Segment.

4.3.3.4.1 Impacts Common to All Alternatives

Construction activities often result in changes to the economy of the surrounding area. The benefits of construction mainly come in the form of construction and related spending entering the community via construction jobs, the purchase of local goods and services needed for construction, and construction employees spending money in the community. Negative effects of construction often include blocked visibility and reduction in access to businesses, traffic delays, noise, and rerouting traffic in ways that increase travel time.

Potential Beneficial Economic Impacts from Construction

The Ballard Link Extension schedule estimates that project construction would begin in 2027 and be completed by 2037. Capital expenditures on light rail projects can help support regional economic activity through the purchase of goods and services, labor income, and tax revenues in the study area. The economic contributions arising from construction projects are often temporary in nature and occur as construction spending unfolds. How much construction increases employment and spending depends on the source of project funding and the types of labor used during construction. Table 4.3.3-3 provides estimated direct expenditures and the



estimated number of direct employees who would be hired for the highest and lowest cost combinations of Build Alternatives. The high-cost estimate includes Alternative CID-2a, Alternative DT-2, Alternative SIB-3, and Preferred Option IBB-2b*. The low-cost estimate includes Alternative CID-2a, Preferred Alternative DT-1, Preferred Alternative SIB-1, and Preferred Alternative IBB-1a.

Table 4.3.3-3. Estimated Direct Expenditures and Direct Employment from Ballard Link Extension Construction

Cost Estimates and Employment	Project Construction ^a
High-cost estimate total direct expenditure (\$ millions)	\$4,958.36
High-cost estimate total employment (job years)	13,429
Low-cost estimate total direct expenditure (\$ millions)	\$4,094.15
Low-cost estimate total employment (job years)	11,088

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Note: These estimates reflect updated cost estimates issued in November 2021.

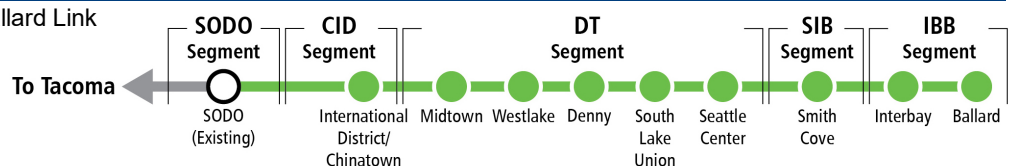
^a Does not include right-of-way, engineering, and contingency costs. A job year is defined as full-time employment for one person over the course of a year (assuming 2,080 hours of employment per year).

The project would support economic activity in the region by increasing demand for inputs to the construction industry. The wages paid to workers in construction or supporting industries would support consumption in the region. The direct estimates represent spending and jobs directly related to the project Build Alternatives. The direct spending generates additional economic output and employment from secondary (supply-chain and consumption) effects associated with each Build Alternative. These secondary effects are represented by economic multipliers, which reflect how spending is distributed across other industries to support regional economic activities.

Potential Adverse Economic Impacts from Construction

Businesses in the study area near construction of the Ballard Link Extension could be negatively affected by construction activities. Negative impacts might include reduced sales, resulting from changes in traffic, access, parking, visibility, dust, and noise because patrons might choose to avoid construction areas or have greater difficulty accessing businesses near construction activity. Reduced sales could affect downstream tax revenues such as sales tax. This type of impact affects cultural, retail, and service businesses most directly because they generally rely on easy customer access. The extent and duration of the interference, the location of competitors, and the type of affected business would all influence the degree of economic effects to local businesses from construction.

For all segment alternatives, construction employment would increase localized demand for parking. Sound Transit anticipates that staging areas could be used for construction employee parking, but construction workers could also park on local streets and arterials where parking is unrestricted and in off-street pay parking lots or garages, which may affect the parking supply. Increased parking occupancy may reduce business patronage for those who travel by personal vehicle if they are not able to find parking or alternative ways to access the business.



4.3.3.4.2 SODO Segment

Businesses in the SODO Segment that could be affected by construction activities are a mix of mostly industrial and commercial. General freight movement could be affected by closure of South Holgate Street in this segment during construction as described in Section 3.18, Ballard Link Extension Affected Environment and Impacts During Operation – Freight Mobility and Access.

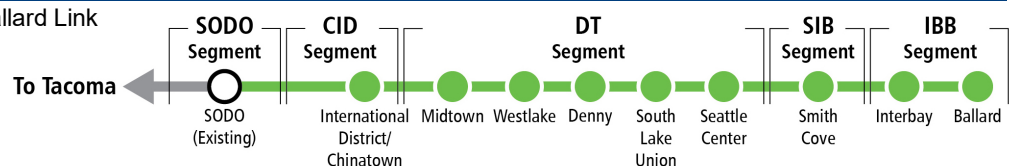
When the Ballard Link Extension portion of the SODO Segment is constructed, a full closure of the Link light rail tracks is proposed between the SODO and International District/Chinatown stations for 6 weeks to 7 weeks when connecting to Alternative CID-1a*. When connecting to other alternatives in the Chinatown-International District Segment, there would be intermittent periods of single-track operation and closures during nights and weekends. Link light rail closures could affect local businesses, and this effect would be greatest with Alternative CID-1a*.

4.3.3.4.3 Chinatown-International District Segment

Businesses in the Chinatown-International District Segment that could be affected by project construction activities are a mix of arts and culture, retail, service, and offices. Roads would be detoured or closed as needed to construct the project (see Chapter 3, Table 3-27, for details on the road closures and durations of closures), which would affect access to some businesses. Closure of a portion of 4th Avenue South and the 4th Avenue South/South Jackson Street intersection for Alternative CID-1a* and Option CID-1b* and of a portion of 5th Avenue South and the 5th Avenue South/South Jackson Street intersection for Alternative CID-2a would affect access to businesses in this area. These closures could also affect event-related revenue for these businesses from events at the nearby stadiums. Closure of 4th Avenue South for Alternative CID-1a* and Option CID-1b* could make access to events at Lumen Field and T-Mobile Park more difficult because 4th Avenue South is adjacent to these stadiums and is also a major arterial. In addition, Alternative CID-1a* would require the Stadium Station to be temporarily closed for up to 2 years to connect to the West Seattle-to-Everett line. During this time, the Stadium Station's users would need to use the International District/Chinatown or SODO stations or another travel mode, which would increase travel time to Lumen Field and T-Mobile Park for these riders. However, construction is not expected to notably affect attendance at events at these facilities. Closure of 4th Avenue South would also affect access to the Union Station complex parking garage, which could put additional pressure on other parking lots in the area and reduce parking available for other businesses in the neighborhood. The diagonal station configuration for Alternative CID-2a would only partially close a portion of 5th Avenue South.

Construction activities for Alternative CID-2a would temporarily impact the loading dock, entry plaza, and garage at Uwajimaya for up to a few months. The diagonal station configuration for this alternative would not affect Uwajimaya access. However, it could require temporary displacement of less than a year of businesses in the American Hotel building at 417 6th Avenue South and the Buty Building at 402 5th Avenue South while structural improvements are made to these buildings. If construction were to last longer than a year, the relocations would be considered permanent. Although these are expected to be temporary displacements, they are included in the impacts in Table 4.3.3-2 because the businesses could choose to permanently relocate.

Access to other businesses could be affected by increased congestion on roads where traffic is diverted or could potentially benefit businesses with increased exposure of travelers. Roads where traffic would be diverted include 1st Avenue South, 6th Avenue South, and Maynard



Avenue South for Alternative CID-1a* and Option CID-1b*, and 4th Avenue South, Maynard Avenue South, South Jackson Street, and 6th Avenue South for Alternative CID-2a and Option CID-2b. Impacts to freight mobility and access during construction are described in Section 3.19.3.6, Freight and Mobility Access, in Chapter 3.

4.3.3.4.4 Downtown Segment

Businesses in the Downtown Segment that could be affected by construction activities are a mix of art and cultural, retail, service, and offices. Station entrance construction at the surface for all stations in this segment would result in road or lane closures and traffic diversion (see Table 3-28 in Chapter 3 for details on the road closures and durations of closures). Road and lane closures for either Downtown Segment alternative could make access to businesses on those blocks more difficult, but sidewalks would remain for pedestrian access. Most buildings adjacent to road closures are office or residential towers, but disruption from construction activities could affect retail or service businesses on lower floors of these buildings.

Alternative DT-2 would be less disruptive to businesses in the downtown retail core in comparison to Preferred Alternative DT-1 but would require construction in the basement of several retail buildings. With either alternative, road and lane closures around the Seattle Center Station would cause increased congestion in the area, and could make access to Climate Pledge Arena and other Seattle Center venues and amenities more difficult. Project construction is not expected to notably affect attendance at larger events and performances, such as hockey games. However, there could be effects on event attendance and revenue for smaller events. With Preferred Alternative DT-1, the closure of 2nd Avenue North and August Wilson Way during construction could affect access for maintenance and event vehicles in this area. During construction, Sound Transit would coordinate with Seattle Center to minimize impacts to events on the campus and to permanent tenants. Impacts to freight mobility and access would be minimal and are described in Section 3.19.4.6, Freight and Mobility Access, in Chapter 3.

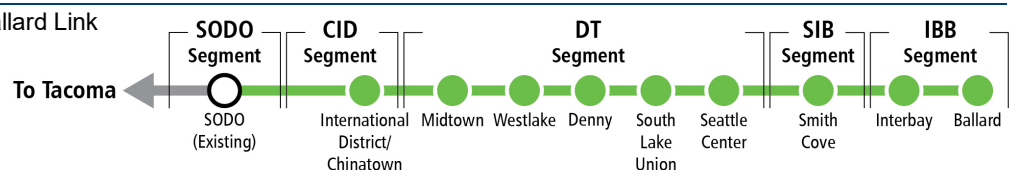
4.3.3.4.5 South Interbay Segment

Businesses in the South Interbay Segment that could be affected by construction activities are a mix of industrial, retail, and service businesses. Table 3-29 in Chapter 3 details road closures that could impact traffic, business access, and freight mobility within the South Interbay Segment. Alternative SIB-3 would require partial closures of 15th Avenue West and Elliott Avenue West (nights and weekends), and would have the least business disruption. Alternative SIB-2 would require closures on Elliott Avenue West, as well as partial closure of a portion of 15th Avenue West, and would have the greatest disruption to business access. Access to other businesses could be affected by increased congestion on roads where traffic is diverted or could potentially benefit businesses with increased exposure of travelers. Impacts to freight mobility and access are minimal and are described in Section 3.19.5.6, Freight and Mobility Access, in Chapter 3.

4.3.3.4.6 Interbay/Ballard Segment

Potential Impacts on Businesses and Freight

Businesses in the Interbay/Ballard Segment that could be affected by construction activities are primarily light industrial and service on 14th Avenue Northwest, while 15th Avenue West and 15th Avenue Northwest is more service and retail-oriented. Table 3-30 in Chapter 3 details road closures that could impact traffic, business access, and freight mobility within the Interbay/Ballard Segment. The construction of Preferred Alternative IBB-1a and Option IBB-1b



would occur in the vicinity the BNSF Railway lead tracks adjacent to the Ship Canal Trail as well as the Ballard Terminal Railroad. Rail operations could be sporadically affected during the construction period and impact the movement of cargo during this time (see Section 3.19.6.7, Freight and Mobility Access, in Chapter 3 for additional information). Preferred Alternative IBB-2a* and Preferred Option IBB-2b* would be the least disruptive to businesses during construction because most of the alternative would be underground. Alternative IBB-3 would be the most disruptive to businesses in Interbay, particularly in Fishermen's Terminal, and Ballard due to construction along or next to 15th Avenue West and 15th Avenue Northwest.

Thomas Boat Repair would experience temporary access restrictions during construction under Preferred Alternative IBB-1a and Option IBB-1b. The shop offers secure docks, parking, and moorage near its 5,000 square foot shop. Other onsite equipment includes a crane, lumber, and woodworking equipment. While shifting operations to a new site may be possible, the added cost of moving equipment and materials would impose substantial challenges.

Construction of all bridges would require short-term closure of the navigation channel and also closure of the area outside the navigation channel. As a result, vessels sailing to nearby businesses could experience temporary delays and interruptions to access. In addition, all bridges except the double-leaf bascule moveable bridge for Alternative IBB-3 would temporarily reduce portions of the planned vertical clearance over the waterway during construction because of the use of scaffolding or netting. Some of the boats that currently access maritime facilities in Lake Union such as marinas and dry docks would not be able to pass under the bridges while the scaffolding or netting is in place.

Impacts to Tribal Treaty-Protected Fishing

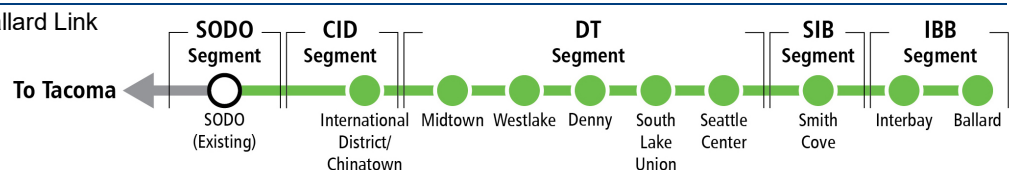
Tribal treaty-protected fishing rights and access to the Usual and Accustomed Areas of the Muckleshoot Indian Tribe may be affected by construction activities for bridges over this waterway if construction would occur during fishing seasons. Tribal treaty-protected access to the Usual and Accustomed Areas of the Suquamish Tribe may also be affected.

4.3.3.5 Indirect Impacts of the Build Alternatives

The Ballard Link Extension could have indirect economic impacts to the surrounding area. These indirect impacts could be positive or negative. Increasing economic activity in and around the industrial areas may place increased pressure on maritime users as they experience more traffic congestion and competition for scarce industrial sites located close to water access.

Benefits from the operation of the Ballard Link Extension would not be automatic; these benefits would require a strong demand for real estate, a location within a neighborhood with the appropriate zoning, increased infrastructure investment, and public policies that support TOD and transit system expansion. Moreover, property values might also be affected by external forces other than TOD, such as fluctuations in the economy, consumer confidence, and local development pressures. Property values might also take time to accrue because TOD would occur over a period of time. As described in Section 4.2.3, TOD benefits may not be uniformly realized at all station areas. The project would also bring high-capacity transit opportunities and connections to new transportation corridors and increase access to locations around the region, especially for those with mobility challenges.

The project may also have broader impacts on the industrial and, specifically, maritime industries. Water-dependent commerce is highly specialized and dependent on being close to suppliers. Direct displacement of these uses could have indirect economic effects as demand for supply-chain services could shift to other areas within or outside the region when these



specialized businesses are relocated. Therefore, some direct business displacements could indirectly affect multiple other businesses if their goods and services were no longer needed in the area due to their primary customers being displaced. Generally, businesses prefer to be close to their markets.

The nature of maritime business displacement in the Ballard Interbay Northend Manufacturing/Industrial Center may create ripple effects on other maritime-related businesses. Though it is not anticipated that the proposed bridge clearance restrictions would have a large effect on existing commercial activity, the business displacements on properties acquired for the project may be disruptive to several businesses and the broader maritime industry around Salmon Bay and along the Lake Washington Ship Canal.

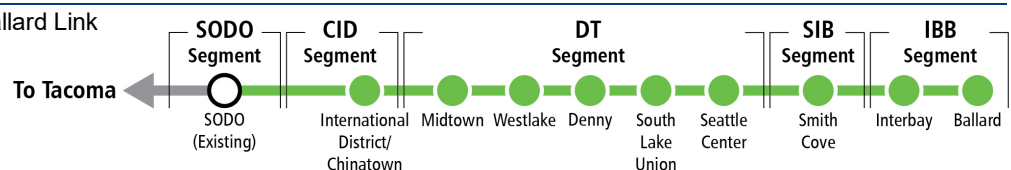
The Port of Seattle calculated that just over 7,000 fishing jobs were located in the area, mostly clustered at Fishermen's Terminal. Many of these jobs are not included in the official employment estimates used for this analysis and therefore are not reflected in estimated potential impacts. Similarly, many recreation jobs that rely on businesses that operate in this area may not be effectively captured using industry reporting.

Many of the maritime businesses in this area purchase goods and services from local suppliers (including other local maritime businesses), who would also lose revenue if their customers were displaced. Coastal Transportation Inc. would have a broader impact on both the local supply chain and for consumers in Alaska that are dependent on year-round service if displaced. Although important, the potential revenue loss for Alaskan businesses is not quantified in this analysis. Many of the jobs directly and indirectly affected in this sector would be in the boat building and repair industries, along with local manufacturers who support those operations. Businesses, such as Fishing Vessels Owners Marine Ways, support local jobs and ensure that the fishing fleet is able to operate. It is difficult to assess whether there is a disproportionate effect from any business being disrupted because it is not possible with the available information to assess if the disrupted firms provide unique services that are not otherwise produced in King County or the broader Seattle Metropolitan Statistical Area. It is also not known if any of the affected firms account for a disproportionate market share within that industry. Presumably, if any of the displaced firms are the sole producer or consumer of any commodities used in the region, that would result in a greater disruption than can be measured using industry averages.

Alternative IBB-3 would likely be the most disruptive to the maritime cluster within the Seattle Metropolitan Statistical Area. It would likely have broader impact to the fishing and recreation industry by displacement of Dock 3 and the Fishing Vessel Operators Marine Ways in Fishermen's Terminal. However, the broader effect may be smaller if boats are able to use other docks and find substitutable services.

4.3.3.6 Mitigation Measures

In most cases, with the relocation assistance for business displacements discussed in Section 4.3.1, Acquisitions, Displacements, and Relocations, long-term operation of the Ballard Link Extension is not expected to result in adverse effects that would require mitigation. Where feasible, Sound Transit would explore ways to maintain water-dependent business operations. Understanding that it might be challenging to relocate water-dependent uses due to their unique needs, Sound Transit would develop a plan with potential additional strategies that could be used to help support these unique needs for a successful relocation of these businesses. Potential strategies may include identifying federal, state, and local programs and leveraging Sound Transit relocation assistance with these programs and organizations.



Construction might cause adverse impacts on businesses due to reduced access or general construction activity. Mitigation measures presented in Chapter 3 and Section 4.3.1 and in Section 4.3.5, Visual and Aesthetics, and Section 4.3.7, Noise and Vibration, would minimize these impacts. Construction management plans would be developed to address the needs of businesses and could include, but are not limited to, the following measures:

- Provide a 24-hour construction telephone hotline for community members to report issues to Sound Transit community engagement staff, who work with the construction team to resolve issues and respond to the community member.
- Provide business cleaning services on a case-by-case basis.
- Provide detour, open for business, and other signage as appropriate.
- Establish effective communications with the public through measures such as meetings, construction updates, alerts, and schedules.
- Implement promotion and marketing measures to help affected business districts maintain their customer base, consistent with Sound Transit policies, during construction.
- Maintain access as much as possible to each business and coordinate with businesses during times of limited access.
- Provide an ombudsman consistent with Sound Transit policy. In the event that complaints arise about construction impacts that could not be resolved by community outreach staff or the relevant department director, the ombudsman policy provides a process for addressing those complaints in an impartial, fair, and timely manner that ensures effective stewardship of public resources and minimizes construction impacts.

If the project design were to affect Tribal treaty-protected fishing rights and access to the Usual and Accustomed Areas of the Muckleshoot Indian Tribe, Sound Transit and the Federal Transit Administration would coordinate with the Muckleshoot Indian Tribe to avoid, minimize, or mitigate for economic impacts from fishing disruption from permanent in-water guideway columns and construction. The same coordination would occur if the project design were to affect Tribal treaty-protected access to the Usual and Accustomed Areas of the Suquamish Tribe.



4.3.4 Social Resources, Community Facilities, and Neighborhoods

4.3.4.1 Affected Environment

The study area for social impacts, community facilities, and neighborhoods is the area within a 0.5-mile radius from the alternative alignment centerlines. Figures 4.3.4-1 through 4.3.4-5 identify the locations of social resources within the SODO, Chinatown-International District, Downtown, South Interbay, and Interbay/Ballard segments study areas, including parks, schools, civic centers, religious institutions, and social services; see Section 4.1.4, Social Resources, Community Facilities, and Neighborhoods, for the definition of social resources. Section 4.3.14, Public Services, Safety, and Security, describes public services within the study area, including schools, fire stations, police stations, and hospitals. Section 4.3.17, Parks and Recreational Resources, provides additional information about parks within the study area.

The Ballard Link Extension originates in the SODO area of Seattle, which is south of the Downtown business core and contains mostly industrial and commercial uses. The Ballard Link Extension travels through Downtown Seattle and ends in Ballard, a City-designated growth area (hub urban village). The Ballard Link Extension study area contains 10 Seattle neighborhoods: Beacon Hill, Industrial District, Downtown (which includes Chinatown-International District and First Hill), Central Area, Capitol Hill, Cascade, Queen Anne, Interbay, Magnolia, and Ballard. Beacon Hill, Central Area, and Capitol Hill are primarily on the east side of Interstate 5, a barrier to the project, so discussion of these neighborhoods is limited. The neighborhoods are described by segment and are shown on Figure 4.3.4-6.

4.3.4.1.1 Neighborhood Cohesion and Social Resources

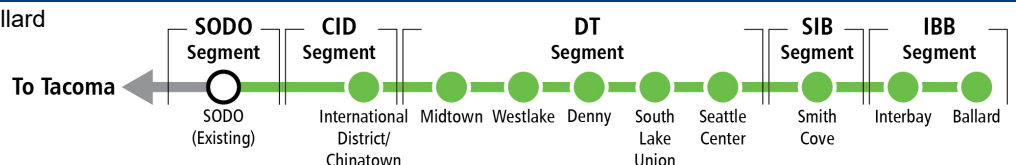
Neighborhood cohesion is qualitatively evaluated in terms of transportation network and services, linkages to community facilities and activity centers, patronage of businesses and cultural institutions, interaction of people (which considers locations where people interact and the likelihood of interaction at those locations), and neighborhood uniqueness. Based on the extent to which all or some of these factors are present in a neighborhood, Sound Transit categorized the neighborhood as having high, medium, or low cohesion.

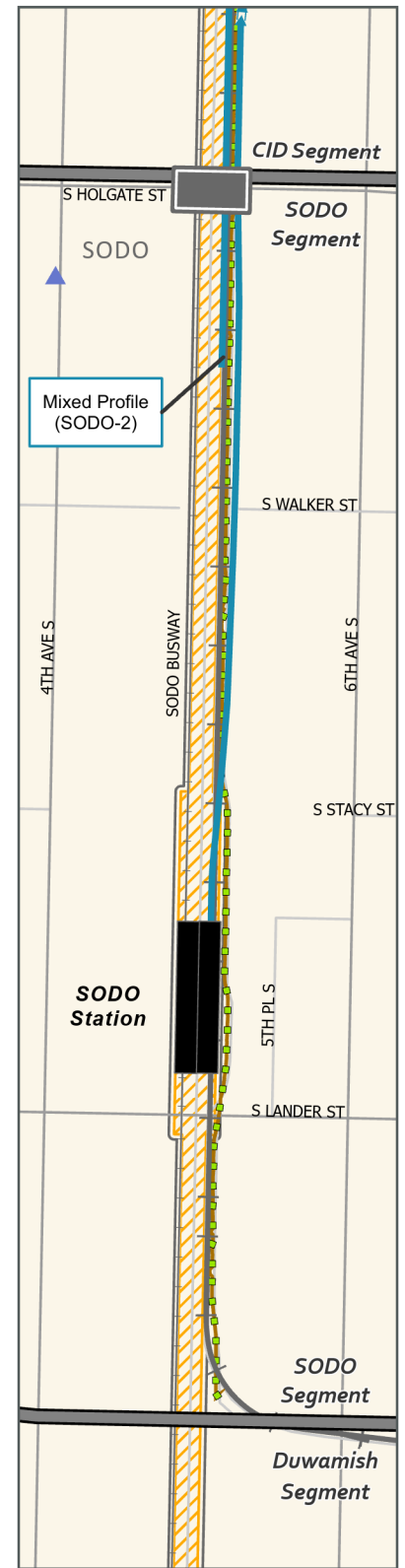
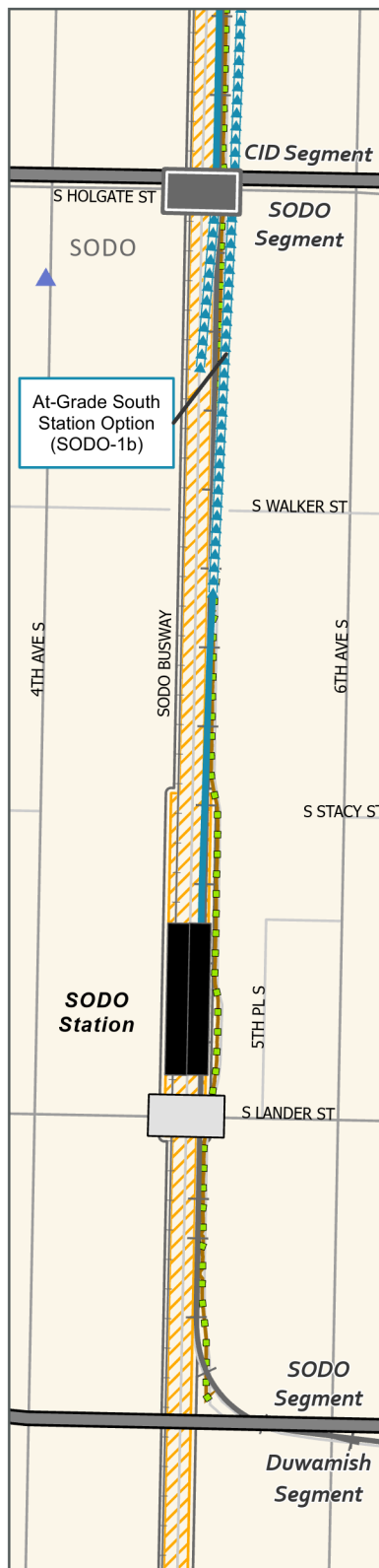
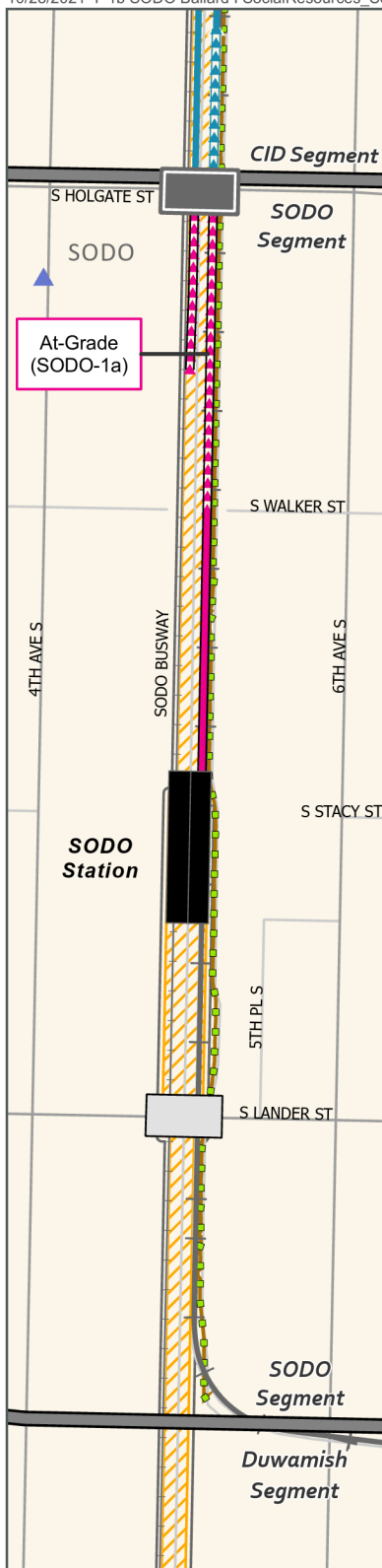
Neighborhood cohesion is defined as the extent to which residents have a sense of belonging to their neighborhood. The level of cohesion considers the interactions between the residents and the resources in that neighborhood.

SODO Segment

The primary neighborhood in the SODO Segment is the Industrial District, with a small area of the Beacon Hill neighborhood on the eastern edge.

The Industrial District is characterized by industrial uses, with a mixture of commercial, warehouse, and office space throughout. It contains one of Seattle's designated manufacturing industrial centers, the Duwamish Manufacturing/Industrial Center; the Port of Seattle; private marine terminals; BNSF Railway and Union Pacific Railroad rail yards; and the Sound Transit Operations and Maintenance Facility Central. This neighborhood also includes SODO, the area "south of Downtown," with a mixture of commercial uses, including the Starbucks company headquarters, warehouse stores, and businesses. The John Stanford Center for Educational Excellence, the Seattle Public School District's central office, is also in SODO.





Source: City of Seattle, King County (2019, 2020, 2021).

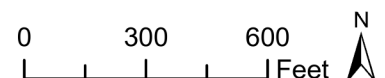
- Alternatives**
- Preferred Alternative
 - Preferred Alternative with Third-party Funding
 - Other Alternatives
- Alternative Profile**
- Elevated
 - At-Grade
 - Tunnel
 - Retained Cut
- Station**
- Existing
- Legend**
- Segment Line
 - Existing Link Light Rail
 - Railroad
 - SODO Busway
 - Existing Overpass
 - Proposed Overpass

▲ Social Service

Note: See Figure 4.2.4-1 for Social Resources in this segment that are outside the map extent.

FIGURE 4.3.4-1
Social Resources
Ballard Link Extension -
SODO Segment

West Seattle and
Ballard Link Extensions





Source: City of Seattle, King County (2019, 2020, 2021).

Alternatives

- Preferred Alternative
- Preferred Alternative with Third-party Funding
- Other Alternatives

Alternative Profile

- Elevated
- Tunnel
- At-Grade
- Retained Cut

Station

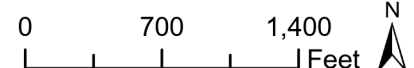
- New
- Existing

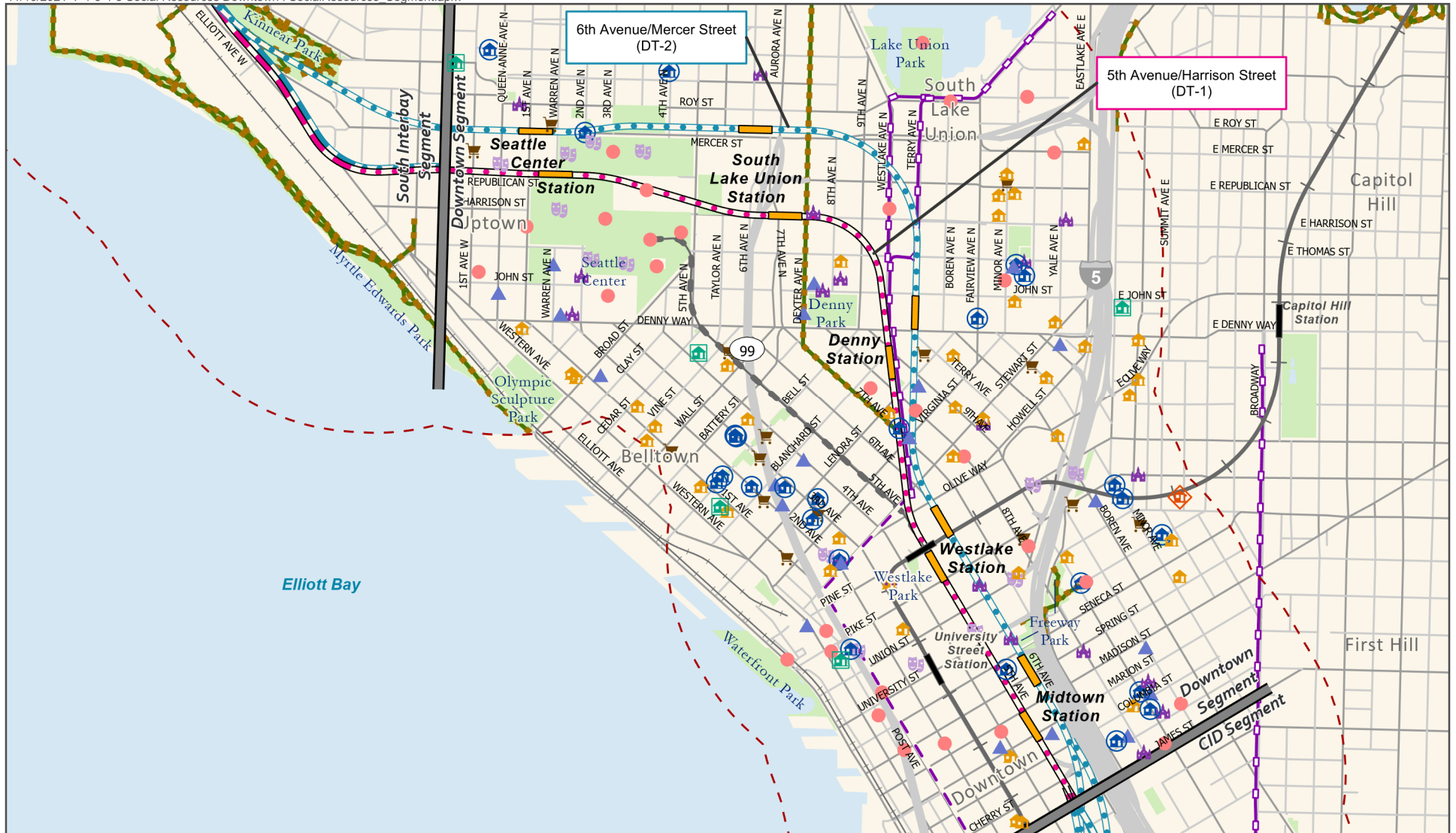
- Segment Line
- Existing Link Light Rail
- East Link Light Rail (Under Construction)
- Existing Streetcar
- Center City Connector Streetcar (Construction Paused)
- Railroad
- SODO Busway
- Proposed Overpass
- Trail
- Park
- Study Area

- ✕ Church / Religious Institution
- Community Facility
- 🛒 Grocery Store/Market
- 🏛️ Government Facility
- 🏠 Housing with Services
- 🏠 Income-restricted Housing
- 🏠 Seattle Housing Authority (SHA) Property
- 🏠 Social Service
- 🎭 Theater/Performance Venue

Note: * indicates resource not visible on Figure 4.3.4-3

FIGURE 4.3.4-2
Social Resources
 Ballard Link Extension -
 Chinatown-International
 District Segment
*West Seattle and
 Ballard Link Extensions*





Source: City of Seattle, King County (2019, 2020, 2021).

Alternatives

- Preferred Alternative
- Preferred Alternative with Third-party Funding
- Other Alternatives

Alternative Profile

- Elevated
- Tunnel
- At-Grade
- Retained Cut

Station

- New
- Existing

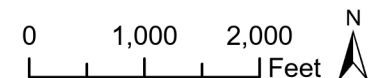
- Segment Line
- Existing Link Light Rail
- Monorail
- Existing Streetcar
- Center City Connector Streetcar (Construction Paused)
- Railroad
- Trail
- Park
- Study Area

- ⛪ Church / Religious Institution
- Community Facility
- 🛒 Grocery Store/Market
- 🏠 Housing with Services
- 🏠 Income-restricted Housing
- 🏠 Mandatory Housing Affordability (MHA) Property
- 🏠 Seattle Housing Authority (SHA) Property
- 🏠 Social Service
- 🎭 Theater/Performance Venue

Note: See Figures 4.3.4-2 and 4.3.4-4 for Social Resources in this segment that are outside the map extent.

FIGURE 4.3.4-3
Social Resources
Ballard Link Extension -
Downtown Segment

*West Seattle and
Ballard Link Extensions*





Source: City of Seattle, King County (2019, 2020, 2021).

Alternatives

- Preferred Alternative
- Preferred Alternative with Third-party Funding
- Other Alternatives

Alternative Profile

- Elevated
- At-Grade
- Tunnel
- Retained Cut

Station

- New

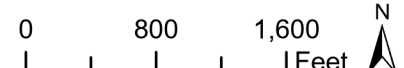
- Segment Line
- Railroad
- Trail
- Park
- Study Area

- Cemetery
- ✠ Church / Religious Institution
- Community Facility
- 🛒 Grocery Store/Market
- 🏠 Housing with Services
- 🏠 Mandatory Housing Affordability (MHA) Property
- 🏠 Seattle Housing Authority (SHA) Property
- ▲ Social Service

Note: * indicates resource not visible on Figure 4.3.4-3

FIGURE 4.3.4-4
Social Resources
Ballard Link Extension -
South Interbay Segment

West Seattle and
Ballard Link Extensions





Source: City of Seattle, King County (2019, 2020, 2021).

Alternatives

- Preferred Alternative
- Preferred Alternative with Third-party Funding
- - - Other Alternatives

Alternative Profile

- Elevated
- At-Grade
- Tunnel
- Retained Cut

Station

- New

Segment Line

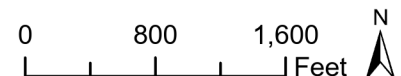
- Railroad
- Stream
- - - Trail
- Park
- - - Study Area

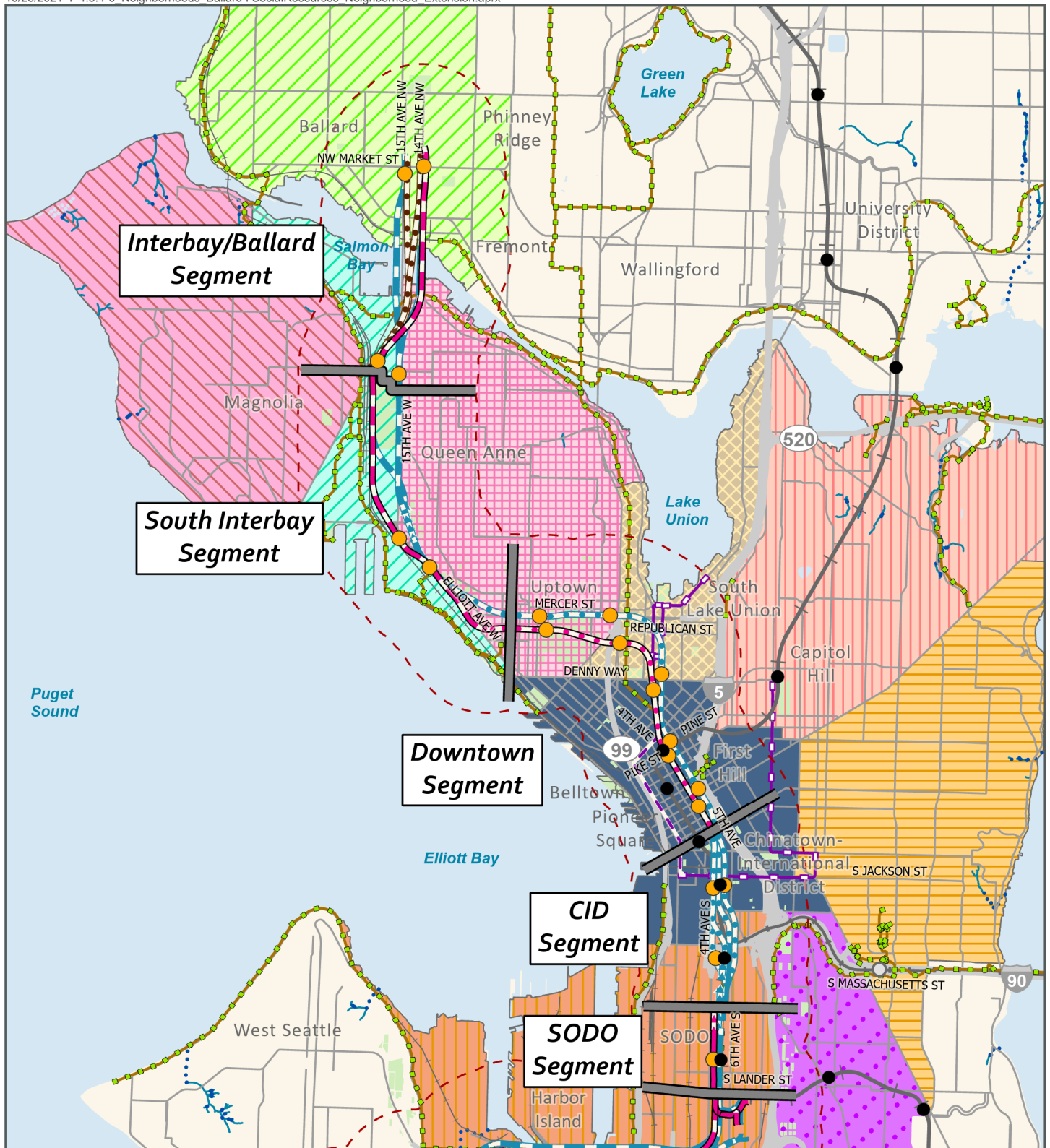
- ⛪ Church / Religious Institution
- Community Facility
- 🛒 Grocery Store/Market
- 🏠 Housing with Services
- 🏠 Income-restricted Housing
- 🏠 Seattle Housing Authority (SHA) Property
- ▲ Social Service

Note: Five Social Resources in this segment are north of the map extent.

FIGURE 4.3.4-5
Social Resources
Ballard Link Extension -
Interbay/Ballard Segment

West Seattle and
Ballard Link Extensions





Source: City of Seattle, King County (2019, 2020, 2021).

Alternatives

- Preferred Alternative
- Preferred Alternative with Third-party Funding
- Other Alternatives

Alternative Profile

- Elevated
- At-Grade
- Tunnel
- Retained Cut

Station

- New
- Existing

- Segment Line
- Existing Link Light Rail
- East Link Light Rail (Under Construction)
- Existing Streetcar
- Center City Connector Streetcar (Construction Paused)
- Railroad
- Stream
- Piped Stream
- Trail
- Park

- Study Area
- Ballard
- Beacon Hill
- Capitol Hill
- Cascade
- Central Area
- Downtown
- Interbay
- Magnolia
- Industrial District
- Queen Anne

FIGURE 4.3.4-6
Neighborhoods
Ballard Link Extension
West Seattle and
Ballard Link Extensions



4.3.4 Social Resources, Community Facilities, and Neighborhoods

The Industrial District neighborhood primarily includes business and industry with very little residential community, except for some low-income housing. As a result, there are very few social resources present; there is one social service, a food bank, near the alignment, and two grocery stores farther from the alignment. Services in the area include restaurants, supply stores, a daycare, and a few community facilities that support the employees in the business and industry community. Although there are few residents in this industrial neighborhood, cohesion between businesses, services, and employees is high.

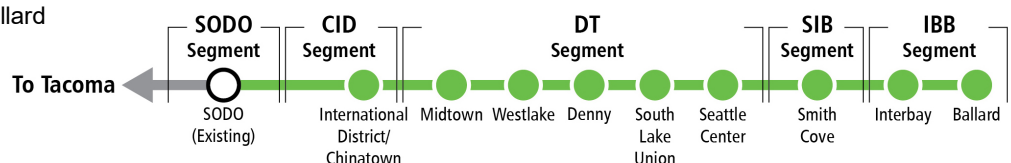
Chinatown-International District Segment

The Chinatown-International District Segment includes parts of the Industrial District and Downtown neighborhoods, with small areas of the Central Area and Beacon Hill neighborhoods. The Industrial District and Beacon Hill neighborhoods are described in the SODO Segment. The few blocks of the Central Area in the study area are similar to the Downtown neighborhood, so this portion of the Central Area is not discussed separately. The Chinatown-International District Segment also includes T-Mobile Park and Lumen Field, which are home to professional sports teams but also host large events throughout the year.

The Chinatown-International District is a hub for the Asian-American community in Seattle. Many people of Asian descent live and work in this neighborhood. It contains a variety of uses including mixed-use, residential, commercial, office, and parks. This area has many restaurants serving Asian cuisine and has several Asian markets, including the large Uwajimaya supermarket. The district has historic and cultural attractions, such as the Chinatown Gate, the Wing Luke Museum of the Asian Pacific American Experience, and the Panama Hotel, which was designed by one of the first Japanese-American architects in Seattle and stands in testimony to the period of Japanese internment during World War II. The district is home to Hing Hay and Donnie Chin parks, the International District/Chinatown Community Center, and community festivals. As described in Section 4.3.4.1.2, Demographics, a high percentage of the population in the Chinatown-International District Segment is low-income. Many social services that support communities of color and/or low-income populations and cater to the Asian-American community are in this district. Other social resources in this segment include senior and low-income housing, a child support office, a community center, and the Goodwill Seattle Outlet.

The Chinatown-International District Segment has several arterials that provide important routes to Downtown Seattle. 1st Avenue South and 4th Avenue South connect Downtown with State Route 99, South Royal Brougham Way, the West Seattle Bridge, and Interstate 90. The roadway network in this area provides access to Union Station, King Street Station, Lumen Field, T-Mobile Park, and other businesses in the Chinatown-International District and Pioneer Square neighborhoods. South Jackson Street is a major connection between the waterfront, Pioneer Square, and residential neighborhoods to the east. South Dearborn Street provides access to 4th Avenue South, Interstate 5, and Rainier Avenue South. The Chinatown-International District is served by transit including light rail, Seattle Streetcar, and numerous bus routes.

The Seattle Chinatown Historic District is listed in the National Register of Historic Places and as a Seattle Landmark, and is historically and culturally important to the Asian community and the city of Seattle. The Chinatown-International District has high neighborhood cohesion.



Downtown Segment

The Downtown Segment contains much of the Downtown and Cascade (also known as South Lake Union) neighborhoods, as well as small areas of the Capitol Hill and Queen Anne neighborhoods.

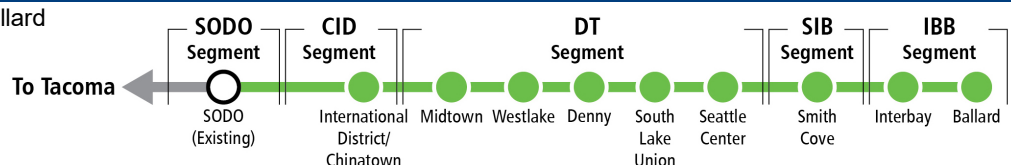
The Downtown neighborhood is the most densely developed area in Seattle and is defined by high-rise office buildings and commercial uses within its business core. It also includes vibrant shopping areas, historic districts, sports stadiums, museums (including the Seattle Art Museum and the Museum of History and Industry), and theaters and performance halls (including Benaroya Hall and the 5th Avenue Theatre), as well as access to public services and social services. The Downtown Segment contains the highest concentration of social resources of all the segments. It contains Seattle's retail core, including Westlake Center, and dense, multi-family residential uses, which are increasing as new apartment and condominium buildings are constructed. In addition to the business office and retail core, the Downtown neighborhood includes four distinct areas: Pioneer Square, Chinatown-International District (described in the preceding paragraphs), First Hill, and Belltown. In general, community amenities such as grocery, pharmacy, and clothing stores are within walking distance to residences. The Downtown Segment also contains libraries and schools. The Seattle Public Library-Central Library is located within this segment and is an important architectural feature. It is also a social resource, used as a space to meet, study, work, or read with public restrooms and computers with internet access available. Strong transportation network and opportunities for people to interact are found throughout the neighborhood and contribute to high neighborhood cohesion.

Pioneer Square is a historic district listed in the National Register of Historic Places and as a Seattle Landmark. This area of the Downtown neighborhood is predominantly mixed-use, with retail and restaurants on the ground floor of buildings. First Hill is separated from the project by Interstate 5, but its western edge is close to the new Midtown Station locations and Freeway Park provides a connection over Interstate 5. First Hill contains a concentration of Seattle's hospitals and medical facilities. It has a mix of residential, commercial, office, and public service uses and a large senior residential population. The small area of Capitol Hill in this segment is on the east side of Interstate 5 and is mixed-use, with businesses and apartment buildings.

Belltown consists mainly of residential, commercial, office, and mixed-use buildings. Most of this area of the Downtown neighborhood is within the study area, and the buildings are a mix of old warehouse buildings and more modern mid- and high-rise residential buildings with ground-floor retail uses, such as restaurants and boutiques.

The Cascade (South Lake Union) neighborhood is home to Amazon headquarters as well as several other technology companies and biomedical research facilities. It has also evolved into a mixed-use and multi-family residential neighborhood. In addition to amenities that support workers, such as restaurants, bars, and drugstores, this neighborhood contains Lake Union Park and the Museum of History and Industry. Mobility and the availability of social resources in this neighborhood (as shown on Figure 4.3.4-3) contribute to its high neighborhood cohesion.

To the north of the Downtown neighborhood, the Uptown neighborhood is mostly multi-family residential uses, commercial uses, small to mid-sized office buildings, and various cultural institutions, particularly at Seattle Center. Seattle Center is designated as an Arts and Cultural District by the City of Seattle. Seattle Center is a publicly owned recreational area, arts hub, and tourist destination, attracting over 12 million annual visitors. The 74-acre site was originally built for the 1962 World's Fair and has museums, restaurants, performance venues, public play and gathering places, and the Space Needle. It is home to roughly 30 arts and cultural organizations and hosts thousands of events annually, including several of Seattle's largest signature



4.3.4 Social Resources, Community Facilities, and Neighborhoods

community events and festivals. It also includes Climate Pledge Arena, which is home to professional sports teams and also hosts large events, including other sporting events and concerts, throughout the year. Seattle Center also functions as an emergency shelter when needed. The Bill and Melinda Gates Foundation, which has a visitors center and hosts community events, is also nearby. The Queen Anne neighborhood contains social resources such as daycare, schools, and social services, as well as opportunities for people to interact. This neighborhood has high neighborhood cohesion.

South Interbay Segment

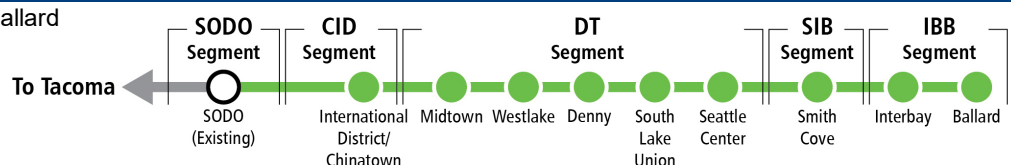
The South Interbay Segment contains parts of the Queen Anne, Interbay, and Magnolia neighborhoods. The area of Queen Anne in this segment is mostly residential and contains Kinneer Park and the Southwest Queen Anne Greenbelt along the western edge of the neighborhood. Both the park and greenbelt contain recreational trails. The small part of the eastern Magnolia neighborhood in this segment is predominantly single-family residential, but there are a few commercial uses adjacent to West Dravus Street and Thorndyke Avenue West.

Interbay is a mostly industrial neighborhood with some commercial and residential areas and is part of the City-designated Ballard Interbay Northend Manufacturing/Industrial Center. It includes a BNSF Railway railroad corridor and rail yard on the west side of 15th Avenue West. It also contains the Washington National Guard Armory property and one Port of Seattle terminal. Recreational facilities include Interbay Golf Center, Interbay Athletic Complex, and the Interbay P-Patch Community Garden. Residential uses, mostly apartments, can be found on both sides of 15th Avenue West, where there is access to transit. The segment also contains regional trails that connect users to other parts of the city. There are a Whole Foods and a QFC grocery store, a daycare facility, and a few restaurants in the neighborhood; however, overall there are few social resources in the neighborhood. Residents living in the Interbay neighborhood must travel to an adjacent neighborhood to access more social resources, community facilities, and social services. This neighborhood has low neighborhood cohesion.

Interbay/Ballard Segment

The Interbay/Ballard Segment primarily includes the Ballard neighborhood, but also small areas of the Interbay, Magnolia, and Queen Anne neighborhoods. Interbay, Magnolia, and Queen Anne are described in the South Interbay Segment section. Salmon Bay is located in this segment, and most uses surrounding the bay are water-based industrial uses, including Fishermen's Terminal. The neighborhoods surrounding the bay support a strong commercial fishing community. Salmon Bay also supports recreational and Tribal treaty-protected fishing, and Fishermen's Terminal is also a social attraction.

The Ballard neighborhood is part of the Ballard Interbay Northend Manufacturing/Industrial Center and is a City-designated hub urban village. Ballard is a vibrant neighborhood with annual events and festivals, such as the Seafood Fest on Northwest Market Street each summer. It contains residential, commercial, and marine-dependent uses. This segment contains Ballard Avenue Historic District or "Old Ballard," located west of the Ballard Bridge and south of Northwest Market Street. Old Ballard is a social attraction and includes a concentration of shops and restaurants and is home to a weekly farmer's market. Industrial uses are concentrated closer to Salmon Bay. Multi-family and single-family residential uses dominate the area north of Northwest Market Street. The area east of the Ballard Bridge is similar in composition, with residential uses to the north of Northwest Market Street and commercial and industrial uses to the south along the water and 14th Avenue Northwest.



The neighborhood contains parks and opportunities for people to interact. This neighborhood has high neighborhood cohesion.

4.3.4.1.2 Demographics

Table 4.3.4-1 provides demographic information for the Ballard Link Extension study area. The estimates shown in the table are based on a geographical information system analysis of the 2014 to 2018 American Community Survey data for the census block groups that intersect with the segment boundaries (United States Census Bureau 2020). The segment demographic information is presented alongside the Ballard Link Extension study area (all segments together) and city of Seattle and Sound Transit Service District demographic information for context. See more detailed demographic information and mapping in Appendix G, Environmental Justice. The term “minority” is used in Appendix G for consistency with the Environmental Justice Executive Order 12898. This section uses the term “communities of color” and “people of color.”

As shown in Table 4.3.4-1, the Chinatown-International District Segment population has the highest percentages of people of color, low-income people, and over-65-aged populations and of households with no vehicles; these percentages are much higher than the city average. The population in this segment also has the lowest median household income, at about half the median household income of Seattle as a whole. The Downtown Segment is the most populous segment and has percentages of people of color, percentages of low-income people, and a median household income similar to Seattle overall. The percentage of households with no vehicle in the Downtown Segment (38 percent) is double the percentage in Seattle overall (17 percent) but is less than the percentage of Chinatown-International District households that have no vehicle (49 percent).

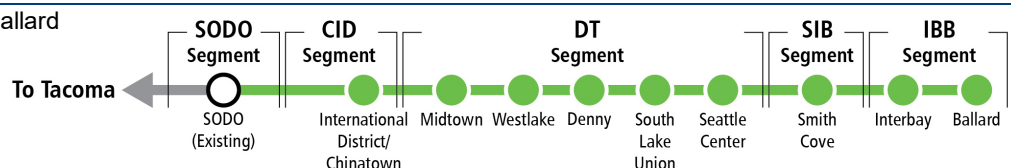
4.3.4.1.3 Transportation Linkages

The Chinatown-International District serves as a transportation hub with light rail, commuter rail, streetcar, and bus (local, regional, and Greyhound) access at or near the existing International District/Chinatown Station. The Downtown Segment contains the highest concentration of transit service within Seattle, served by Metro, Sound Transit, Community Transit, the Seattle Streetcar, and others.

Sound Transit operates buses and light rail within the study area, and Metro runs the RapidRide D Line and many other local bus routes that serve most areas of Seattle. In addition to the transit and roadway network for vehicles, there is a network of pedestrian and bicycle facilities throughout the study area (see Chapter 3 for information about the roads and trails in the study area). Railroad lines provide an alternative to roads for moving people and goods within the study area; heavy rail (BNSF) and commuter and passenger rail (Sound Transit and Amtrak) operate in Downtown Seattle.

4.3.4.1.4 Social Equity

The City of Seattle’s 2016 equity analysis found that there is a high displacement risk in the Chinatown-International District, a medium-high displacement risk in Downtown Seattle and the southern part of the Queen Anne neighborhood, and low displacement risk in Interbay and Ballard. The Chinatown-International District and Downtown Seattle have high access to opportunity, Queen Anne and Ballard have medium-high access to opportunity, and Interbay has low-medium access to opportunity (City of Seattle 2016). This analysis did not consider future light rail in the project corridor, which would increase access to opportunity and could increase displacement risk near stations. Access to light rail is one of 15 factors for displacement risk and 1 of 13 factors for access opportunity.



4.3.4 Social Resources, Community Facilities, and Neighborhoods

Table 4.3.4-1. Ballard Link Extension Study Area Demographics

Geographic Area	Total Population	People of Color	Low-Income Households ^a	Limited-English-Proficiency Households ^b	Under 18 Population	Over 65 Population	Households with No Vehicle	Median Household Income
Seattle	708,823	36%	24%	4%	15%	12%	17%	\$85,562
Sound Transit Service District ^c	3.2 million	39%	24%	5%	21%	13%	9%	\$88,018
Ballard Link Extension Study Area	132,674	34%	22%	2%	8%	11%	30%	\$88,819
SODO Segment	1,788	47%	24%	8%	18%	11%	12%	\$102,330
Chinatown-International District Segment	12,680	59%	59%	12%	5%	14%	49%	\$41,160
Downtown Segment	66,890	39%	20%	1%	4%	11%	38%	\$91,483
South Interbay Segment	20,934	24%	14%	2%	14%	13%	16%	\$91,884
Interbay/Ballard Segment	32,170	23%	18%	1%	12%	8%	11%	\$97,584

Source: 2018 American Community Survey 5-Year Estimates (United States Census Bureau 2020).

Note: Numbers rounded to nearest percentage point.

^a Sound Transit's low-income threshold is defined as two times the federal Health and Human Services Service poverty level.

^b Speaks English "less than very well."

^c The Sound Transit Service District includes portions of King, Pierce, and Snohomish counties.



4.3.4.1.5 Income-restricted and Supportive Housing

Seattle has many organizations that provide income-restricted, transitional, or supportive housing, and some have housing in the study area. There are 40 Seattle Housing Authority properties within the study area as well as many other income-restricted properties provided by other organizations, such as Catholic Housing Services, Compass Housing Alliance, Bellwether Housing, Plymouth Housing, Y.W.C.A., Low Income Housing Institute, Interlm CDA, and others. The City of Seattle also has M.H.A. zoning in some neighborhoods in the project study area, which requires developers to either build affordable housing or contribute to an affordable housing fund. Some multi-family residential buildings in the study area have income-restricted units through Seattle's Incentive Zoning program. Some multi-family residential buildings in the study area also currently have rent- or income-restricted units through Seattle's Multifamily Tax Exemption (M.F.T.E.) program, although buildings currently in the program will no longer qualify by the time the project opens in 2037. Additional properties in the study area could be built in the future under this program.

Incentive Zoning

Incentive Zoning is a voluntary program in some Seattle land use zones that allows developers to achieve additional development capacity by contributing to or providing affordable housing units or other public amenities. Affordable housing units in this program remain restricted for a minimum of 50 years.

Multifamily Tax Exemption Program

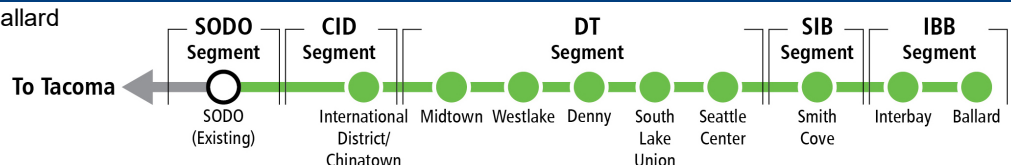
The Multifamily Tax Exemption program, or M.F.T.E., is an incentive to create affordable housing in Seattle. Buildings participating in the MFTE program receive a property tax exemption for up to 12 years in exchange for lowering rents for tenants meeting income requirements. The MFTE program requires 20% or 25% of the apartments in a participating building to be affordable. Program rents are typically hundreds of dollars less per month than market rate.

Sound Transit reviewed the properties of these listed providers and found many Seattle Housing Authority, income-restricted, M.H.A., and supportive housing with services locations throughout the Ballard Link Extension study area, with most concentrated in the Downtown Segment.

There are also several housing projects with services in the study area that are intended to be temporary:

- The Chief Seattle Club operates Eagle Village, a pilot modular housing shelter for formerly homeless Native Americans, on a Metro property at 6th Avenue South north of South Massachusetts Street.
- Catholic Community Services operates Elliott Junction on a King County property along the west side of Elliott Avenue West.
- King County Public Health operates the SODO Assessment Center/Recovery Center on 6th Avenue South, north of South Royal Brougham Way.
- The Low Income Housing Institute has a tiny house village, Interbay Village, north of the Magnolia Bridge on the east side of 15th Avenue West.

Figures 4.3.4-1 through 4.3.4-4 show these housing resources described above except for buildings in the M.F.T.E program that would no longer have income restrictions when the project begins operating.



4.3.4.2 Environmental Impacts of the No Build Alternative

The No Build Alternative would avoid the property acquisitions and other built environment impacts associated with building and operating light rail in an urban area. Those who reside in or travel to and from neighborhoods within the study area would not be provided with the reliability of light rail or increased transit accessibility. The neighborhoods and communities in the study area would develop according to adopted plans, dependent upon economic conditions, which could change the character of neighborhoods or neighborhood cohesion.

4.3.4.3 Environmental Impacts of the Build Alternatives during Operation

The analysis of potential impacts of the Ballard Link Extension on neighborhoods considers changes in neighborhood quality, barriers to social interaction, impacts on social resources, and impacts on public services, safety, and security. Much of the impacts evaluation in this section is based on analyses conducted for other sections of the Draft Environmental Impact Statement, including Chapter 3; Section 4.3.1, Acquisitions, Displacements, and Relocations; Section 4.3.5, Visual and Aesthetic Resources; Section 4.3.7, Noise and Vibration; and Section 4.3.17. Impacts on other resources do not automatically constitute a social impact or impact on neighborhood cohesion. Instead, these impacts are evaluated collectively, with potential mitigation measures taken into account, for their effects on social resources and neighborhoods. Appendix G, Environmental Justice, addresses potential impacts and benefits to people of color and low-income people.

4.3.4.3.1 Impacts Common to All Alternatives

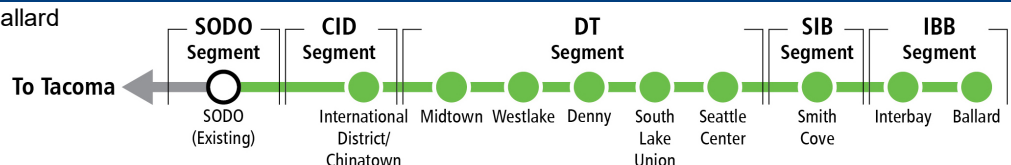
Introducing a new light rail facility within a densely populated urban area could result in benefits and impacts that would be common to all Build Alternatives.

Benefits

Neighborhoods served by light rail stations would benefit from increased transit access to Downtown Seattle and other areas in the Puget Sound region accessible by light rail. Light rail service would be a fast, frequent, and reliable alternative to car travel and local bus service for many people in the travel corridor. Light rail access benefits include easier access to employment opportunities; educational facilities; cultural facilities and activities; medical, social and public service providers; sporting events and recreational activities; and other regional transportation terminals and hubs. Neighborhoods near sporting and cultural event venues could also benefit because of increased transit ridership by event attendees and attendees being able to leave the area more efficiently. The project would provide increased access to locations around the city for pedestrians, bicyclists, and those with mobility challenges. The station areas would include bus bays on adjacent streets, which would facilitate transfers between buses and light rail for people who live outside of the station's walkshed. Neighborhoods close to light rail stations could experience increased social activity due to

Equitable Transit-Oriented Development

The City of Seattle has received a grant from FTA to support equitable transit-oriented development along the WSBL Project corridor. The priorities of this grant-funded program are to advance racial equity and community agency in access, public realm, and TOD investments throughout the WSBL corridor, and improve City of Seattle accountability and transparency regarding racial equity.



improved access, residential and business redevelopment, or TOD projects. Local businesses could experience greater patronage and provide an increased employment base.

The project generally would have health benefits. The alternatives would increase the opportunity for physical activity by encouraging walking and biking to the stations through incentives such as limited parking around the stations, bicycle lockers at the stations, and bicycle racks on the trains. The project would also increase access to city parks and recreation destinations and new connections to bus transit routes at the light rail stations. The project would improve air quality by reducing vehicle miles traveled in the study area. Maintaining good health also depends on access to health services. The project would provide more frequent and reliable transit service throughout the study area and the region, which means that people would have better access to services that promote good health, such as healthcare providers, grocery stores, and gathering spaces.

Property Acquisitions and Land Use Changes/Neighborhood Cohesion

The project would result in property acquisitions. Some of these acquisitions would displace existing uses, while others would allow the existing use to continue. The project could also displace housing where tenants use Housing Choice vouchers; however, because vouchers are assigned to individuals rather than properties, the specific location of these units is not identified. Displacement of homes and businesses could change the neighborhood cohesion. The Build Alternatives would not displace any existing or currently planned affordable M.H.A. housing units.

Housing Choice Vouchers

The Seattle Housing Authority helps low-income families, individuals, seniors, and people with disabilities to pay their monthly rent in eligible privately owned apartments or houses within the city through its Housing Choice Voucher program. Qualifying households typically earn 50 percent or less of the area median household income.

The street-level entrances to stations would be designed to fit in with the surrounding neighborhoods and would be designed with community input. Sound Transit would coordinate with the City of Seattle on design in station areas.

Section 4.3.1 discusses expected property acquisitions for each alternative and the relocation process. Appendix L4.1, Acquisitions, Displacements, and Relocations, shows potentially affected parcels. Section 4.3.2, Land Use, discusses the project's potential impacts on neighborhood land uses, and potential redevelopment and TOD opportunities.

Visual Impacts

Elevated guideways could result in visual impacts, including light from the trains and shading and visual intrusion from elevated guideways, to varying degrees on adjacent and nearby viewers. The height of the guideway and size of the light rail station and facilities would be factors in how visually intrusive the project would be within neighborhoods. Adding a visually intrusive element would change the visual character of the neighborhood, which could result in changes to the way neighbors perceive their surroundings and affect their everyday experience. The project would remove trees and vegetation as necessary, which would make a visible change. Where possible and consistent with light rail operation and maintenance needs, the removed trees and vegetation would be replaced. Section 4.3.5 discusses potential visual impacts and mitigation.



Transportation and Parking

The project would have localized impacts on property access and circulation associated with the placement of the light rail facility adjacent to or within existing roads. Affected property access points would be redesigned or relocated to maintain use of the property. Impacts to traffic circulation could include turn movement limitations, modified routing, new traffic signal movements, and new signalization at previously unsignalized intersections. Neighborhoods with stations could be affected by light rail riders using street parking in their neighborhoods. See Chapter 3 for discussion of this potential impact and mitigation measures.

With the West Seattle and Ballard Link Extensions M.O.S. or the Ballard Link Extension-only M.O.S., the bus network in the Ballard Link Extension area would be a hybrid between existing service and what is planned for the Build Alternatives. In the Ballard Link Extension-only M.O.S., the terminus station would be Smith Cove and would accommodate many bus routes from Magnolia, Queen Anne, and parts of North Seattle. This would allow access to light rail, but would create a transfer for residents from these neighborhoods that currently do not have to transfer when they take the bus to and from Downtown Seattle.

Noise and Vibration

In general, operation of the new light rail facility would create a new source of noise and vibration in the community. Noise and vibration impacts would vary by segment with each alternative and are also dependent on the types of noise receivers adjacent to the project. Sound Transit would mitigate noise and vibration to levels below FTA impact criteria, as discussed in Section 4.3.7.

Safety and Security

Typically, crime around stations mirrors what is occurring in the neighborhood in which they are located (Moudon et al. 2018, Billings et al. 2011, City of Seattle 1999). WSBLE is not anticipated to have safety and security impacts. See Section 4.3.14 for additional information.

4.3.4.3.2 SODO Segment

In general, social resource and community impacts would be minor in the SODO Segment because it contains very few social resources; no social resources would be impacted by the project in this segment. There would be no impacts to neighborhood cohesion. The alternatives would not create barriers, hinder access to social resources, or notably change traffic patterns in a way that would make neighborhood access difficult. See Section 4.2.4.3.2, SODO Segment, for a discussion of converting the SODO Busway from bus to light rail use.

All alternatives add an overpass at South Holgate Street, which would benefit traffic circulation and connectivity.

4.3.4.3.3 Chinatown-International District Segment

Long-term neighborhood impacts would occur in the Chinatown-International District Segment due to property acquisitions for the station entrances. Long-term neighborhood benefits include increased access to light rail serving different parts of the city and the region. Because the number of acquisitions would be relatively small and would not include major social resources, community facilities, and the project would be underground except for station entrances and on the edge of the neighborhood along existing transportation and transit facilities, the project would not directly impact neighborhood cohesion.



4.3.4 Social Resources, Community Facilities, and Neighborhoods

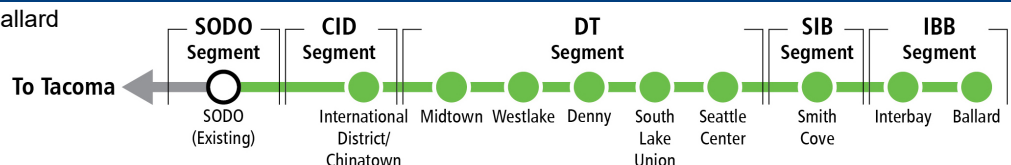
Alternative CID-1a* and Option CID-1b* would not displace buildings within the heart of the Chinatown-International District neighborhood. These alternatives would place the new station entrances along the existing 4th Avenue South transit corridor and a block farther away from the heart of the community. All the alternatives except Alternative CID-1a* would displace the Goodwill Seattle Outlet. Alternative CID-2a and Option CID-2b would have the most business displacements. The light rail stations for the alternatives and option along 5th Avenue South would be more integrated into the Chinatown-International District. These alternatives would displace some buildings and businesses at the edge of the neighborhood for station entrances. There would be 13 business displacements at the edge of the neighborhood east of 5th Avenue South for both Alternative CID-2a and Option CID-2b. These displacements may include businesses important to the community because of the history, strong cohesion, and long-standing community connections in the neighborhood. It is anticipated that residents of the Chief Seattle Club Eagle Village pilot modular housing shelter will have moved to their permanent facility prior to construction of the project, but if not, the village would be displaced and residents would be relocated with Alternatives CID-1a and CID-2a, and Option CID-2b.

All alternatives would require passengers to go up to street level and then go down to the existing station platform for some transfers from the Ballard Link Extension to the existing Link Light Rail line (refer to Section 2.1.2.2.2, Chinatown-International District Segment, in Chapter 2 for additional information). With Alternative CID-1a* and Option CID-1b* that have station entrances along 4th Avenue South, passengers would either walk along the sidewalk and cross 4th Avenue South to transfer or transfer at the transit plaza on the edge of the neighborhood where people currently enter and exit the existing station. With Alternative CID-2a and Option CID-2b that have entrances along 5th Avenue South, passengers would either cross 5th Avenue South to transfer or transfer at the existing transit plaza. Passenger transfer at the surface could have a benefit of increased patronage of local businesses and other facilities in the area, particularly with Alternative CID-2a and Option CID-2b because of the proximity of the entrances within the neighborhood.

All alternatives would be consistent with the industrial and transportation uses found in the south part of the segment where the alternatives would be at-grade before transitioning to a tunnel. In the north part of the segment, near the existing International District/Chinatown Station, the alternatives would be visually similar to existing conditions, with new station entrances along 4th Avenue South or 5th Avenue South, depending on the alternative. The stations would be designed to integrate into the community in coordination with the City of Seattle, and Sound Transit would include the community in the station design process. Sound Transit is currently partnering with the community and other agencies on a community-based planning effort for the area to evaluate strategies to maintain and enhance community cohesion as well as strengthen connections between the Chinatown-International District, Pioneer Square, and the existing transit hub. These efforts are in early phases and will continue during the Final Environmental Impact Statement and final design phases, guided by the community and informed by the actions of the Sound Transit Board to identify the light rail project to be built.

4.3.4.3.4 Downtown Segment

Both alternatives in the Downtown Segment are tunnel alternatives, so potential impacts to social resources or neighborhoods would be limited to areas around station entrances. Preferred Alternative DT-1 would have the fewest residential and business displacements. The station entrances in this highly developed area would not result in visual impacts or noise impacts. There would be no impacts to neighborhood cohesion. The part of Freeway Park that would be impacted by Alternative DT-2 does not provide a connection across Interstate 5 and therefore would not affect connectivity. The South Lake Union and Seattle Center stations would



provide the benefit of increased access to the businesses in South Lake Union, including major employers in South Lake Union, such as Amazon, Google, and the Bill and Melinda Gates Foundation, and to the social and cultural attractions around Seattle Center, particularly with Preferred Alternative DT-1. The Alternative DT-2 Seattle Center Station would require passengers to cross a roadway to access Seattle Center, whereas the Preferred Alternative DT-1 Seattle Center Station would not. People who live, work, and play in these neighborhoods would benefit from the reliability and connectivity provided by the light rail system.

4.3.4.3.5 South Interbay Segment

The South Interbay Segment is divided by Elliott Avenue West/15th Avenue West, which is a major north-south arterial connecting Downtown Seattle and the Ballard neighborhood. The alternatives generally follow this existing arterial or existing railroad corridors, with impacts on the edges of the adjacent neighborhoods. The new Smith Cove Station would bring enhanced access and better transit connectivity to the Interbay area.

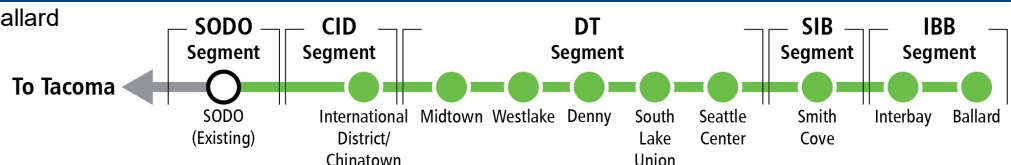
Both Preferred Alternative SIB-1 and Alternative SIB-2 would result in residential displacements to accommodate the Downtown tunnel portal. Preferred Alternative SIB-1 would displace the Interbay Village, which is a community of tiny homes administered by the Low Income Housing Institute. It is anticipated that Elliott Junction will have moved prior to construction of the project, but if not, both Preferred Alternative SIB-1 and Alternative SIB-2 would displace the shelter and residents would be relocated.

Neighborhood cohesion would not be altered by any of the alternatives in this segment because the alternatives would be along the edges of the adjacent neighborhoods and two major transportation corridors. The alternatives would not create barriers, hinder access to social resources, or notably change traffic patterns in a way that would make neighborhood access difficult. The area would look different to residents, but the project would not impact the adjacent neighborhoods' ability to connect to social resources or community facilities. Preferred Alternative SIB-1 and Alternative SIB-3 would have guideway columns on the grass playfields, making them unusable for their purpose as baseball and football fields, and would remove up to half of the parking lot in the Interbay Athletic Complex, which is shared between the grass playfields and the soccer stadium. Although there are other playfields in Magnolia less than 1 mile away, these fields are heavily used by both the Magnolia and Queen Anne neighborhoods. The loss of parking for the soccer stadium could also be a community impact because parking is already limited in this area; however, it is expected that the soccer stadium would remain operational. All alternatives would permanently impact the Interbay Golf Center property to some degree, but only Alternative SIB-3 would impact playable area. This alternative would place guideway columns across the southwest corner of the Interbay Golf Center property, permanently impacting playable area at the southwest corner of the golf course. This alternative would have the most impacts to social resources in this segment.

4.3.4.3.6 Interbay/Ballard Segment

Potential impacts to social resources or neighborhoods in the Interbay/Ballard Segment would occur predominantly in the north part of the Queen Anne neighborhood, south of Salmon Bay, and in Ballard.

Preferred Alternative IBB-1a and Option IBB-1b would displace the most social resources of all the alternatives, including the Safeway grocery store, a daycare center, and one Seattle Housing Authority low-income housing building with nine units. These alternatives would also displace the 14th Avenue Northwest Boat Ramp, which is a public boat ramp on Salmon Bay.



Sound Transit would move the boat ramp to a new location near the existing location prior to construction. The elevated alternatives (Preferred Alternative IBB-1a and Option IBB-1b) would present a visual change and physical intrusion to the Ballard community; elevated guideways and an elevated station would be built in a mixed-use area with a lot of community activity. Neighborhood cohesion would not be affected because these alignments would be in an urban area with arterials, businesses, and industry, and few residences. The neighborhood character is focused on business and industry, and therefore a guideway would be less disruptive than in a residential and retail focused area. The area would look different to residents, but the project would not create barriers, impact the ability to connect to social resources or community facilities, or notably change traffic patterns in a way that would make neighborhood access difficult.

Preferred Alternative IBB-2a* and Preferred Option IBB-2b* would have minimal visual and traffic impacts on neighborhoods in this segment, resulting in no change to neighborhood cohesion, but they would still displace businesses and residences, including the Safeway grocery store on Northwest Market Street. These alternatives would not create barriers, hinder access to social resources, or notably change traffic patterns in a way that would make neighborhood access difficult.

Alternative IBB-3 would present a visual change and physical intrusion to the Ballard community in a mixed-use area with a lot of community activity. It could result in impacts to neighborhood cohesion in Ballard because it passes through a developed area before the alignment crosses over 15th Avenue Northwest. This would effectively widen the north-south transportation corridor in that section of Ballard, which could create a perceived barrier between the west and east sides for people, especially pedestrians and bicyclists. Alternative IBB-3 would avoid displacement of the Safeway.

4.3.4.4 Environmental Impacts of the Build Alternatives during Construction

4.3.4.4.1 Impacts Common to All Alternatives

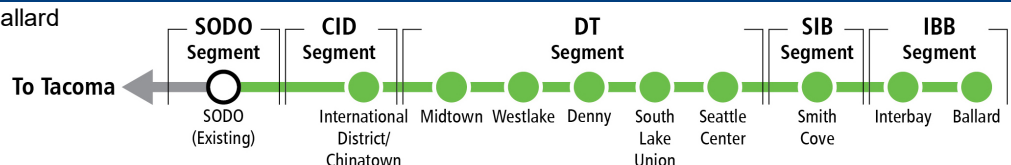
Ballard Link Extension project construction would impact adjacent social resources and neighborhoods. Although the entire project would have an extended multiple year construction period, the impacts on specific adjacent neighborhoods would last a shorter duration while the project components in that area are built.

Construction activities that would temporarily affect neighborhood quality in adjacent areas would include:

- The presence and movement of equipment and materials to and from construction areas
- Clearing, grading, and exposure of soils
- Construction lighting for nighttime work
- Storage of construction materials onsite and at staging areas
- Road closures, access changes, and detours

Increases in noise, dust, and traffic congestion, as well as temporary road or lane closures and detours, would occur along the project alignment and at staging areas and may affect people using some community resources. Visual impacts of an active construction area, such as construction equipment and fencing, would occur. There would be impacts on some public parks and recreation facilities in the form of temporary access changes; see Section 4.3.17.

Neighborhoods adjacent to the project could experience cut-through traffic due to road or lane closures and detours. These construction impacts would be felt primarily by those closest to the



construction areas and could temporarily affect social interaction and neighborhood cohesion. In areas where the project alignment moves away from an existing arterial and into developed city blocks, these construction impacts may feel more intense for the neighborhood. Unsheltered people living near the project construction areas would experience increases in noise, dust, and vehicle exhaust; project construction may result in the need for them to move elsewhere.

Temporary road and lane closures on arterials would affect neighborhood circulation and access to and from study area neighborhoods. Durations of roadway construction closures would vary from nights and weekends to multi-year closures. See the discussion of construction impacts to arterials and local streets in Section 3.19, Ballard Link Extension Construction Impact, of Chapter 3, for further detail. Attachment N.1E, Construction-Related Roadway Modifications, of Appendix N.1, Transportation Technical Report, includes all proposed roadway closures by alternative. Major arterial closures are listed in the segment-specific discussions below. In some areas where major truck routes are not available, arterial and local streets would be used to access construction areas. People living in, working in, and traveling through these areas would experience construction traffic in their neighborhood.

As part of roadway closures during construction, sidewalks would be closed or the sidewalk width could be reduced within the construction areas along the impacted roadways. Sound Transit would provide protected sidewalks next to the construction area when detour routes are not feasible. In some locations, crosswalks may be closed for construction, although they would remain open to the extent feasible. The project may result in Americans with Disabilities Act-accessible curb ramps being removed temporarily to accommodate the project or to facilitate construction. There might also be bicycle facility closures and reduced bicycle lane widths within or adjacent to construction areas.

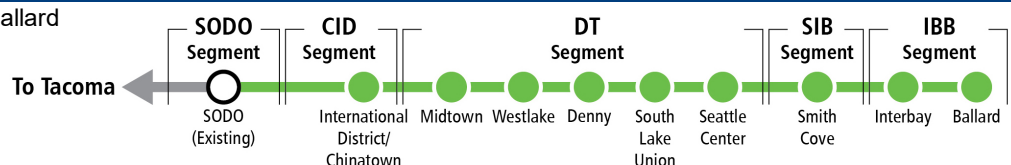
Bus reliability could potentially degrade along arterials with lane and road closures needed for construction of the Ballard Link Extension. In these locations, bus routes would need to use alternate pathways and temporary bus facilities may need to be installed. See the discussion of temporary construction impacts to transit in Section 3.19 of Chapter 3 for further detail.

The availability of on-street parking could be reduced by construction workers driving to their worksite. Because the Ballard Link Extension segments are in urban areas where parking may be limited or require payment, Sound Transit anticipates that staging areas could be used for construction employee parking but that construction workers could also park on local streets and arterials where parking is unrestricted and in off-street pay parking lots or garages, which may affect the parking supply.

See Section 2.6, Construction Approach, in Chapter 2 for a description of the construction activities for this project.

4.3.4.4.2 SODO Segment

Construction of the connection between any of the SODO Segment alternatives and Alternative CID-1a* in the Chinatown-International District would require temporary closure of the existing light rail service between the existing SODO Station and International District/Chinatown Station for 6 weeks to 7 weeks. This impact to Sound Transit's light rail system would affect riders traveling between Downtown Seattle and the southern portion of the region, including Tacoma, and could affect up to 78,000 daily riders. Construction of any SODO Segment alternatives with the remaining Chinatown-International District Segment alternatives (Option CID-1b*, Alternative CID-2a, and Option CID-2b), would maintain light rail service between Stadium Station and the existing SODO Station, but would have intermittent periods of single-track operation for a total duration of up to 6 months. During these intermittent periods of single-track



operation, Sound Transit would operate the trains on about 6- to 7-minute headways, which would be disruptive to riders because that would be a 1- to 2-minute-longer wait than planned peak period headways. This may also result in crowded train cars.

The construction activities for the SODO Segment could impact businesses and those who work near the construction area. Traffic and access to businesses on South Holgate Street between 4th Avenue South and 6th Avenue South would be disrupted while the new roadway grade separation is constructed.

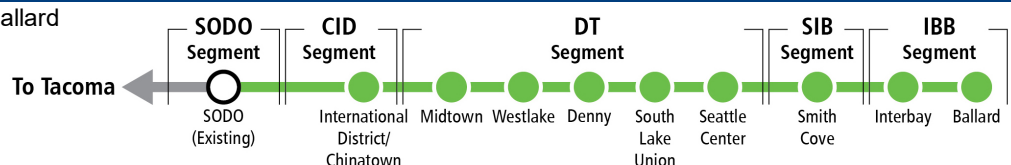
4.3.4.4.3 Chinatown-International District Segment

The south part of the Chinatown-International District Segment, where the alternatives would be at-grade, is an industrial area, so construction could impact adjacent businesses and those who work in the area. Roads would be detoured or closed as needed to construct the project; see Table 3-29 in Chapter 3, Transportation Environment and Consequences, for details on the road closures and durations of closures. Partial or full closure of a portion of 4th Avenue South and the South Jackson Street/4th Avenue South intersection for Alternative CID-1a* and Option CID-1b* would require traffic detours, primarily to 1st Avenue South but also to 6th Avenue South and Maynard Avenue South, closer to the Chinatown-International District community. Traffic diversion closer to the Chinatown-International District and Pioneer Square communities would cause increased congestion in those neighborhoods, particularly during major events at T-Mobile Park and Lumen Field. Closure of the 4th Avenue South and South Jackson Street intersection for Alternative CID-1a* and Option CID-1b* would impact this segment of the Seattle Streetcar; the other segments (Capitol Hill/First Hill and Downtown/South Lake Union) would still operate, but not as a connected system. This would impact community mobility between Pioneer Square and the Chinatown-International District for 2 years.

Partial or full closure of a portion of 5th Avenue South and the 5th Avenue South/South Jackson Street intersection for Alternative CID-2a would require traffic diversion to other streets, including 4th Avenue South, Maynard Avenue South, South Jackson Street, and 6th Avenue South. Detouring traffic to Maynard Avenue South and 6th Avenue South would result in more traffic closer to the heart of the Chinatown-International District community. The volume of traffic diverting from 5th Avenue South would be less than that which would divert from 4th Avenue South for Alternative CID-1a* and Option CID-1b* because 5th Avenue South is a substantially less busy road than 4th Avenue South.

Closure of a portion of 5th Avenue South for Alternative CID-2a could inconvenience access between the existing International District/Chinatown Station and the Chinatown-International District community to the east. Alternative CID-2a would require closure of South Weller Street and South King Street. These roads would be closed for several years, which could inconvenience people traveling between the existing International District/Chinatown Station and the Chinatown-International District community to the east. Closure of the 5th Avenue South and South Jackson Street intersection for Alternative CID-2a would impact this segment of the Seattle Streetcar, which would impact community mobility between Pioneer Square and the Chinatown-International District for less than a year. It would also relocate Metro trolley buses from 5th Avenue South to either 7th Avenue South or 8th Avenue South, farther into the Chinatown-International District. Alternative CID-2a could remove on-street parking spaces on 6th Avenue South, South Weller Street, 5th Avenue South, and South King Street, and additional parking along 8th Avenue South with the relocation of the Metro trolley bus system, which could impact adjacent businesses and those who work in the area.

The diagonal station configuration for Alternative CID-2a would require closure of South King Street for several years, which could inconvenience people traveling between the existing



International District/Chinatown Station and the Chinatown-International District community to the east. The diagonal station configuration for Alternative CID-2a would not require closure of 5th Avenue South or major traffic detours, would not have parking impacts along 6th Avenue South and South Weller Street, and would not impact the streetcar or trolley bus.

Option CID-2b would require partial closures of 5th Avenue South but would not require relocation of the trolley buses or the streetcar closure. It would also temporarily remove parking along 6th Avenue South and South Weller Street during construction, which could impact adjacent businesses and those who work in the area.

Construction of the station entrances and other surface components would result in localized construction areas within the Chinatown-International District, and the community would experience construction noise, visual changes, and detours as these elements of the project are built. Alternative CID-2a and Option CID-2b would place these potential construction impacts closer to the community than Alternative CID-1a* and Option CID-1b*. The Chinatown Gate would be wrapped for protection for the duration of civil construction for Alternative CID-2a, the diagonal station configuration, and Option CID-2b as described in Section 2.6.1, Construction Sequence and Activities.

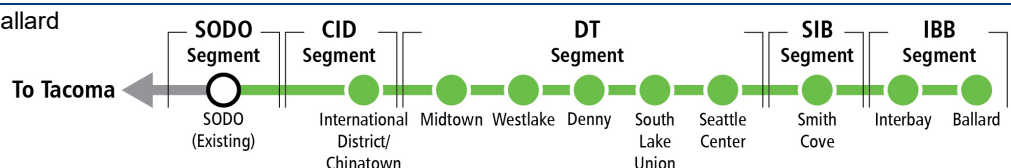
Uwajimaya, the Asian supermarket, would be impacted during construction of Alternative CID-2a. The loading dock would be temporarily closed for an estimated 1 month to 2 months as a result of in-street utility modifications and ground improvements. The entry plaza pedestrian access from 5th Avenue South, stairway from entry plaza, and lower-level garage access (for grocery store and apartment parking) would also be temporarily closed for approximately 3 months for plaza structure and foundation modifications and ground improvements. The entry plaza pedestrian access from 6th Avenue South and South Weller Street would remain open. Sound Transit would coordinate with Uwajimaya to identify mitigation measures for impacts to its property. The diagonal station configuration for this alternative would not affect Uwajimaya access. However, it could require temporary displacement of less than a year of businesses in the American Hotel building at 417 6th Avenue South and the Buty Building at 402 5th Avenue South while structural improvements are made to these buildings.

Alternative CID-1a* could have approximately 120 residential displacements due to the loss of access to the ICON Apartment building during construction. This building includes 24 rent- and income-restricted units as a condition of the building's participation in the M.F.T.E. program. However, the building was constructed in 2015, which means the M.F.T.E. program requirements would expire by 2027, which is before the relocations would occur. The residential use of this apartment building could be restored following construction, although units are expected to be market rate by then.

Hing Hay Park would experience proximity impacts due to construction staging across the street on the west side of 6th Avenue South. Impacts would include a temporary increase in construction traffic, dust, noise, and would also be visible to park users.

4.3.4.4.4 Downtown Segment

Construction impacts would be at the station entrance locations and other surface components, and would be similar to those described for the Chinatown-International District Segment. Roads would be partially or fully closed and detoured as needed to construct the project; see Table 3-30 in Chapter 3 for details on the road closures and durations of closures. Closures and detours would affect access to some social resources and community facilities and make access to these resources and facilities less convenient in some areas. Construction of Denny Station for Preferred Alternative DT-1 would require full closure of Westlake Avenue from 7th



4.3.4 Social Resources, Community Facilities, and Neighborhoods

Avenue to Denny Way, as well as partial and full closures of some cross streets. The closure of Westlake Avenue would impact this segment of the Seattle Streetcar. Other segments of the streetcar may continue to operate, but not as a connected system which could impact the frequency of service and community mobility. Alternative construction approaches that could allow for single track operations of the streetcar and maintain access to the maintenance facility during construction are being considered for this location that could substantially reduce the impact to streetcar service through the Westlake Avenue/Denny Way portion of the route. The streetcar would be closed at the Terry Avenue North and Thomas Street intersection for Alternative DT-2, impacting northbound travel of the streetcar which could impact frequency of service and community mobility. Construction of the Seattle Center Station for Preferred Alternative DT-1 would fully close portions of Republican Street, which would impact the community's ability to access Seattle Center in this location. Construction of the Seattle Center Station for Alternative DT-2 would require partial closure of a section of Mercer Street, making access to community facilities such as the Seattle Repertory Theatre from the west less convenient. There are limited east-west arterials in this area for traffic to bypass the construction area.

Some park social resources would be affected by the project during construction. A portion of Westlake Park would be impacted temporarily during construction of the Preferred Alternative DT-1, and there would also be construction proximity impacts (see Section 4.3.17 for more detail). The Urban Triangle Park would be closed during construction of Preferred Alternative DT-1 and used for construction staging; the park would be restored after construction. Freeway Park would experience construction proximity impacts for Alternative DT-2.

Construction of the Midtown Station entrance on 5th Avenue for Alternative DT-2 could require temporary relocation of tenants (126 units, 114 of which are M.H.A.-funded) and the shelter functions at the Y.W.C.A. (1118 5th Avenue) due to construction noise. Tenant and shelter functions would be restored at the Y.W.C.A. after construction. The Seattle Public Library-Central Library would be affected by noise associated with construction of the Preferred Alternative DT-1 Midtown Station. See Section 4.3. 14 for more information on noise impacts to the library.

Construction of the Seattle Center Station for Preferred Alternative DT-1 would be immediately east of the Seattle Repertory Theatre, between the theater and the Cornish Playhouse. Access would be maintained to these theaters, but construction could be disruptive. The Cornish Playhouse, Seattle Repertory Theatre, The Vera Project, the Seattle International Film Festival Film Center, and K.E.X.P. radio station and recording studio facility may also be affected by construction noise or vibration. Construction would also temporarily prevent access along 2nd Avenue North (now a pedestrian walkway within Seattle Center and used by Seattle Center maintenance and event vehicles) and impact access to Seattle Center in this location. Although alternative access points to Seattle Center facilities for visitors and maintenance and event staff are available, these detours may be less convenient. Construction of Alternative DT-2 could also have vibration or groundborne noise impacts on the Seattle Repertory Theatre, Seattle Opera and KING FM, and McCaw Hall. Sound Transit would coordinate with Seattle Center regarding construction phasing and timing for work on and near the campus to minimize the construction impacts. With either alternative, traffic diversion around Seattle Center would cause increased congestion in the adjacent neighborhoods, particularly during major events at the center, including events at Climate Pledge Arena.



4.3.4.4.5 South Interbay Segment

Project construction for all the South Interbay Segment alternatives would temporarily impact several parks in this segment, as described in Section 4.3.17. The construction impacts to these social resources would impact those who live nearby and use them, as well as those who travel to use the recreational facilities.

Roads would be detoured or closed as needed to construct the project (see Table 3-31 for details on the road closures and durations of closures). Preferred Alternative SIB-1 would require partial closure of Elliott Avenue West, which would increase congestion on Elliott Avenue West. Alternative SIB-3 would require partial closures of Elliott Avenue West and 15th Avenue West. Alternative SIB-2 would require similar closures on Elliott Avenue West to Preferred Alternative SIB-1 but for a shorter period of time, as well as partial closure of a portion of 15th Avenue West, which would likely increase congestion on these streets. While travel would remain on 15th Avenue West, some trips, likely originating or ending in the Magnolia or Queen Anne neighborhoods, may divert to other local roads, such as Queen Anne Avenue North, 11th Avenue West, West Dravus Street, and 28th Avenue West.

Alternative SIB-2 would have the most extensive construction impacts. Access changes for social resources and businesses along Elliott Avenue West/15th Avenue West would occur. Construction of this alternative would result in traffic disruptions and delays within the Interbay neighborhood.

4.3.4.4.6 Interbay/Ballard Segment

Construction impacts in the Interbay/Ballard Segment for the elevated alternatives (Preferred Alternative IBB-1a, Option IBB-1b, and Alternative IBB-3), would be similar to those described for the South Interbay Segment. The Interbay/Ballard Segment is denser with businesses and residences, especially in Ballard, so the construction impacts would affect more people, and road closures or detours could impact the ability to get around the neighborhood; see Table 3-32 in Chapter 3 for details on the road closures and durations of closures. Option IBB-1b and Alternative IBB-3 would require intermittent short-term closures of the West Dravus Street on- and off-ramps to 15th Avenue Northwest and also closures of a portion of 15th Avenue West. West Dravus Street would remain open for east-west travel except for short-duration night or weekend closures. These closures would impact access to the Queen Anne and Magnolia neighborhoods from this location, requiring the use of alternate routes such as the West Emerson Street interchange, which may be less convenient. Increased traffic congestion on 15th Avenue West would also impact the community. Preferred Alternative IBB-1a, Option IBB-1b, and Preferred Alternative IBB-2a* would require closure of a portion of 14th Avenue Northwest, as well as some cross streets. Closure of 14th Avenue Northwest, a north-south arterial, could make access in this area less convenient during construction.

Preferred Alternative IBB-1a, Option IBB-1b, and Alternative IBB-3 would require periodic closures for short durations of the Ship Canal Trail during construction of the elevated guideway over the trail. Pedestrians and bicyclists would be rerouted to the next adjacent street to minimize out-of-direction travel. Construction activities and street closures would also limit pedestrian and bicycle access to the future Burke-Gilman Trail Missing Link on Northwest 46th Street.

All of the alternatives in the Interbay/Ballard Segment could require short-term deactivation of the Metro trolley bus wire along Northwest Market Street, affecting both transit routes that travel along this street and community mobility.



4.3.4.5 Indirect Impacts of the Build Alternatives

Potential indirect impacts on social resources, community facilities, and neighborhoods would be changes in neighborhood composition or character over time due to the presence of the light rail facilities. The manner in which a neighborhood changes in response to new light rail facilities could impact neighborhood cohesion positively or negatively. The project may encourage redevelopment in station areas (TOD), or the completion of missing transportation links, such as bicycle facilities, sidewalks, or trails. Station area improvements could provide new meeting places for nearby residents and employees, improving community cohesion. Station area redevelopment could promote economic activity by expanding neighborhood business districts consistent with zoning and could increase property values (refer to Section 4.3.3, Economics, for information on potential economic benefits). Increased property values could cause higher rents and property taxes, which could have a negative effect on existing renters, homeowners, and business owners, resulting in some deciding to move away from the neighborhoods. Light rail facilities that are not close to stations could also adversely affect property values.

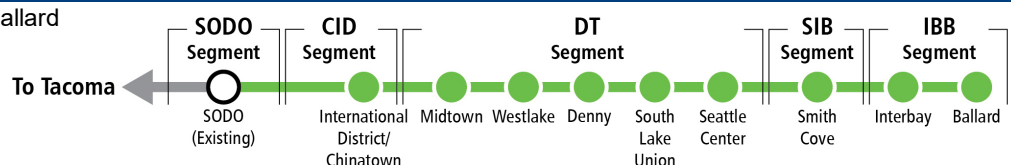
Indirect impacts of potential TOD are discussed in Sections 4.3.2 and 4.3.3. Potential future transportation or mobility projects built to connect to the project are discussed in Chapter 3.

As discussed in Section 4.3.4.1, Affected Environment, the Chinatown-International District was identified by the City as having a high displacement risk to residents and businesses. Increased property values and redevelopment encouraged by the addition of transit service could result in changes to neighborhood composition and character. These changes are already occurring to some extent with recent growth trends.

As discussed in Section 4.3.3, there would be water-dependent businesses displaced by Preferred Alternative IBB-1a, Option IBB-1b, and Alternative IBB-3 in the Interbay/Ballard Segment. One of the businesses potentially displaced by Preferred Alternative IBB-1a and Option IBB-1b, Coastal Transportation Inc., provides cargo service to several communities in southwest Alaska that are only accessible by boat or airplane. While other water-based transport companies serve these ports, Coastal Transportation Inc. is the only company that provides service year-round to some communities.

4.3.4.6 Mitigation Measures

Mitigation measures to address project impacts to neighborhoods are discussed in the following sections: the Mitigation sections of Chapter 3 and Sections 4.3.1, Acquisitions, Displacements and Relocations; 4.3.3, Economics; 4.3.5, Visual and Aesthetic Resources; 4.3.7, Noise and Vibration; 4.3.14, Public Services, Safety, and Security; and 4.3.17, Parks and Recreational Resources.



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4.3.5 Visual and Aesthetic Resources

4.3.5.1 Affected Environment

The study area for visual and aesthetic resources is the viewshed of the Build Alternatives. In many locations, views of the project components such as guideways, stations, and trains by sensitive viewers would be partially or completely blocked by vegetation, terrain, and buildings. In densely developed areas, the viewshed of the alternatives is frequently between 100 and 500 feet on either side of it. In areas where Ballard Link Extension components would be higher than nearby buildings and vegetation, and in areas where bodies of water are crossed, the viewshed can extend out to approximately 0.5 mile. Given the developed urban nature of the areas the Build Alternatives would pass through, being able to see Ballard Link Extension components beyond approximately 0.5 mile would not alter the visual character or visual quality of views beyond that distance.

The description of the affected environment focuses on visual character, visual quality, locations where there are concentrations of sensitive viewers, and views from City of Seattle Designated Scenic Routes. Sound Transit's methodology draws upon established Federal Highway Administration guidelines (Federal Highway Administration 1988) with several key differences, such as the identification of viewer sensitivity, and the use of a qualitative rather than quantitative scale. See Appendix N.2, Visual and Aesthetics Technical Report, for additional information on visual methodology, affected environment, and project impacts. As described in the technical report, key observation points (KOPs) were selected to represent areas where there is a potential for visual impacts along the alignment of the Build Alternatives.

Visual Terminology

Visual character is an objective assessment of a landscape view that has various natural and human-built elements.

The **visual quality** of a landscape view reflects how well its character-defining features are composed.

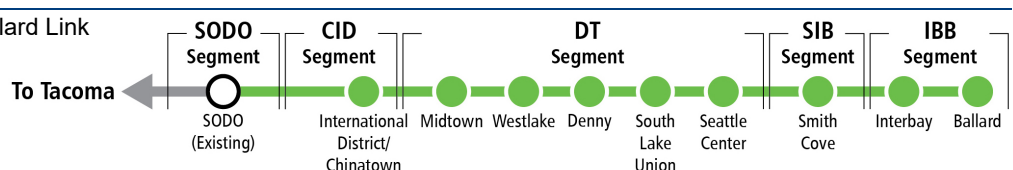
Vividness, intactness, and unity determine the visual quality of landscape views

Visual quality categories help assess how the project would change the visual environment. As a baseline, existing visual quality was categorized as low, average, or high.

Sensitive viewers are people for whom the landscape view is important. They are likely to notice, and be concerned with, changes to the viewed landscape. Residents and park users are more sensitive to changes in landscapes than office workers or motorists.

4.3.5.1.1 SODO, Chinatown-International District, and Downtown Segments

The description of the affected environment focuses on areas that contain concentrations of sensitive viewers. The SODO Segment does not have areas with concentrations of sensitive viewers and is not discussed further in this section. The Chinatown-International District Segment has some areas with concentrations of sensitive viewers, including multi-family residential buildings and Hing Hay Park. The Downtown Segment also has areas with concentrations of sensitive viewers, including multi-family residential buildings and several parks such as Freeway Park, Westlake Park, Urban Triangle Park, and Seattle Center. However, the alternatives being considered in the Chinatown-International District and Downtown segments would be in tunnels, and the only above-ground elements that would be potentially seen by sensitive viewers are the station entrances and other facilities such as tunnel vents.



4.3.5.1.2 South Interbay Segment

The southern part of the South Interbay Segment has several areas containing concentrations of sensitive viewers. They include multi-family residential areas, Kinnear Park, and the Southwest Queen Anne Greenbelt. Multi-family residential buildings are east of Elliott Avenue West on blocks north and south of West Mercer Street and West Mercer Place, along West Republican Street and on streets east of Kinnear Park. The visual quality of views in this area ranges from low average to high average. The lower portion of southwestern Kinnear Park is largely undeveloped as is the Southwest Queen Anne Greenbelt to the immediate northwest. Both of these areas have a natural forested character. Several developed and user-created trails pass through the lower part of Kinnear Park and a series of user-created trails pass through the greenbelt. People using the trails in the park and greenbelt are assumed to be recreationists (who are considered sensitive viewers). Some residences on the top of Queen Anne Hill might have views of the lower portions of the park and greenbelt, although heavy vegetation blocks most views. The visual quality of views in the lower portions of Kinnear Park and the Southwest Queen Anne Greenbelt ranges from low to average along the edges of these areas (that look at the backs of commercial buildings lining Elliott Avenue West) to high within the interiors of these two areas.

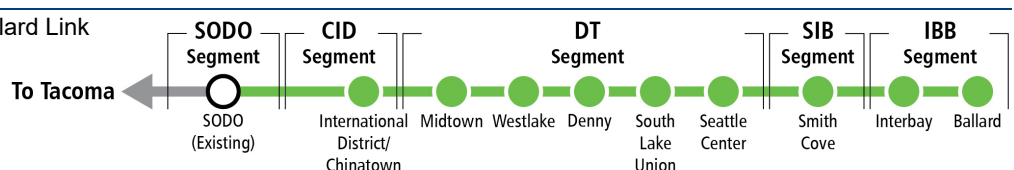
Between the park, greenbelt, and the Seattle Armory, the land use and visual character of the segment is commercial and industrial. North of the Seattle Armory, land use and visual character changes with the presence of the Interbay P-Patch Community Garden, the Interbay Golf Center, and the Interbay Athletic Complex. These three areas have a recreational character that is enjoyed by sensitive viewers that include recreationists using the facilities, people living in multi-family residential complexes along 15th Avenue West, and residents on the lower hillsides of Queen Anne Hill and Magnolia, although many views toward Interbay from these elevated areas are partially or completely blocked by vegetation or buildings. The visual quality of views in these areas is generally average, although views from the Interbay Athletic Complex are high average.

4.3.5.1.3 Interbay/Ballard Segment

The Interbay/Ballard Segment south of Salmon Bay and west of 15th Avenue West supports commercial and industrial land uses, has visual character types that reflect these land uses, and does not contain concentrations of sensitive viewers. Areas along the east side of 15th Avenue West and east of the West Emerson Street interchange on the northwest corner of Queen Anne Hill contain a mixture of land uses that include multi-family and single-family residential. These areas contain sensitive viewers. The segment also includes Salmon Bay, whose shoreline contains commercial and maritime industrial uses and has a maritime commercial visual character. The visual quality of views in this part of the segment ranges from low to high. Sensitive viewers include recreational users in Salmon Bay, and recreationists passing through the Lake Washington Ship Canal.

The area between Salmon Bay and Northwest Market Street is primarily commercial and industrial, has commercial and industrial visual character, and supports no concentrations of sensitive viewers. Areas north of Northwest Market Street support a mixture of residential uses ranging from multi-family complexes to single-family residences. The character of these areas is primarily residential and there are concentrations of sensitive viewers. The visual quality of views in these areas ranges from low average to average.

There are several City of Seattle Designated Scenic Routes within the Ballard Link Extension. The portion of Elliott Avenue West from the southern boundary of the South Interbay Segment to the Magnolia Bridge is a City of Seattle Designated Scenic Route as is the Magnolia Bridge.



Views from this section of Elliott Avenue West of features such as Mount Rainier, the downtown skyline, Elliott Bay, Puget Sound, and the Olympic Mountains are frequently blocked by buildings, stationary freight trains, or trees, whereas views from the Magnolia Bridge are open and include all of the features. A lookout point at the west end of the Magnolia Bridge provides views of many of these features, but trees block much of the view toward Interbay. At the north end of Interbay, 15th Avenue West and West Emerson Street are City of Seattle Designated Scenic Routes. The designation of 15th Avenue West continues over the Ballard Bridge as 15th Avenue West becomes 15th Avenue Northwest. It continues north to Northwest Market Street, which is also a City of Seattle Designated Scenic Route. Features that are visible from parts of these routes include the Lake Washington Ship Canal, Salmon Bay, Mount Rainier, and the Olympic and Cascade mountains.

4.3.5.2 Environmental Impacts of the No Build Alternative

The No Build Alternative would maintain existing visual and aesthetic conditions, subject to changes related to planned development. Given City of Seattle policies encouraging increased residential density, it can be assumed that the appearance of residential neighborhoods in the general and immediate vicinity of Northwest Market Street and 14th Avenue Northwest and 15th Avenue Northwest would change over time as development in these areas would increase their density.

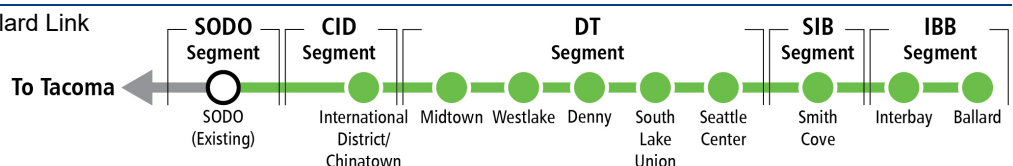
4.3.5.3 Environmental Impacts of the Build Alternatives during Operation

This section describes the visual and aesthetic impacts of the Build Alternatives during operation. Chapter 2, Alternatives Considered, and Appendix J, Conceptual Plans, details each of the Build Alternatives. KOPs were selected to represent areas where there is a potential for visual impacts along the alignment of the Build Alternatives. This section shows the KOPs where simulations were developed to assist in assessing visual impacts, identifies areas along the Build Alternatives with concentrations of sensitive viewers, identifies areas where there would be visual impacts by one of more of the Build Alternatives, and discusses potential impacts to City of Seattle Designated Scenic Routes. Visual impacts occur when an existing visual quality category (high, average, or low) is reduced one or more categories. Visual impacts are in miles along the length of the alternative adjacent to concentrations of sensitive viewers.

4.3.5.3.1 Impacts Common to All Alternatives

All of the Build Alternatives would change the visual environment to varying degrees. Sound Transit has developed the following design measures that would be incorporated into the Build Alternatives.

- Sound Transit would develop specific design criteria for the Ballard Link Extension that would guide project design through a balanced set of system-wide elements and contextual elements, such as a consistent architectural theme for elevated elements and stations, consistent signage, and a system-wide art program. Interdisciplinary teams would develop these criteria with input from local communities and the City of Seattle and would integrate these criteria with existing plans, including plans for redevelopment.
- Sound Transit would coordinate with the City of Seattle and adjacent communities through design review to promote visual unity in station areas.
- Sound Transit would conduct design review of the bridges in coordination with the City of Seattle. Measures to minimize impacts to visual quality as result of the bridges, such as design guidelines and context-sensitive design, would be considered.



- Sound Transit would surplus the remainder of the parcels not needed after construction, which could potentially be redeveloped consistent with Sound Transit's Transit Oriented Development Policies and City of Seattle plans.
- When possible, Sound Transit would preserve existing vegetation.
- Sound Transit would plant appropriate vegetation within and adjoining the project right-of-way to replace existing street trees and other visually important vegetation removed for the project, and/or to provide screening for sensitive visual environments and/or sensitive viewers. New plantings would be consistent with Sound Transit operations and maintenance requirements.
- Exterior lighting at stations, tail tracks, and hi-rail access would be designed to minimize height and use source shielding to avoid light bulbs that would be directly visible from residential areas, streets, and highways. Shielding would also limit spillover light and glare in residential areas.

4.3.5.3.2 Chinatown-International District and Downtown Segments

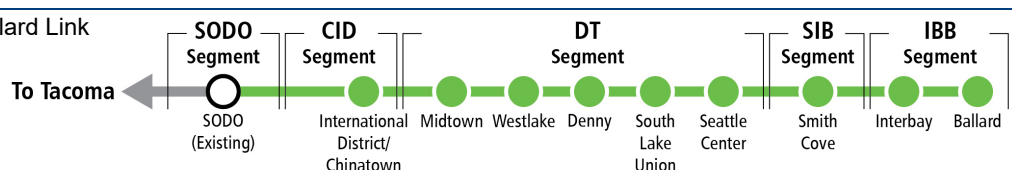
The alternatives being considered in these segments would be in tunnels that would be accessed via station entrances. Other than stations and other facilities such as tunnel vents, these areas would not contain components above the ground. The stations' street-level entrances would be the main above-ground elements of the alternatives that would be potentially seen by sensitive viewers but would not change the visual quality of views towards them by the sensitive viewers. The street-level entrances to stations would be designed to fit in with the neighborhoods of which they would be a part and would be designed with community input; they would not reduce visual intactness, vividness, or unity. Sound Transit would coordinate with the City of Seattle on design to promote visual unity in station areas. Other facilities such as the tunnel vents would typically be less prominent than the station entrances but would also be designed to fit in the neighborhood in coordination with the City. These facilities would not change the visual quality of views towards them by sensitive viewers. An exception is the tunnel vent in front of Union Station which would be a prominent component of Alternative CID-1a* and Option CID-1b*. Any aesthetic and visual concerns related to the design of the stations and other facilities would be addressed during the community input and design review phases of the Ballard Link Extension. These segments are not considered further in this section, and KOPs were not used to depict existing conditions or alternatives.

4.3.5.3.3 South Interbay Segment

The South Interbay Segment, which would have primarily above-ground components, contains nearby concentrations of sensitive viewers. Figure 4.3.5-1 shows the KOPs where simulations were developed, identifies areas with concentrations of sensitive viewers, identifies areas where there would be visual impacts, and identifies City of Seattle Designated Scenic Routes. Cross sections of the stations are shown in Attachment N.2B, Station 3D Views and Cross Sections, to Appendix N.2, Visual and Aesthetics Technical Report.

Areas with Concentrations of Sensitive Viewers

As shown in Table 4.3.5-1, all three South Interbay Segment alternatives would have impacts on visual quality in terms of reducing the existing visual quality of views toward the alignments that are seen from nearby areas with concentrations of sensitive viewers. Preferred Alternative SIB-1 would have the least impact of the three alternatives.





Source: City of Seattle, King County (2019, 2020, 2021).

Alternatives

- Preferred Alternative
- Preferred Alternative with Third-party Funding
- Other Alternatives

Alternative Profile

- Elevated — Tunnel
- At-Grade — Retained Cut

Station

- New

— Segment Line

— Railroad

— Park

● Key Observation Point (KOP) and View Direction

— City of Seattle Designated Scenic Route

○ Location of impact to visual quality with one or more alternatives near areas with concentrations of sensitive viewers

XXXXX Approximate Areas with Concentration of Sensitive Viewers

FIGURE 4.3.5-1
Visual Setting and Impacts
Ballard Link Extension -
South Interbay Segment

West Seattle and
Ballard Link Extensions

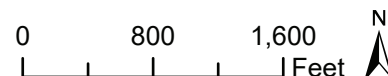


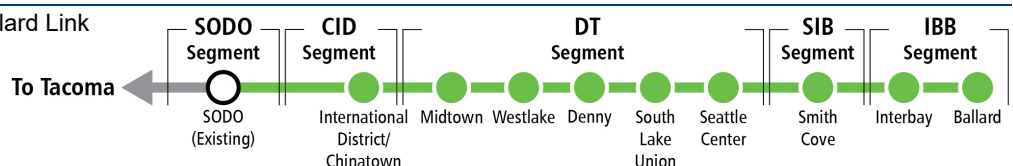
Table 4.3.5-1. South Interbay Segment Visual Quality Impacts to Concentrations of Sensitive Viewers

Alternative	Visual Quality Impacts (miles)	Where Visual Impacts Would Occur
Preferred Galer Street Station/Central Interbay (SIB-1)	0.1	Residences to the northeast of the Interbay Athletic Complex
Prospect Street Station/15th Avenue (SIB-2)	0.4	Trails in the Southwest Queen Anne Greenbelt and possibly residences uphill from the greenbelt
Prospect Street Station/Central Interbay (SIB-3)	1.0	Trails in the lower part of Kinnear Park and the Southwest Queen Anne Greenbelt, possibly residences uphill, and residences to the northeast of the Interbay Athletic Complex

The Preferred Alternative SIB-1 elevated guideway would be between about 30 and 80 feet high and would be highest near West Armory Way. The portion of the alignment that would exit the tunnel portal would be seen from nearby residences along West Republican Street and several side streets. However, it would not reduce the existing average visual quality of this area. The elevated guideway and straddle bents would be seen by nearby residents as it follows Elliott Avenue West northward, including a concentration of sensitive viewers in the nearby multi-family residential buildings at 6th Avenue West and Elliott Avenue West. The guideway in this area would partially block views of the Olympic Mountains. However, the elevated guideway would not lower the average visual quality of views from residences along Elliott Avenue West to the west that include features such as Elliott Avenue West, industrial buildings, office buildings, parking lots, the BNSF Railway tracks (and stationary freight train cars), the green open space of Centennial Park Trail, and the Pier 86 grain terminal. Partial views at some locations along Elliott Avenue West of Elliott Bay and the Olympic Mountains are possible between buildings and structures west of Elliott Avenue West. The visual simulation at KOP B-1 (see Attachment N.2A, Key Observation Point Analysis in Appendix N.2, Visual and Aesthetics Technical Report) is representative of the condition along Elliott Avenue West, north of West Republican Street.

Near the southwest corner of Queen Anne Hill, Preferred Alternative SIB-1 alignment would follow the east side of Elliott Avenue West past the west side of Kinnear Park. It would be seen through trees in the park by recreationists using some of the trails near the edge of the park. Because western views from portions of the edge of Kinnear Park also include views of Elliott Avenue West, the BNSF Railway tracks, and the Pier 86 grain terminal, the low visual quality of those views would not be lowered with the presence of the elevated guideway.

The Preferred Alternative SIB-1 elevated guideway would travel northwest to the elevated Smith Cove Station (the height to the top of the station would be about 90 feet), which would be above the West Galer Street overpass and not near concentrations of sensitive viewers. The alignment would pass west of the Southwest Queen Anne Greenbelt and would not be seen from it. From the station, the alternative would travel north to the Interbay Golf Center and follow its west side. This alternative would remove vegetation along the west side of the Interbay Golf Center that screens some views to the west of BNSF Railway tracks and freight trains. The elevated guideway would introduce an additional transportation element into southern and western views from parts of the golf center. The presence of the elevated guideway along the west side of the golf center would somewhat lower the average visual quality of views toward its alignment, but not enough to reduce it to a low visual quality rating.

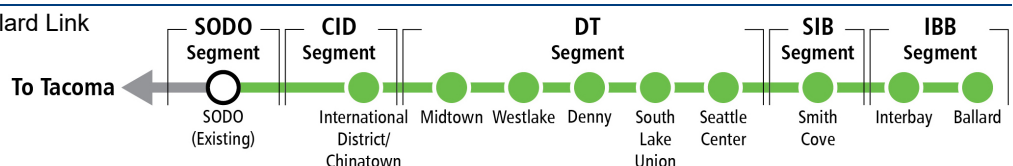


The elevated guideway would continue north and cross through the northwest edge of the Interbay Athletic Complex, where it would be viewed by people using the soccer stadium and associated stands, and residents in the multi-story residential development directly northeast of the complex (fronting West Dravus Street). The alternative would remove vegetation that partially screens views of the BNSF Railway tracks and freight trains to the immediate west of the complex. The elevated guideway passing through this relatively small and visually contained recreational area would remove grass fields and add a large-scale transportation element. This would change the visual character of the view toward the elevated guideway from recreational to transportation. The high average visual quality of the view would be reduced to low. This would be a visual impact to views from the multi-story residential development to the northeast but not to recreationists because the grass fields they use would be displaced and recreationists would no longer use the fields. It would also not be a visual impact to people using the soccer field and associated stands (which face south away from the changes to the athletic fields) at the Interbay Athletic Complex because their viewing attention would continue to be on the soccer field.

From 2nd Avenue West to beyond Kinnear Park, the Alternative SIB-2 alignment would be very similar to that of Preferred Alternative SIB-1. North of Kinnear Park, the elevated guideway and elevated Smith Cove Station (the top of which would be about 60 feet high) would be adjacent to the Southwest Queen Anne Greenbelt. The station and guideway north of the station would remove trees in part of the greenbelt. Commercial buildings along the east side of Elliott Avenue West would also be removed. These changes would be seen by recreationists using the trails in the greenbelt and possibly by people in residences east of the greenbelt, although views of the changes from the residences would often be screened by trees on the slope between the residences and the alignment. The natural visual character of the western portion of the greenbelt would be changed to transportation. The existing high average visual quality of views within the greenbelt would be reduced to low, which would be a visual impact.

Alternative SIB-2 elevated guideway would transition to the center of 15th Avenue West and pass concentrations of sensitive (residential) viewers. Residents who would see the elevated guideway passing approximately 40 feet high along 15th Avenue West are in multi-family residential buildings along the west side of the road and in single-family residences on hillside streets east of 15th Avenue West, such as 14th Avenue West and Prosch Avenue West. However, trees and other buildings block views to the west from many of the residents on the hillside east of 15th Avenue West, so, in these situations, the elevated guideway would not be seen. The elevated guideway would add another transportation element into views to the west from these residential areas and would not greatly change the character of the viewed landscape, which is a combination of commercial, recreation (due to the Interbay Golf Center) and transportation (15th Avenue West). The presence of the elevated guideway and trains would not reduce the average visual quality of existing views to the west, and therefore would not have a visual impact.

Alternative SIB-3 would remove vegetation at the north end of its route in Kinnear Park before the alignment would follow a retained cut. The removal of vegetation in this limited area of the lower Kinnear Park would lower the existing high average visual unity and intactness to low. These reductions would reduce the visual quality of the area to low, which would be a visual impact. Farther northwest, the alignment would pass through the western edge of the Southwest Queen Anne Greenbelt in a retained cut that would transition to at-grade. The removal of vegetation and presence of the alternative would change the natural visual character of the western portion of the Southwest Queen Anne Greenbelt to transportation and would reduce the high average visual quality of views to low within the forested parts of the greenbelt that are viewed by recreationists using trails and potentially by some nearby residents.



Alternative SIB-3 would cross 15th Avenue West, where it would remove some buildings along the east side of the road and change the view from residences on the southern end of 14th Avenue West. This visual change would not change the visual quality of the view. After crossing 15th Avenue West, this alternative would turn northwest and follow the same route as Preferred Alternative SIB-1 along the west side of the Interbay Golf Center and the Interbay Athletic Complex. Alternative SIB-3 would have the same impacts on the visual quality of views by sensitive viewers from these areas as Preferred Alternative SIB-1 but would be lower as shown on Figure 4.3.5-2.

City of Seattle Designated Scenic Routes and Public View Protection

All of the South Interbay Segment alternatives would cross over Elliott Avenue West, a City of Seattle Designated Scenic Route. Preferred Alternative SIB-1 would cross over it at three locations, Alternative SIB-2 would cross over it at two locations, and Alternative SIB-3 would not pass over it. In all cases, the alternatives would not intrude upon or block views of Mount Rainier, the downtown skyline, Elliott Bay, Puget Sound, or the Olympic Mountains.

For Preferred Alternative SIB-1, western views of Elliott Bay and the Olympic Mountains could be blocked along a limited portion of the Magnolia Bridge (which is a City of Seattle Designated Route) east of where the elevated guideway would cross over the bridge. Western and southwestern views from the bridge on-ramp area are generally blocked or partially blocked by existing buildings, so the presence of an elevated guideway would likely not block views of important features from the Magnolia Bridge.

With the exception of the Interbay Golf Center (a protected viewpoint), Preferred Alternative SIB-1 and Alternative SIB-2 would not intrude on views of Mount Rainier, the Olympic and Cascade mountains, the downtown skyline, or Puget Sound from the City of Seattle specified protected viewpoints near this segment (Smith Cove Park and Kinnear Park). Views of these features would not be blocked from the Interbay Golf Center, but views of Elliott Bay would be partially intruded upon from some locations within the Interbay Golf Center (see Figure 3-2b in Attachment N.2A, Key Observation Point Analysis, to Appendix N.2, Visual and Aesthetics Technical Report) with both of these alternatives. Alternative SIB-3 would not intrude upon or block views of Puget Sound, Mount Rainier, or the Olympic and Cascade mountains from any of the City of Seattle specified protected viewpoints within or near this segment.

Light, Glare, and Shadows

Lights from trains using the Preferred Alternative SIB-1 elevated guideway would be seen from nearby locations, including the multi-family buildings at the southern end of this alternative in the vicinity of Elliott Avenue West and West Republican Street. The train would add additional lights to nighttime views toward Elliott Avenue West that currently include lights from facilities to the west, such as commercial buildings, trains on BNSF Railway tracks, the Pier 86 grain terminal, and ships anchored in Elliott Bay.

The elevated Smith Cove Station over the West Galer Street Flyover would be seen at night from distant residences, along with vehicle lights on the Magnolia Bridge, lights from commercial and industrial areas, and lights from berthed cruise ships. Lights from trains would also be noticed from the Interbay Golf Center, the Interbay Athletic Complex soccer stadium and its stands, and the multi-family building to the northeast, but the lights would not impact these areas because they would only be seen for a short duration. The elevated guideway would cast shadows in the late afternoon on adjacent open spaces used by the public, specifically the western edge of Kinnear Park and the Interbay Golf Center, but would be unlikely to impact facility users.

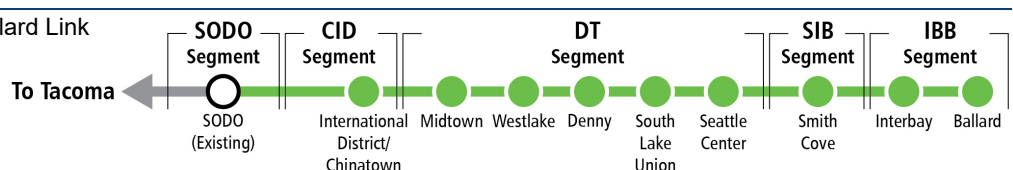


Figure 4.3.5-2. KOP B-2: Looking South from Interbay Golf Center toward Pier 91 Cruise Ship Terminal

Existing Condition



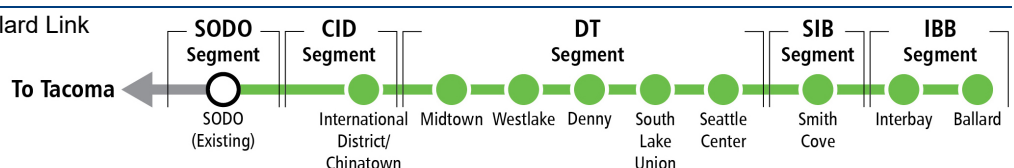
**Preferred Galer Street
Station/Central Interbay Alternative (SIB-1)**



**Prospect Street
Station/Central Interbay Alternative (SIB-3)**



Lights from trains using the Alternative SIB-2 elevated guideway south of Smith Cove Station would be the same as described above for Preferred Alternative SIB-1. Lights from trains passing through the Alternative SIB-2 elevated Smith Cove Station and guideway would be seen from nearby residences, from Kinnear Park, and from the Southwest Queen Anne Greenbelt. The hi-rail vehicle access lighting would also be seen from the Southwest Queen Anne Greenbelt and nearby residences. However, the lights from passing trains and the hi-rail access would not impact motorists, pedestrians, and the surrounding area. Lights from trains passing on the elevated guideway would be well above roadways and pedestrian pathways, and if the lights are seen it, would only be for a short duration and would not impact motorists or pedestrians. Similarly, where train lights are seen from the surrounding area, there would not be an impact because of the short duration the lights would be seen as the trains pass. Lights from the elevated Smith Cove Station would be designed in accordance with Sound Transit design measures and would not have an impact on the surrounding area. Approaches to reduce potential light impacts associated with stations and the hi-rail vehicle access are described in the design measures discussion in Section 4.3.5.3.1, Impacts Common to All Alternatives. In the late afternoon, shadows from the elevated guideway would be cast on adjacent open spaces



used by the public, specifically the western edge of Kinnear Park and the Southwest Queen Anne Greenbelt but would be unlikely to impact facility users.

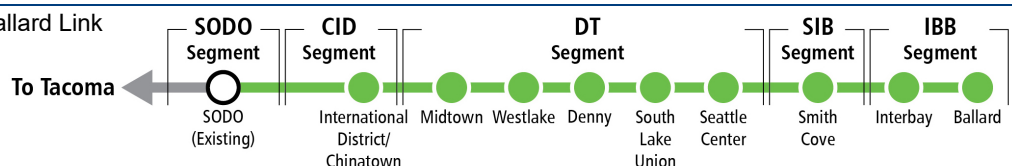
Lights from trains on the at-grade portion of the Alternative SIB-3 and lighting in the portion of Smith Cove Station above the existing ground surface (approximately 30 feet) would be seen by recreationists in the northern end of Kinnear Park and in the Southwest Queen Anne Greenbelt. Lights from the trains on the elevated guideway would be noticed from the Interbay Golf Center, Interbay Athletic Complex soccer stadium and stands, and the multi-family building to the northeast. Train lights would not impact these areas because of the short duration the lights would be seen as the trains pass. In addition to lights from trains, lights from the BNSF Railway railyard and beyond that are currently blocked by trees from most (but not all) locations in the golf center, the athletic complex, and the multi-family building would become visible. Lights from trains passing on the elevated guideway portion of the alternative would be well above roadways and pedestrian pathways and if the lights are seen it would only be for a short duration and would not impact motorists or pedestrians. The hi-rail vehicle access lighting would be seen from the Southwest Queen Anne Greenbelt. Lights from Smith Cove Station and the hi-rail vehicle access would be designed in accordance with Sound Transit design measures (see Section 4.3.5.3.1) and would not have an impact on the surrounding area. The elevated guideway would cast afternoon shadows on adjacent open space used by the public, specifically the western edge of the Interbay Golf Center, but would be unlikely to impact facility users.

4.3.5.3.4 Interbay/Ballard Segment

The Interbay/Ballard Segment, which would have above-ground and below ground components, contains nearby concentrations of sensitive viewers. Figure 4.3.5-3 shows the KOPs where simulations were developed, identifies areas with concentrations of sensitive viewers, identifies areas where there would be visual impacts, and identifies City of Seattle Designated Scenic Routes. Cross sections and 3D views of some stations are shown in the following section to illustrate the general height, bulk, and scale of the stations (see Attachment N.2B, Station 3D Views and Cross Sections, to Appendix N.2, Visual and Aesthetics Technical Report, for additional information).

Areas with Concentrations of Sensitive Viewers

With Preferred Alternative IBB-1a, Option IBB-1b the top of the Interbay Station would be about 80 to 90 feet high. The presence of the alternative in this mostly commercial and industrial area might slightly increase the low visual unity, intactness, and vividness of views from nearby residences. However, they would not change the existing low visual quality. After leaving the Interbay Station, Preferred Alternative IBB-1a and Option IBB-1b would pass over the West Emerson Street interchange into the residential area on the northwest edge of Queen Anne Hill. The removal of residences and presence of the elevated guideway and start of the fixed-span bridge would change the residential character of areas along the alignment to transportation character but would not lower the average to high average visual quality of views toward the alignment to low, thus would not be considered a visual impact.





Source: City of Seattle, King County (2019, 2020, 2021).

Alternatives

- Preferred Alternative
- Preferred Alternative with Third-party Funding
- Other Alternatives

Alternative Profile

- Elevated
- At-Grade
- Tunnel
- Retained Cut

Station

- New

Key

- Segment Line
- Railroad
- Stream
- Park

Key Observation Point (KOP) and View Direction

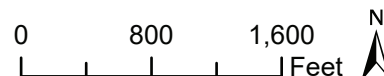
- City of Seattle Designated Scenic Route
- Location of impact to visual quality with one or more alternatives near areas with concentrations of sensitive viewers

- Location of impact to visual quality with one or more alternatives near areas with concentrations of sensitive viewers

- XXXXX Approximate Areas with Concentration of Sensitive Viewers

FIGURE 4.3.5-3
Visual Setting and Impacts
Ballard Link Extension -
Interbay/Ballard Segment

West Seattle and
Ballard Link Extensions



Preferred Alternative IBB-1a and Option IBB-1b would cross over Salmon Bay and be seen from some nearby residences in this area. The balanced cantilever segmental box girder bridge would have a clearance of approximately 136 feet over the navigation channel in Salmon Bay. Its alignment would be approximately 600 feet east of the Ballard Bridge. Seeing the fixed-span bridge would lower the high average visual quality of views of residences to low average, which would not be enough of a reduction to be considered a visual impact to residential viewers. The fixed-span bridge would be visible from many locations along and within Salmon Bay used by water-based recreationists. The scale and height of the bridge would be very noticeable, especially compared to the Ballard Bridge, but would not block views of the Ballard Bridge or views up and down Salmon Bay (Figure 4.3.5-4). Although the vividness of the bridge would be high, the existing high intactness and unity of views toward the bridge would be lowered to average, which would reduce visual quality to average. This would be considered a visual impact to recreationists on the waters of Salmon Bay. The visual quality impact would be slightly less than with Alternative IBB-3.

Sound Transit is considering several bridge types for the Preferred Alternative IBB-1a and Option IBB-1b crossing. In addition to the balanced cantilever segmental box girder bridge depicted in the simulations in Figure 4.3.5-4, Sound Transit is considering an arch bridge, a extradosed bridge, and a cable-stayed bridge. Each of these bridge types would have different visual characteristics and different potential impacts on the visual quality of views seen by sensitive viewers.

The arch, extradosed, and cable-stayed bridges would have components that would be taller than those of the balanced cantilever segmental box girder bridge. Like the balanced cantilever segmental box girder bridge, the three other potential bridge types would have visual impacts on views from Salmon Bay by water-based recreationists. The three taller bridge types could result in enough of a reduction to the visual quality of views seen by residents on the northwest part of Queen Anne Hill to be considered a visual impact. Through design review in coordination with the City of Seattle, Sound Transit would consider measures to minimize impacts to visual quality from the bridge for Preferred Alternative IBB-1a and Option IBB-1b, such as design guidelines and context-sensitive design.

The arch, extradosed, and cable-stayed bridges would also likely be the most visually distinctive bridge types. They would likely be seen over a greater distance than the balanced cantilever segmental box girder bridge, and could be considered attractive enough by some people to become a positive signature element to views toward Salmon Bay.

After crossing Salmon Bay, Preferred Alternative IBB-1a and Option IBB-1b would pass through commercial and industrial areas that do not have concentrations of sensitive viewers. As these alternatives approach Northwest Market Street, they would be seen by residents. These alternatives would remove a number of commercial buildings along 14th Avenue Northwest for the elevated Ballard Station (about 80 feet high) that would cross over Northwest Market Street and be seen from residences on 14th Avenue Northwest. The guideway and station, in addition to the change from removing some residences along 14th Avenue Northwest, would also be seen from remaining residences and convert the character of this area from commercial to transportation. For the configuration, height, bulk, and scale of Ballard Station for Preferred Alternative IBB-1a and Option IBB-1b, see Figures 4.3.5-5 and 4.3.5-6.

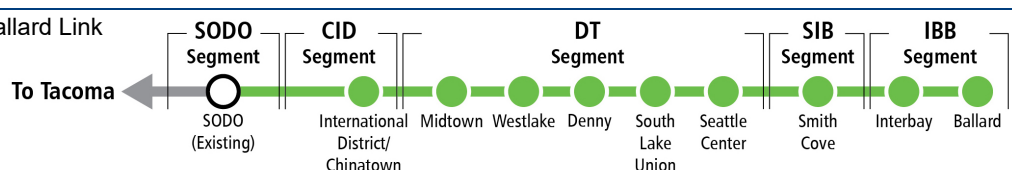


Figure 4.3.5-4. KOP B-8: Looking East from Side Dock North of Main Dock Street Dock toward Ballard Bridge (Represents Views from Water)

Existing Condition



**Preferred Elevated 14th Avenue
Alternative (IBB-1a) (balanced cantilever
segmental box girder bridge type)**



**Elevated 15th Avenue Alternative (IBB-3)
(vertical lift moveable with balanced cantilever
segmental box girder approach bridge type)**



Residences on the east side of 14th Avenue Northwest north of Northwest Market Street would also be removed for the tail track. The character of the area that would be seen from remaining residences would be altered from residential to transportation facility. The alternatives would reduce the existing average visual intactness of the views along 14th Avenue Northwest to low average but would not reduce the above average vividness or the average unity. The alternatives would not reduce the average visual quality of views, and thus would not be a visual impact.

The Preferred Alternative IBB-2a* and Preferred Option IBB-2b* would have the least impact on visual character and visual quality (Table 4.3.5-2) of the alternatives in this segment because most of the alternative and option would be in a tunnel. The primary project component that would be visible to sensitive viewers would be the top 30 feet of the Interbay Station, which would be in a retained cut (in an area that is currently industrial in character) north of West Dravus Street between 17th Avenue West and Thorndyke Avenue West.

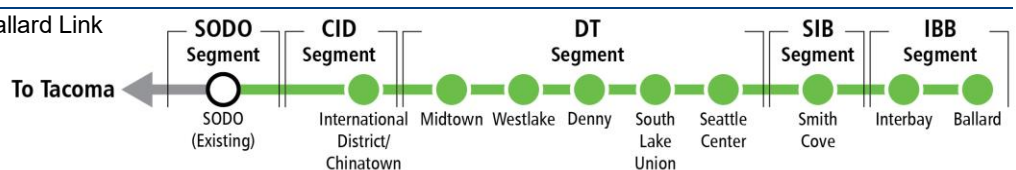


Figure 4.3.5-5. Ballard Station 3D View for Preferred Alternative IBB-1a and Option IBB-1b

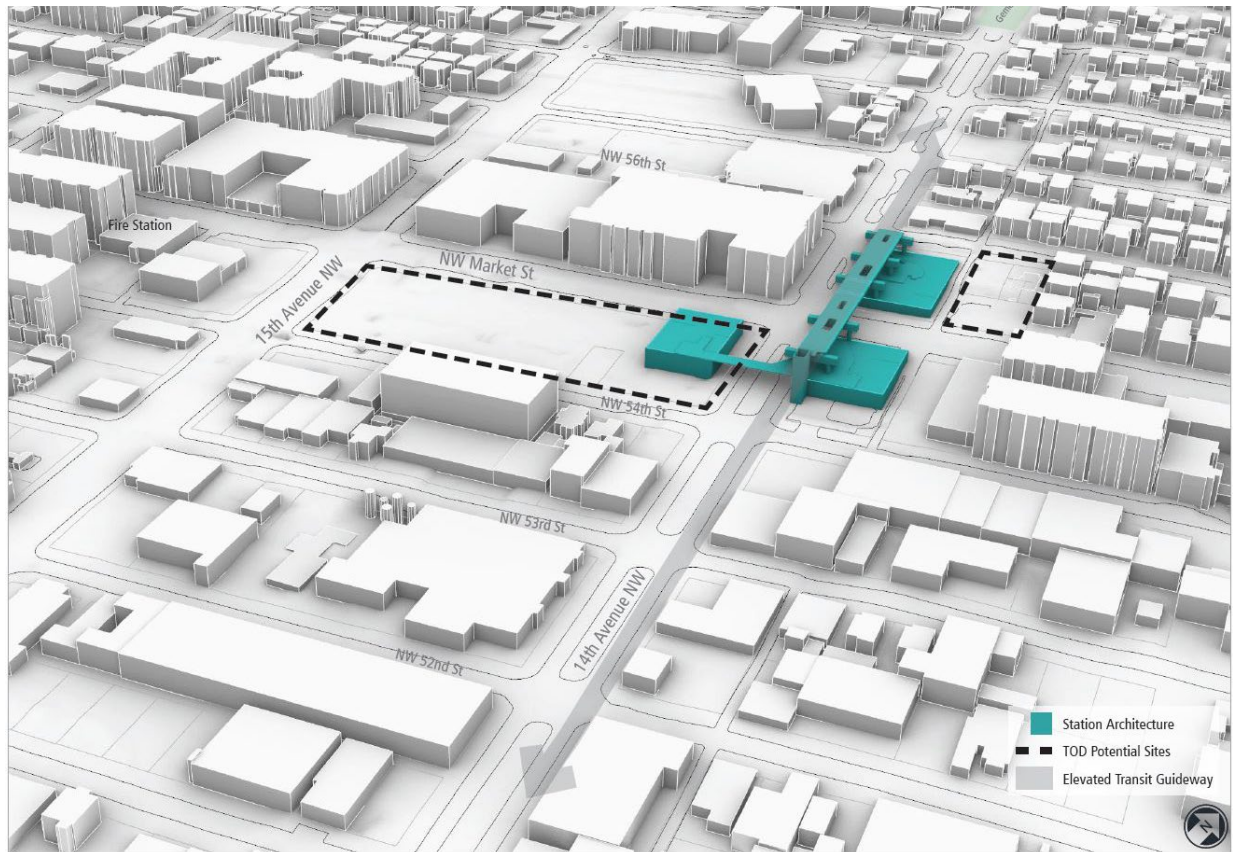


Figure 4.3.5-6. Ballard Station Cross Section for Preferred Alternative IBB-1a and Option IBB-1b

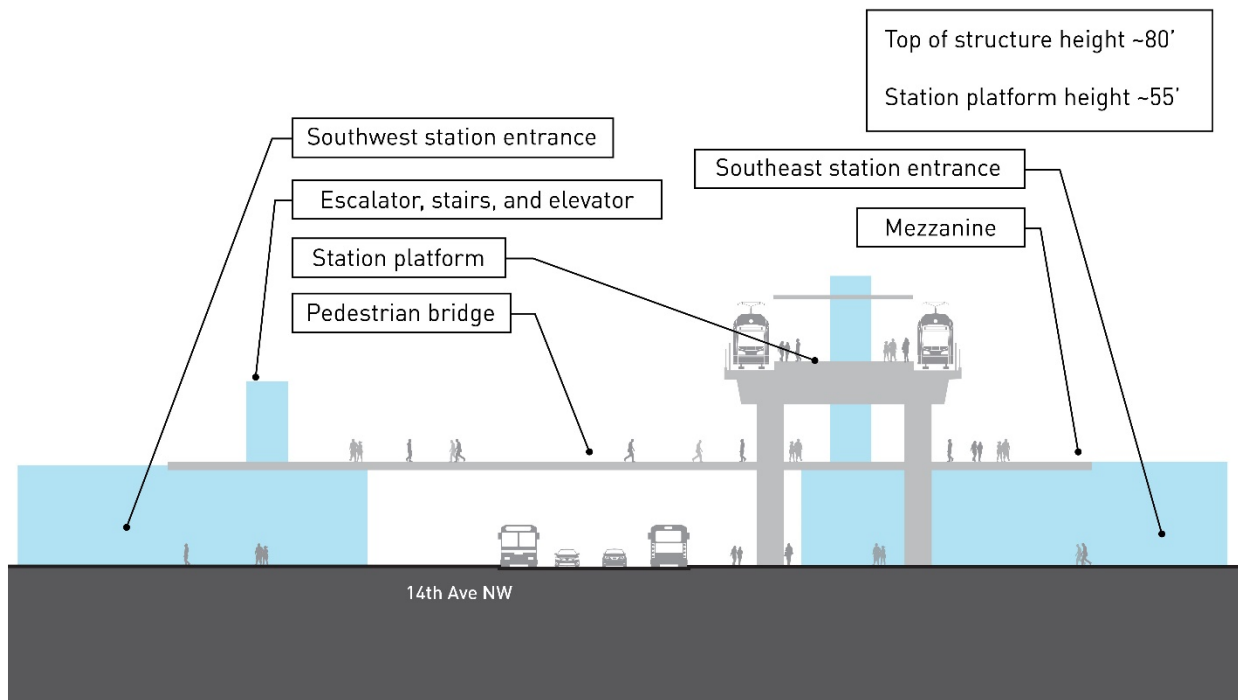


Table 4.3.5-2. Interbay/Ballard Segment: Visual Quality Impacts to Concentrations of Sensitive Viewers

Alternative	Visual Quality Impacts (miles)	Where Visual Quality Impacts Would Occur
Preferred Elevated 14th Avenue (IBB-1a)	0.1	The high visual quality of views from Salmon Bay toward the Ballard Bridge with any of the bridge types would be reduced to average for water-based recreationists. Only the arch, extradosed, and cable-stayed bridge types being considered could also impact visual quality of views from the northwestern part of Queen Anne Hill.
Elevated 14th Avenue Alignment Option (from Prospect Street Station/15th Avenue) (IBB-1b)	0.1	Same as for the Preferred Alternative IBB-1a.
Preferred Tunnel 14th Avenue (IBB-2a)*	0	None.
Preferred Tunnel 15th Avenue Station Option (IBB-2b)*	0	None.
Elevated 15th Avenue (IBB-3)	0.2	The high visual quality of views from Salmon Bay toward the Ballard Bridge by water-based recreationists would be reduced to low average.

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

The presence of the station would convert the industrial character of the area to transportation and would not further reduce the low visual quality of the area. The station would not have a visual impact on the recreationists' views at the soccer field and associated stands at the Interbay Athletic Complex or in the multi-family residential complex to the northeast.

Preferred Alternative IBB-2a* and Preferred Option IBB-2b* would remove a number of commercial and residential buildings along 14th Avenue Northwest and 15th Avenue Northwest, respectively, for the tunnel to Ballard Station. The changes from Preferred Alternative IBB-2a* would be seen from remaining residences but would not reduce the existing average quality views and therefore would not be a visual impact. Changes associated with Preferred Option IBB-2b* would be seen by sensitive viewers in multi-family buildings near the intersection of 15th Avenue Northwest and Northwest Market Street. The tunnel station would somewhat improve the overall visual quality and would be a beneficial change to views toward the station that would be seen by nearby multi-family residences. For the configuration, height, bulk, and scale of Ballard Station for Preferred Alternative IBB-2a* see Figures 4.3.5-7 and 4.3.5-8. The height, bulk, and scale of Ballard Station for Preferred Alternative IBB-2b* would be similar to Preferred Alternative IBB-2a* (see Attachment N.2B, Station 3D Views and Cross Sections, to Appendix N.2, Visual and Aesthetics Technical Report, for additional information).

With Alternative IBB-3 the top of the Interbay Station would be about 80 to 90 feet high. The presence of the alternative in this mostly commercial and industrial area might slightly increase the low visual unity, intactness, and vividness of views from nearby residences. However, it would not change the existing low visual quality. After leaving the Interbay Station, Alternative IBB-3 would pass north through commercial and industrial areas on its alignment to Salmon Bay

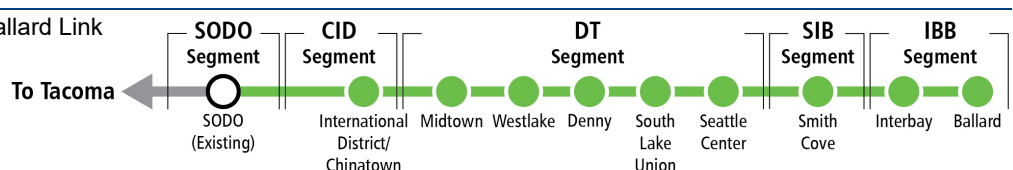


Figure 4.3.5-7. Ballard Station 3D View for Preferred Alternative IBB-2a*

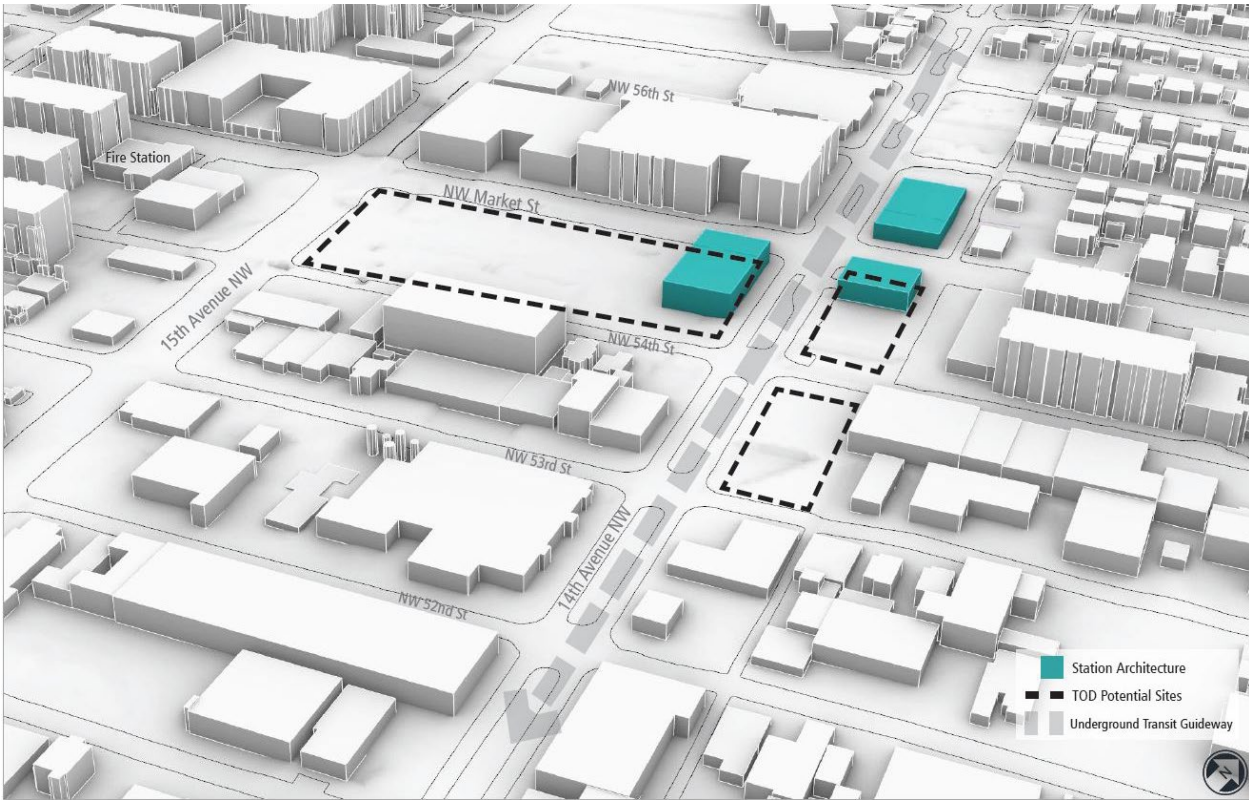
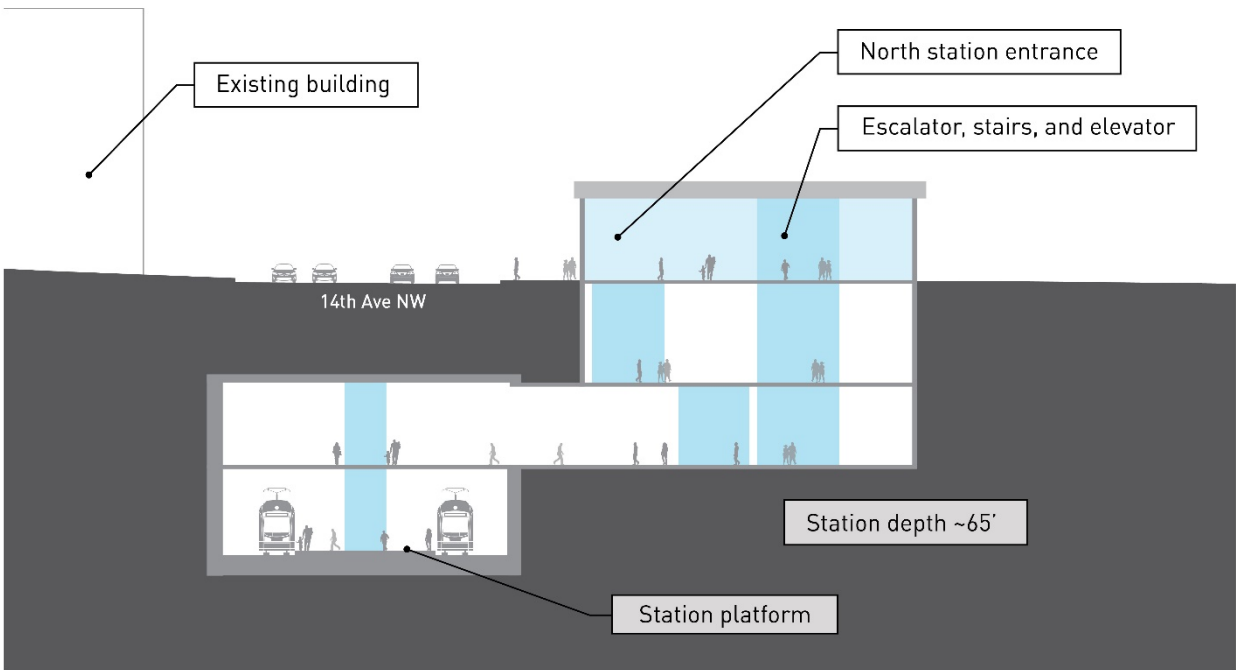


Figure 4.3.5-8. Ballard Station Cross Section for Preferred Alternative IBB-2a*



rather than through the residential areas on the northwest corner of Queen Anne Hill through which Preferred Alternative IBB-1a and Option IBB-1b would pass.

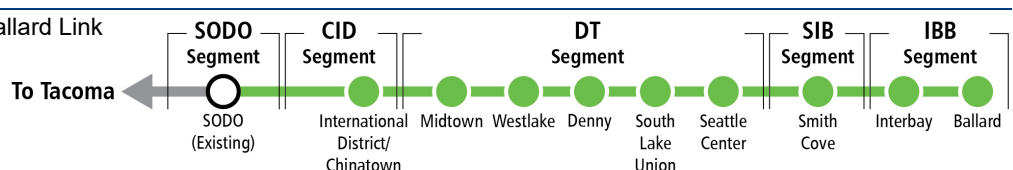
The Alternative IBB-3 Salmon Bay crossing would include a moveable bridge with a clearance of approximately 70 feet over the navigation channel and be about 130 feet west of the Ballard Bridge (see Figure 4.3.5-4). The moveable bridge type depicted in Figure 4.3.5-4 (a vertical-lift moveable bridge with balanced cantilever segmental box girder approach) would not be seen from nearby areas with concentrations of sensitive viewers, but would be seen by water-based recreationists on Salmon Bay. From the west, the vertical-lift moveable bridge (particularly the four support structures) would be seen in front of, and higher than, the Ballard Bridge. The large-scale and vertical orientation of the four support structures of the vertical-lift moveable bridge would interrupt views of the Ballard Bridge and areas behind it and reduce the high intactness and unity of views from the water to the east to low average. These reductions would lower the high visual quality of the view seen by water-based recreationists to low average, which would be a visual impact. Sound Transit is also considering a double-leaf bascule moveable bridge. This type of bridge would include two spans (the bridge deck that vehicles drive on) and, depending upon the design of the bridge, could include truss-like columns and weights at the ends of each span. This bridge type would not have the four towers associated with the vertical-lift bridge simulated on Figure 4.3.5-4 but would also impact the visual quality of views of it by recreationists on Salmon Bay, reducing the visual quality of the view from high to low average. Through design review in coordination with the City of Seattle, Sound Transit would consider measures to minimize impacts to visual quality from the bridge for Alternative IBB-3, such as design guidelines and context-sensitive design.

After crossing Salmon Bay, Alternative IBB-3 would pass through commercial and industrial areas that do not have concentrations of sensitive viewers. The Alternative IBB-3 Ballard Station (which would be about 80 feet in height) and guideway would be seen above 15th Avenue Northwest from nearby multi-family residential buildings. The commercial visual character of the properties south of Northwest Market Street next to the station would change to transportation in character. The presence of the elevated station would somewhat increase the vividness of views in this area to average. With the changes associated with the station and its plaza, the low average visual quality of this area would be increased to average. For the configuration, height, bulk, and scale of Ballard Station for Alternative IBB-3 see Figure 4.3.5-9.

City of Seattle Designated Scenic Routes and Public View Protection

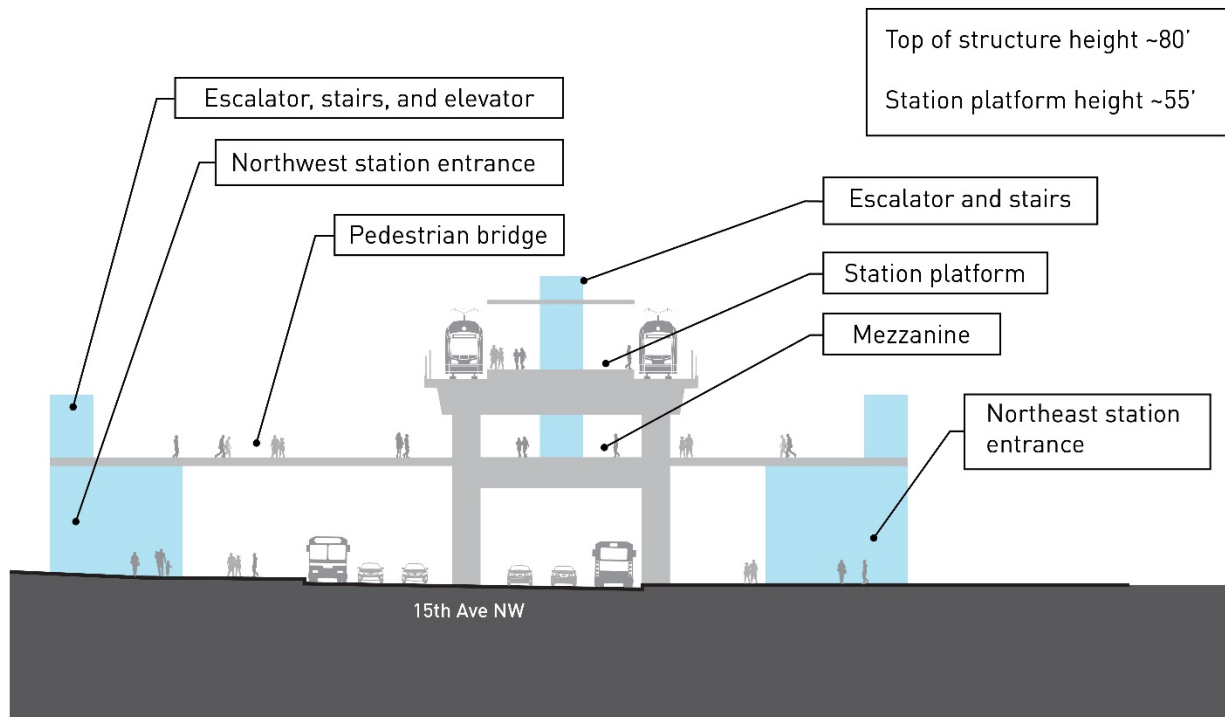
Both the high-level fixed-span and moveable bridge types described above would be clearly seen from the Ballard Bridge, which is a City of Seattle Designated Scenic Route. With Preferred Alternative IBB-1a and Option IBB-1b, views to the east of features such as Salmon Bay, the Lake Washington Ship Canal, and the Cascade Mountains would be partially blocked by columns supporting the fixed-span bridge, depending on where on the bridge travelers would be. However, the elevated guideway would be high enough that it would not block views of these features.

The Alternative IBB-3 moveable bridge over Salmon Bay would be very visible from the Ballard Bridge. The columns of the moveable bridge would block some views of the Lake Washington Ship Canal, Salmon Bay, and the Olympic Mountains, depending on where travelers would be on the Ballard Bridge. The moveable bridge deck would be high enough that it would not block views of these features from most of the Ballard Bridge. The alternative alignment would cross over 15th Avenue Northwest just south of Northwest Market Street but would not block views to the south of features such as the downtown skyline and Mount Rainier. None of the Interbay/Ballard Segment alternatives would intrude upon views from City of Seattle specified



viewpoints, parks, or view corridors of Mount Rainier, the Olympic and Cascade mountains, the downtown skyline, or Puget Sound.

Figure 4.3.5-9. Ballard Station Cross Section for Alternative IBB-3



Light, Glare, and Shadows

Lights associated with trains traveling on the Preferred Alternative IBB-1a and Option IBB-1b elevated guideways would be seen by sensitive viewers on northwest Queen Anne Hill, on the bridge crossing Salmon Bay, and from residences in Ballard at the north end of these alternatives' alignment. Views of lights from passing trains would not impact motorists, pedestrians, and the surrounding area. Lights from trains passing on the elevated guideway portion of the alternative and option would be well above roadways and pedestrian pathways, and if the lights are seen, it would only be for a short duration and would not impact motorists or pedestrians. Train lights would also not impact the surrounding area because of the short duration the lights would be seen as the trains pass. Lights from the elevated Interbay and Ballard stations and the tail track at Ballard Station would be seen by nearby residents but would not have an impact because lighting would be designed in accordance with Sound Transit design measures. Approaches to reduce potential light impacts are described in the design measures discussion in Section 4.3.5.3.1. The elevated guideway would cast shadows on one open space used by the public—Salmon Bay.

Lights from the top of Interbay Station for Preferred Alternative IBB-2a* and Preferred Option IBB-2b* would be seen by nearby residents in the multi-family complexes on West Dravus Street and on the west side of 15th Avenue West but would not have an impact because lighting would be designed in accordance with Sound Transit design measures.

Lights associated with trains traveling on the Alternative IBB-3 elevated guideway would also be seen at night from areas around Salmon Bay and along the Lake Washington Ship Canal. Sensitive viewers who would see the passing lights (and lights from the elevated station) would

be residents near the 15th Avenue Northwest and Northwest Market Street intersection. Views of lights from passing trains would not impact motorists, pedestrians, or the surrounding area because the guideway would be elevated and because of the short duration the lights would be seen as the trains pass. Lights from the elevated Interbay Station (on West Dravus Street), the elevated Ballard Station, and the tail track at Ballard Station would be seen by nearby residents but would not have an impact because lighting would be designed in accordance with Sound Transit design measures. The elevated guideway would also cast shadows on one open space used by the public—Salmon Bay.

4.3.5.4 Construction Impacts

Activities related to building the Ballard Link Extension would have temporary impacts on the visual environment. Section 2.6, Construction Approach, in Chapter 2, Alternatives Considered, provides an overview of potential construction activities and timing. Many of the construction activities would be seen by sensitive viewers. These activities would include moving and storing equipment and materials; exposing soils; glare and lights associated with nighttime construction; and the presence of construction equipment such as cranes, in-water equipment, and barges for bridge construction. Guideway construction is estimated to take between 1 and 2 years, bridge construction between 4 and 5 years, station construction about 2 to 6 years, and tunnel portal construction about 1.5 to 2 years. All of these activities would be seen by the public and some would be near and seen by sensitive viewers. Staging areas would be throughout the project corridor and would range in size from about 1 to 5 acres, depending on the location and construction activity. Views toward the Ballard Link Extension by sensitive viewers would change during the construction period, and there would be impacts of varying degrees.

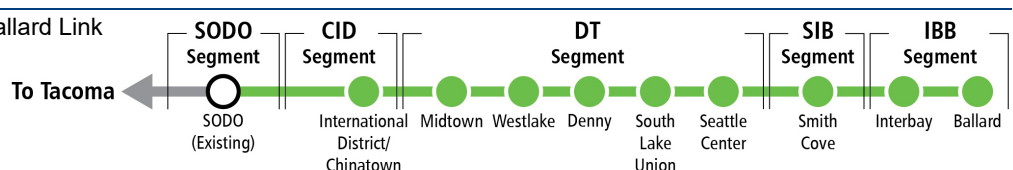
During construction, Sound Transit would provide visual screening where appropriate along some areas where construction activities would be seen by nearby sensitive viewers. Visual screening would include construction of a barrier to screen ground-level views into construction areas where practical. Nighttime construction lighting would be shielded and directed downward to avoid light spillover onto adjacent sensitive uses.

4.3.5.5 Indirect Impacts of the Build Alternatives

The Ballard Link Extension could support changes to nearby land uses, as allowed in adopted plans. Increases in the density of development as allowed by zoning could occur. This might result in changes to the visual setting of the areas where the Ballard Link Extension would create changes and support new and more dense development around station areas. The portion of the Ballard Link Extension that would most noticeably reinforce a dense large-scale urban environment would be the Ballard Station in the Interbay/Ballard Segment.

4.3.5.6 Mitigation Measures

In addition to the design measures described in the Impacts Common to All Alternatives section, Sound Transit has developed mitigation measures for areas with visual impacts. Site-specific mitigation measures are described below by segment. It should be noted that the use of vegetation to buffer or screen views of Build Alternative elements would not provide immediate mitigation. Based upon Sound Transit safety setback and clear zone requirements and depending upon the location of the vegetation in relationship to sensitive viewers, distance to Build Alternative elements, size of the elements, and the growth rates of the vegetation selected, effective screening of the elements could take between 5 years and 10 years and perhaps as many as 15 years. Impacts associated with some of the higher elements of the



alternatives, such as bridges crossing Salmon Bay, could not be fully mitigated. The impacts of the elements on sensitive viewers could be lessened with the strategic planting of vegetation, but the elements themselves would be too large to screen and they would produce unavoidable impacts.

The areas for each segment where there are visual impacts can be found in Figures 4.3.5-1 and 4.3.5-3. Most of the visual quality impacts would be mitigated by planting screening vegetation along the edge of construction footprints or within residential properties (if desired by residents) to screen views of new project components and/or areas that are currently screened by vegetation that would be removed. Mitigation measures will be further refined if necessary, in coordination with the City of Seattle as the project design advances.

4.3.5.6.1 South Interbay Segment

Area 1: Kinnear Park

Applies to Alternative SIB-3.

- Replant vegetation within the construction footprint using the same or similar plant species and spacing patterns as the vegetation that was removed.

Area 2: Southwest Queen Anne Greenbelt

Applies to Alternatives SIB-2 and SIB-3.

- Following construction, plant screening vegetation where appropriate along the edge of the construction footprint.
- Following construction, replant vegetation within the construction footprint using the same or similar plant species and spacing patterns as the vegetation that would be removed.

Area 3: Residences to the Northeast of Interbay Athletic Complex

Applies to Preferred Alternative SIB-1 and Alternative SIB-3.

- Following construction, plant screening vegetation where appropriate along the west edge of the construction footprint where it would be far enough away from the elevated guideway over time to block views of the BNSF Railway tracks and stationary freight train cars.

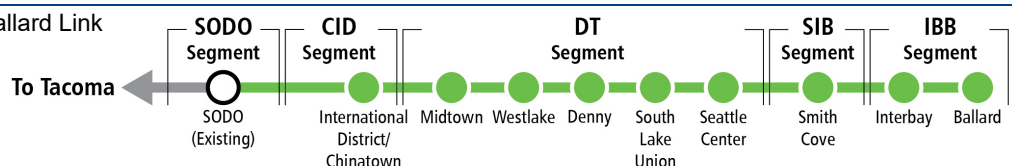
4.3.5.6.2 Interbay/Ballard Segment

Area 1: Salmon Bay East of Ballard Bridge

Because the bridge for the Salmon Bay crossing would be passing over water and through airspace above the water, there would be no opportunities for screening views of the bridge from the water. Therefore, no mitigation measures related to screening views are recommended for Preferred Alternative IBB-1a or Option IBB-1b.

Area 2: Salmon Bay West of Ballard Bridge

The bridge for the Salmon Bay crossing would be passing over water and through airspace above the water, which would offer no opportunities for screening views of the bridge. Therefore, no mitigation measures related to screening views are recommended for Alternative IBB-3.



4.3.6 Air Quality

4.3.6.1 Affected Environment

4.3.6.1.1 Regional Topography and Climate

The project is in the city of Seattle in King County within the Puget Sound Lowlands region. The climate in the region is a product of the interaction between large-scale wind and weather patterns and the complex topography of the region. Winter temperatures generally range from 10 degrees Fahrenheit to 45 degrees Fahrenheit, and summer temperatures generally range from 50 degrees Fahrenheit to 78 degrees Fahrenheit. Air pollution is usually most noticeable in the late fall and winter season, under conditions of clear skies, light wind, and a sharp temperature inversion. These conditions may prevail a few days before a weather system moves through that removes the pollution by wind and rain (Western Regional Climate Center 2019).

4.3.6.1.2 Criteria Pollutants

Air quality is affected by pollutants that are generated by both natural and human-made sources. In general, the largest human-made contributors to air emissions are fossil fuel combustion sources such as transportation and industrial operations. The largest contributors of pollution related to transportation are motor vehicles. Pollutants of concern for transportation typically include carbon monoxide; PM₁₀ and PM_{2.5}; ozone and its precursors including nitrogen oxides and volatile organic compounds; mobile source air toxics; and greenhouse gases.

4.3.6.1.3 Existing Air Quality

The United States Environmental Protection Agency has established National Ambient Air Quality Standards to protect public health and welfare, with an adequate margin of safety. The Puget Sound Clean Air Agency monitors criteria air pollutant concentrations at several locations in Seattle. The monitoring stations closest to the project corridor are at 4700 East Marginal Way, 4103 Beacon Hill South, and 10th Avenue South and South Weller Street in the Chinatown-International District. Appendix L4.6B, Air Monitoring Data from the Study Area, shows the criteria air pollutant concentrations monitored at these stations during 2017 to 2019. Monitored concentrations of carbon monoxide, nitrogen oxides, PM₁₀, ozone, and sulfur dioxide are below the applicable National Ambient Air Quality Standards in all 3 years. Although the 98th-percentile 24-hour average concentrations of PM_{2.5} measured in 2017 and 2018 are greater than the PM_{2.5} standard of 35 micrograms per cubic meter, the 98th percentile of the daily concentrations of PM_{2.5} averaged over 3 years is lower than the standard. Therefore, it is not considered a violation to the PM_{2.5} National Ambient Air Quality Standard.

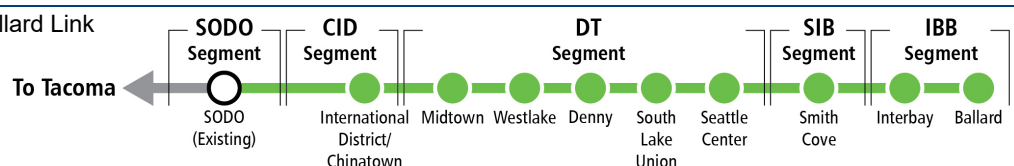
4.3.6.1.4 Attainment Status

The central Puget Sound region was classified as a nonattainment area by United States Environmental Protection Agency for carbon monoxide in 1978. In 2016, the Puget Sound region reached the end of a 20-year maintenance period for carbon monoxide, and

Key Terms

A **nonattainment area** is an area that has not consistently met the clean air levels set by the United States Environmental Protection Agency in the National Ambient Air Quality Standards.

Transportation Conformity, for the purpose of the state air quality implementation plan, means that transportation activities will not cause new air quality violations, worsen existing violations, or delay timely attainment of the National Ambient Air Quality Standards.



transportation conformity is no longer required for carbon monoxide in the region (Puget Sound Regional Council 2018).

Three areas in the Puget Sound region were designated as nonattainment for PM₁₀ in 1987, comprising the Seattle Duwamish Waterway industrial area, the Kent Valley, and the Tacoma Tideflats. In 2014, the United States Environmental Protection Agency approved a limited maintenance plan for these three areas, which ensures continued maintenance until 2021. The project study area is in attainment or unclassified for all other criteria pollutants.

4.3.6.1.5 Mobile Source Air Toxics

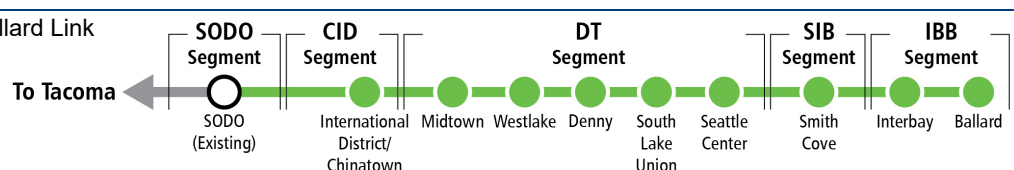
Mobile source air toxics are hazardous air pollutants emitted from on-road and non-road vehicles that can cause cancer and noncancer health risks. Transportation projects may affect the regional or local air toxic concentrations due to the mobile source air toxics emissions from vehicles. Nationwide mobile source air toxics emissions are expected to be lower than present levels in future years as a result of United States Environmental Protection Agency's national emissions control programs and fuel economy standards. Estimated emissions using the United States Environmental Protection Agency's MOVES 2014a model indicate that even if vehicle miles traveled increase by 45 percent from 2010 to 2050 as forecast, a combined reduction of 91 percent in the total annual emissions for the priority mobile source air toxics is projected for the same time period. Diesel particulate matter is the dominant component of mobile source air toxics emissions, making up 50 to 70 percent of all priority mobile source air toxics pollutants by mass, depending on calendar year (Federal Highway Administration 2016).

Washington State Department of Ecology began monitoring air toxics at the Seattle Beacon Hill monitoring station in 2000. Carbon tetrachloride presented the highest potential cancer risk from air toxics monitored at the Seattle Beacon Hill site. Carbon tetrachloride is relatively common and has a long half-life, and concentrations are similar in urban and rural areas. Benzene ranked second, and it comes from a variety of sources including vehicle exhaust, wood burning, evaporation of industrial solvent, and other combustion (Puget Sound Clean Air Agency 2018).

4.3.6.1.6 Greenhouse Gases

Greenhouse gases include both naturally occurring and human-made gases that trap heat in the earth's atmosphere. Greenhouse gases include, but are not limited to, carbon dioxide, methane, nitrous oxide, hydrochlorofluorocarbons, perfluorocarbons, and sulfur hexafluoride. These gases trap the energy from the sun and help maintain the temperature of the Earth's surface, creating a process known as the greenhouse effect. The accumulation of greenhouse gases in the atmosphere influences the long-term range of average atmospheric temperatures.

According to the greenhouse gas inventory for King County (ICLEI USA 2019), the "geographic-plus" greenhouse gas emissions totaled 20.1 million metric tons of carbon dioxide equivalent in the county in 2017. The geographic-plus inventory quantifies all emissions that physically occur in King County, plus emissions associated with electricity used in King County regardless of where it was produced. The largest sources of geographic-plus greenhouse gas emissions were the built environment (62 percent), dominated by greenhouse gas emissions from residential and commercial energy usage, and transportation (36 percent), dominated by greenhouse gas emissions from passenger vehicles. Emissions in King County decreased by 1.2 percent between 2007 and 2017.



4.3.6.1.7 Sensitive Receptors

Sensitive air quality receptors typically include land uses where people are most vulnerable to air pollutants, such as hospitals, schools, daycare facilities, elderly housing, and convalescent facilities. Table L4.6B-1 in Appendix L4.6B is representative of the existing air quality conditions experienced by sensitive receptors near the proposed project.

The land uses in the vicinity of the Ballard Link Extension are commercial and industrial in the SODO Segment, and primarily commercial with some residential in the Downtown, South Interbay, and Interbay/Ballard segments. Sensitive receptors such as schools and hospitals are present throughout the Ballard corridor.

4.3.6.2 Environmental Impacts No Build Alternative

Under the No Build Alternative, vehicle miles traveled for cars and light trucks would increase over existing conditions by about 7 percent. However, pollutant emissions for all criteria pollutants would be lower than existing levels because of cleaner automobiles. There would be no construction-related greenhouse gas emissions because the project would not be built.

4.3.6.3 Environmental Impacts of the Build Alternatives during Operation

Long-term project impacts were evaluated based on the following analysis years and scenarios:

- 2019: existing condition
- 2042: No Build Alternative and Build Alternatives (both West Seattle Link Extension and Ballard Link Extension in operation)

The Build Alternative evaluated is a combination of alternatives intended to represent the range of alternatives for the project. For the West Seattle Link Extension, it included Preferred Alternative SODO-1a, Preferred Alternative DUW-1a, Preferred Alternative DEL-1a, Preferred Alternative WSJ-1, Preferred Alternative WSJ-2, Preferred Alternative WSJ-3a*, and Preferred Option WSJ-3b*. For the Ballard Link Extension, it included Preferred Alternative SODO-1a, Alternative CID-1a*, Preferred Alternative DT-1, Preferred Alternative SIB-1, Preferred Alternative IBB-1a, Preferred Alternative IBB-2a*, and Preferred Option IBB-2b*.

The Build Alternative for 2042 includes the West Seattle Link Extension, as well as other Sound Transit 3 planned projects, due to the cumulative nature of the air quality analysis.

4.3.6.3.1 Criteria Pollutants

Vehicle emissions were evaluated based on the trend of the vehicle miles traveled in the Puget Sound region under the No Build Alternative and project Build Alternatives. Vehicle emissions in the region would decrease when the region's vehicle miles traveled decreases. In the long-term, as shown in Table 4.3.6-1, regional vehicle miles traveled and average daily traffic in 2042 for the Build Alternatives would be lower than the No Build Alternative when some people switch from driving to using light rail, thereby reducing regional vehicle emissions of criteria pollutants, mobile source air toxics, and greenhouse gases. Regional passenger vehicle average daily traffic would decrease, while vehicle miles traveled or average daily traffic of heavy duty trucks would not change.

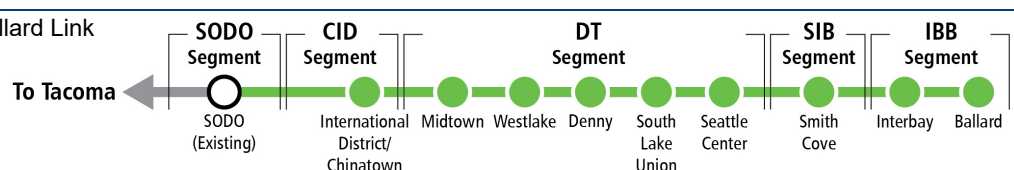


Table 4.3.6-1. Regional Vehicle Miles Traveled and Average Daily Traffic Change

Parameter	2019 Existing Condition	2042 No Build	2042 Build	Difference in 2042 Build versus 2042 No Build
Cars and light trucks (regional vehicle miles traveled per day)	79,532,000	85,364,000	85,247,000	-117,000
Heavy duty trucks (regional vehicle miles traveled per day)	9,012,000	11,269,000	11,269,000	0
Transit buses (regional vehicle miles traveled per day)	205,100	257,700	259,900 ^a	2,200
Streetcar (regional vehicle miles traveled per day)	700	3,500	3,500	0
Cars/light trucks (average daily traffic)	10,433,000	11,995,000	11,977,000	-18,000
Heavy duty trucks (average daily traffic)	502,000	625,000	625,000	0
Transit buses (average daily traffic)	10,500	13,400	13,300	-100
Streetcar (average daily traffic)	200	400	400	0

^a Because of the shift from cars and trucks to light rail and transit buses, the Build Alternatives would result in an increase in transit bus miles compared to the No Build Alternative.

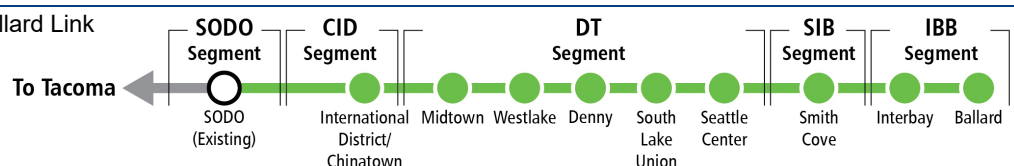
There would be a slight increase in transit bus vehicle miles traveled with operation of the Build Alternatives because more people would use transit buses to travel to and from the light rail stations, but the increase would be minor compared to the reduction of vehicle miles traveled from passenger vehicles. Therefore, the overall regional vehicle emissions are expected to decrease with the Build Alternatives, and the project is expected to have long-term benefits to regional air quality by reducing pollutants emissions.

4.3.6.3.2 Mobile Source Air Toxics

Sound Transit evaluated potential mobile source air toxics effects from project operation following the Federal Highway Administration's memorandum, *Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents* (Federal Highway Administration 2016). Although there are no established criteria for determining when mobile source air toxics emissions related to transit projects should be considered a problem, the Federal Highway Administration guidance provides an approved approach to evaluating potential effects. According to the guidance, projects that improve operations of highway, transit, or freight without adding substantial new capacity or without creating a facility that has meaningfully increased mobile source air toxics emissions are considered to have low potential mobile source air toxics effects.

The new light rail would be powered by electricity; therefore, there would be no direct emissions of mobile source air toxics from the light rail operation. Because the project is expected to reduce regional vehicle miles traveled and would not involve adding diesel vehicle travel into the region, high levels of mobile source air toxics impacts are unlikely. However, the project may change localized vehicle traffic patterns at some locations, such as near the stations, which has low potential for mobile source air toxics effects.

The amount of mobile source air toxics emitted from vehicles traveling on roadways is proportional to the number of vehicle miles traveled, assuming other variables such as the



roadway vehicle mix or light rail power source do not change. As shown in Section 4.3.6.3.3, Greenhouse Gases, the vehicle miles traveled for the Build Alternatives in the region would be lower than those for the No Build Alternative. Therefore, the overall mobile source air toxics emissions from the Build Alternatives would decrease compared to No Build Alternative due to the removal of vehicles from roadways when people switch from driving to take light rail transit.

Light rail operations would have the potential to increase mobile source air toxics emissions when vehicles drive to or from the light rail stations. Therefore, under the Build Alternatives there may be localized areas where ambient concentrations of mobile source air toxics would be higher than under the No Build Alternative. However, the magnitude and the duration of these potential effects cannot be reliably quantified due to incomplete or unavailable information in forecasting project-specific health impacts. Also, on a region-wide basis, the United States Environmental Protection Agency's vehicle and fuel regulations, coupled with fleet turnover, will cause substantial reductions over time such that in almost all areas the mobile source air toxics levels in the future will be substantially lower than today. Local conditions may differ from these national projections in terms of fleet mix and turnover, vehicle-miles-traveled growth rates, and local control measures. However, the United States Environmental Protection Agency projected reductions are so substantial (even after accounting for vehicle-miles-traveled growth) that mobile source air toxics emissions in the study area are likely to be lower in the future as well.

The mobile source air toxics analysis above is a basic analysis of the likely mobile source air toxics impacts of the proposed project. The limitations of information and methodology of the analysis is discussed Appendix L4.6C, Limitations of the Mobile Source Air Toxics Analysis.

4.3.6.3.3 Greenhouse Gases

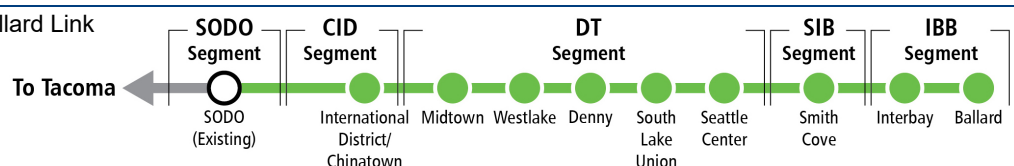
Greenhouse gas effects from project operation would be different between the No Build Alternative and the Build Alternatives due to emissions from regional vehicle miles traveled and light rail energy consumption. Greenhouse gas emissions from regional vehicle miles traveled were estimated using emission factors derived from the United States Environmental Protection Agency's MOVES 2014b model. The MOVES model estimates the direct emissions from vehicles. The embodied greenhouse gases associated with producing fuel were calculated using the Federal Highway Administration fuel-cycle factor of 0.27 (Washington State Department of Transportation 2018). The fuel cycle includes emissions released through extraction, refining, and transportation of fuels used by vehicles traveling in the study area. Detailed emissions calculations are included in Appendix L4.6D, Greenhouse Gas Emissions Calculations.

As shown in Table 4.3.6-2, in the project horizon year of 2042, the Build Alternatives would have lower greenhouse gas emissions compared to the No Build Alternative due to the increase in light rail ridership and the subsequent reduction in regional vehicle miles traveled.

Table 4.3.6-2. Greenhouse Gas Operational Emissions from Regional Vehicle Miles Traveled

Parameter	2019 Existing Condition	2042 No Build	2042 Build	Difference in 2042 Build versus 2042 No Build
Vehicle miles traveled (miles per day) ^a	88,749,100	96,890,700	96,775,900	-114,800
Carbon dioxide equivalent (metric tons per year)	21,411,936	17,955,605	17,944,663	-10,941

^a Vehicle miles traveled include cars, trucks, and transit buses.



The light rail trains would be electrically powered; therefore, the project would not have direct greenhouse gas emissions. Indirect emissions of greenhouse gases associated with the energy use of the light rail operation are discussed under Section 4.3.6.5, Indirect Impacts of the Build Alternatives.

4.3.6.3.4 Conformity Determination

As discussed in Section 4.3.6.1.4, Attainment Status, because the area is under a limited PM₁₀ maintenance plan, a regional emissions analysis is no longer required to demonstrate conformity. However, the project is subject to project-level PM₁₀ conformity requirements.

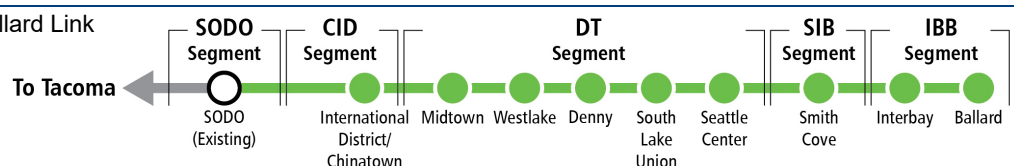
The West Seattle and Ballard Link Extensions are listed in Puget Sound Regional Council's long-range transportation plan, *The Regional Transportation Plan – 2018* (Puget Sound Regional Council 2018). Conformity demonstration of the plan is included in Appendix D of the 2018 Regional Transportation Plan. Inclusion of the project in the Regional Transportation Plan demonstrated that the project would be consistent with the regional Transportation Improvement Program and would not cause substantial adverse regional air quality impacts.

Potential localized PM₁₀ impacts of the project were analyzed following the criteria listed in *Transportation Conformity Guidance for Quantitative Hot-spot Analyses in PM_{2.5} and PM₁₀ Nonattainment and Maintenance Areas* (United States Environmental Protection Agency 2015). According to this guidance, the first step in the PM₁₀ hot-spot evaluation is to determine if the project is a "project of air quality concern." A project that is not a project of air quality concern is unlikely to cause localized PM₁₀ hot-spot impacts.

United States Environmental Protection Agency specified in Code of Federal Regulations Title 40, Section 93.123(b)(1) that projects of air quality concern are certain highway and transit projects involving significant levels of diesel vehicle traffic, such as major highway projects and projects at congested intersections that handle significant diesel traffic, or any other project identified in the PM_{2.5} or PM₁₀ Transportation Improvement Program as a localized air quality concern. A preliminary evaluation of PM₁₀ hot-spot impacts was conducted for the project following the criteria described in Code of Federal Regulations Title 40, Section 93.123. Sound Transit determined that the project would not be a project of air quality concern based on the United States Environmental Protection Agency criteria discussed above, because it would not attract diesel traffic into the project study area or cause a large amount of diesel traffic aggregating at a single location. Therefore, the project is not expected to cause or contribute to new localized PM₁₀ violations or increase frequency or severity of existing violations. As such, the project meets the conformity requirements. Additional information on the project not being a project of air quality concern is included in Appendix L4.6E, Evaluation of PM₁₀ Hot Spots Impacts.

4.3.6.3.5 Minimum Operable Segments

With the West Seattle and Ballard Link Extensions M.O.S. and the Ballard Link Extension-only M.O.S., long-term reduction in pollutants and greenhouse gases would occur as described in Sections 4.3.6.3.1 and 4.3.6.3.3 because vehicle miles traveled would be reduced as people switch from personal vehicles to light rail. However, because there would be fewer stations with each M.O.S. than with the full Build Alternatives, there would be less of a reduction in vehicle miles traveled and, consequently, less of a reduction of pollutants and greenhouse gases. Because each M.O.S. would be shorter than the full Build Alternatives, they would also have fewer air quality impacts during construction. Additional information about the M.O.S. is provided in Section 2.4, Minimum Operable Segment and Interim Terminus, in Chapter 2, Alternatives Considered.



4.3.6.4 Environmental Impacts of the Build Alternatives during Construction

4.3.6.4.1 Criteria Pollutants

Project construction activities could result in short-term increases in dust and equipment-related emissions in and around the project construction area. Exhaust emissions during construction would be generated by fuel combustion in motor vehicles and construction equipment, and particulate emissions would result from soil disturbance, earthwork, and other construction activities. Construction vehicle activity and disruption of normal traffic flow may result in increased motor vehicle emissions within certain areas. Potential air quality impacts would be short-term, occurring only while construction work is in progress. Best management practices would be implemented to ensure that concentrations of air pollutants are minimized during the construction phase.

According to Code of Federal Regulations Title 40, Section 93.123(c)(5), because the duration of major construction activities for the project would not exceed 5 years in any one location, construction emissions are considered a temporary impact and a project-level conformity analysis is not required.

Lower levels of criteria pollutant emissions would occur from construction of either M.O.S. for the Ballard Link Extension.

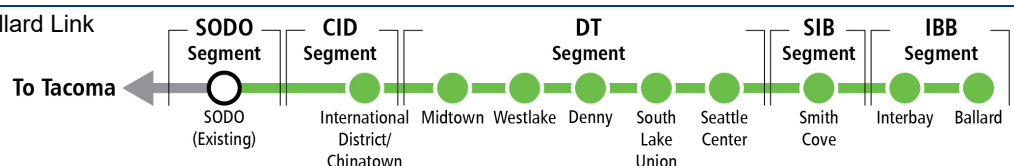
4.3.6.4.2 Greenhouse Gases

Project construction would have the potential to emit greenhouse gases from the construction equipment and vehicles. Greenhouse gas emissions from project construction were estimated using the methodology and emission factors of the FTA *Greenhouse Gas Estimator* (FTA 2021), based on related construction activities on a per track mile basis by profile (at-grade, tunnel, or elevated). Because energy use and the associated greenhouse gas emissions are correlated to total project costs, the analysis compared the greenhouse gas emissions for both the overall low- and high-cost project scenarios of the Build Alternatives. Table 4.3.6-3 shows the estimated minimum and maximum construction-related greenhouse gas emissions for the low-cost and high-cost project scenarios. The low-cost scenario includes Alternative CID-2a, Preferred Alternative DT-1, Preferred Alternative SIB-1, and Preferred Alternative IBB-1a. The high-cost scenario includes Alternative CID-1a*, Alternative DT-2, Preferred Alternative SIB-3, and Preferred Alternative IBB-2b*. Alternative CID-1a* would require the existing Stadium Station to be rebuilt. Detailed emissions calculations are provided in Appendix L4.6D.

Table 4.3.6-3. Greenhouse Gas Emissions during Construction

Scenario	Carbon Dioxide Equivalent (metric tons)
Ballard Link Extension Build Alternative: Low Cost	1,654,311
Ballard Link Extension Build Alternative: High Cost	2,426,895

The short-term greenhouse gas emissions during the construction period of the project's Build Alternatives would be temporary, and the implementation of best management practices, such as using energy-efficient construction equipment and limiting the equipment and vehicle idling time during construction, would reduce greenhouse gas emissions from construction activities. In addition, the greenhouse gas emissions from the construction phase of the project would be offset by the emission reduction during project operation, well within the project's life span, due



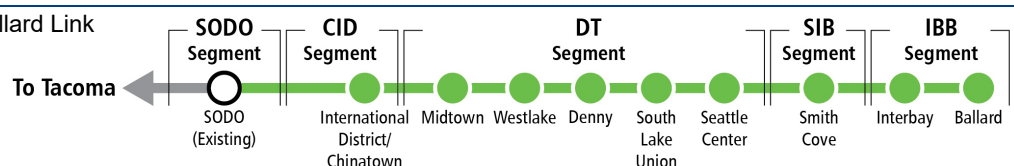
to the reduction of regional vehicle miles traveled, as indicated in Table 4.3.6-2. Lower levels of greenhouse gas emissions would occur for construction of either Ballard Link Extension M.O.S.

4.3.6.5 Indirect Impacts of the Build Alternatives

Indirect air quality impacts from a light rail project are usually related to the power generation that supplies the electricity to the light rail operation. The project would use electricity supplied by Seattle City Light that has achieved zero net greenhouse gas emissions since 2005. In addition, Sound Transit's 2019 *Sustainability Plan Update* (Sound Transit 2019) and the Sound Transit 3 Plan (Sound Transit 2016) committed the agency to reduce greenhouse gas emissions, expand the use of renewable energy, and make all facilities and electricity sources carbon neutral by 2030. Because the project would be completed by 2037, operation of the light rail would use 100 percent carbon-neutral energy. Therefore, there would be no indirect greenhouse gas emissions associated with the electricity use of the light rail operation.

4.3.6.6 Mitigation Measures

Operation and construction of the project would comply with federal, state, and regional regulations related to air quality. Potential impacts to air quality would be minimized or avoided through project planning, design, and the application of required best management practices during operation and construction, as described in Appendix L4.6F, Air Quality Best Management Practices. The air pollutant and greenhouse gas emissions analyses demonstrated that no substantial air quality impacts are expected to occur during the operation and construction of the project; therefore, no mitigation measures would be required.



4.3.7 Noise and Vibration

4.3.7.1 Affected Environment

Section 4.2.7.1.1, Background Information on Noise and Vibration Analysis, describes how noise and vibration are measured and the criteria used to analyze impacts. This section summarizes sensitive land uses and the existing noise and vibration levels within the Ballard Link Extension study area. The study area for noise is based on measured noise levels of the existing fleet of Sound Transit light rail vehicles, operational schedule, and train speeds, and is large enough to capture all potential noise impacts from system operations. The study area for noise is at least 500 feet from the track alignments, and the vibration study area is 450 feet for Category 1 land uses and 200 feet for Category 2 and 3 land uses. Over 1,400 noise and/or vibration-sensitive properties were identified within the Interbay-Ballard study area and over 2,000 locations between the Downtown tunnel portals and the Ballard Stations.

Noise- and vibration-sensitive land uses in the Ballard Link Extension study area include FTA Category 1 land uses (highly noise- and vibration-sensitive such as research facilities and performance or recording venues), Category 2 residential (single- and multi-family residences and fire stations), Category 3 institutional (schools, including daycares with educational components), and some parks.

Category 1 and special buildings for noise and vibration are presented in Tables 4.3.7-1 and 4.3.7-2, respectively. Because these receivers are the most sensitive to noise and vibration, they require special consideration in this analysis. The three buildings listed as noise sensitive are in areas with high existing ambient noise levels, and the interior of the facilities have been modified as needed to operate in these areas, including sound booths and other acoustical treatments; therefore, operations of these business would not likely experience interior noise impacts from the project. However, exterior noise levels were still predicted and compared to the FTA Category 1 criteria.

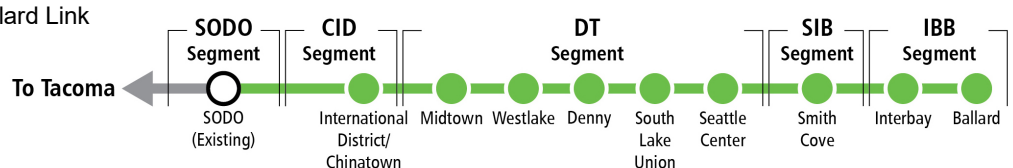
Table 4.3.7-1. Category 1 and Special Building Noise-Sensitive Receivers – Ballard Link Extension

Occupant	Segment	Address	Description of Use
iHeart Media	South Interbay	645 Elliott Avenue West	Radio station with recording booths
Victory Studios	South Interbay	2247 15th Avenue West	Recording studio with isolated booths, editing suites, and video shoot rooms
Seattle Film Institute	Interbay/Ballard	3210 16th Avenue West	Private film school with editing booth, theater, and classrooms



Table 4.3.7-2. Category 1 and Special Building Vibration-Sensitive Receivers – Ballard Link Extension

Segment	Occupant	Address	Description of Use
Downtown	5th Avenue Theatre	1308 5th Avenue	Historic theater with live performances
	ACT Theatre	700 Union Street	Theater for live plays
	Kineta	219 Terry Avenue North	Biotechnology company with lab space
	Biodesix	219 Terry Avenue North	Biotechnology company with lab space
	Genewiz	219 Terry Avenue North	Biotechnology company with lab space
	Seattle Children's Research Institute Center for Global Infectious Disease Research	307 Westlake Avenue North	Pediatric research center
	Institute for Systems Biology	401 Terry Avenue North	Non-profit research institution
	Just Biotherapeutics	401 Terry Avenue North	Biotechnology company with lab space
	Juno Therapeutics	400 Dexter Avenue North	Biopharmaceutical company with lab space
	Allen Institute	615 Westlake Avenue North	Non-profit bioscience research institution
	UW Medicine South Lake Union Campus	850 Republican Street	Graduate medical school research labs
	Cascade Public Media (KCTS 9)	401 Mercer Street (Seattle Center)	Public television studio
	Seattle Opera and KING FM	363 Mercer Street (Seattle Center)	Rehearsal space for Seattle Opera and broadcast space for KING FM
	McCaw Hall	321 Mercer Street (Seattle Center)	Concert hall that hosts the Seattle Opera and Pacific Northwest Ballet performances and Seattle Center Studios recording events
	Pacific Northwest Ballet (Phelps Center)	301 Mercer Street (Seattle Center)	Ballet rehearsal space and Expo Hall in basement level
	Cornish Playhouse	201 Mercer Street (Seattle Center)	Theater associated with the Cornish School for the Arts
	Seattle Repertory Theatre	155 Mercer Street (Seattle Center)	Two theaters (Bagley Wright and Leo K.) with live performances
	Seattle International Film Festival (SIFF) Film Center	305 Harrison Street (Seattle Center)	SIFF Theater
	The Vera Project	305 Harrison Street (Seattle Center)	Music and art non-profit with performing and recording spaces
	K.E.X.P.	472 1st Avenue North (Seattle Center)	Radio station with recording studio, DJ booths, and edit suites



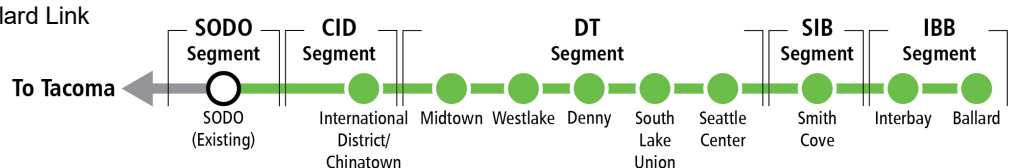
Segment	Occupant	Address	Description of Use
South Interbay	iHeart Media	645 Elliott Avenue West	Radio station with recording booths
	Nixelis	645 Elliott Avenue West	Contract research organization with lab space
	Luminex	645 Elliott Avenue West	Lab space to assemble and test vibration sensitive equipment with lasers
	Victory Studios	2247 15th Avenue West	Recording studio with isolated booths, editing suites, and video shoot rooms
Interbay/Ballard	Friedman & Bruya	3012 16th Avenue West	Analytical laboratory
	Seattle Film Institute	3210 16th Avenue West	Private film school with editing booth, theater, and classrooms
	Specialty Vet Path	3450 16th Avenue West, Suite #303	Veterinary diagnostic laboratory and research services
	Bardahl Manufacturing	1400 Northwest 52nd Street	Lubricant manufacturing company with laboratory
	Vaupell Industrial Plastics	1144 Northwest 53rd Street	High-precision molding

Land uses in the SODO Segment are mostly industrial and commercial, and no noise-sensitive or vibration-sensitive properties were identified in the SODO Segment study area.

The Chinatown-International District Segment does not have any noise-sensitive land uses where the project would be above-ground, and no noise analysis is required for proposed tunneled areas. There are no Category 1 vibration-sensitive land uses in this segment. Vibration-sensitive land uses are mostly multi-family residences along 4th Avenue South and 5th Avenue South. The King County Correctional Facility and Fire Station 10 are located toward the north end of this segment and are considered Category 2 residential land uses. The Inscape Arts and Culture Center is the only Category 3 institutional land use identified in this segment.

In the Downtown Segment, the proposed alternatives would be in tunnels and therefore do not require noise analysis. Vibration-sensitive Category 2 land uses in the Downtown Segment are primarily multi-family condominium buildings and hotels. Category 3 institutional land uses in the Downtown Segment include places of worship, schools, and the Seattle Public Library-Central Library. This segment includes many receivers with high-vibration sensitivity (Category 1 or special buildings). The South Lake Union neighborhood has several research institutions and biotechnology companies that have vibration-sensitive equipment. The Seattle Center houses several performance venues and recording spaces that are sensitive to groundborne noise and vibration.

In the South Interbay Segment, Category 1 noise- and vibration-sensitive land uses include recording spaces, but because these facilities are along Elliott Avenue West and 15th Avenue West and near the Balmer Rail Yard, they have likely developed methods to accommodate the high existing noise levels. Category 2 noise- and vibration-sensitive land uses include residential areas and Fire Station 20. Kinnear Park and the Southwest Queen Anne Greenbelt are considered to be Category 3 noise sensitive land uses. Because of the high noise levels from the adjacent BNSF Railway heavy rail switching yard (Balmer Rail Yard) and the active uses of these parks, neither the Interbay Golf Center, including the Interbay P-Patch Community Garden, or the Interbay Athletic Complex are considered noise-sensitive.



In the Interbay/Ballard Segment, The Seattle Film Institute is a Category 1 noise- and vibration-sensitive land use. Category 2 noise- and vibration-sensitive land uses include residences and Fire Station 18. Category 3 noise- and vibration-sensitive land uses include the Seattle Maritime Academy, St. Alphonsus Church and School, and Quest Church.

4.3.7.1.1 Noise Measurements

To establish the existing noise environment, onsite noise monitoring was performed at 14 locations in the South Interbay and Interbay/Ballard segments, as shown on Figure 4.3.7-1. These locations included seven long-term sites that were monitored for 48 hours or more and seven sites monitored twice daily for 15 minutes with traffic counts. No monitoring was done in the SODO, Chinatown-International District, or Downtown segments because the project would be in a tunnel or in areas without noise-sensitive receivers.

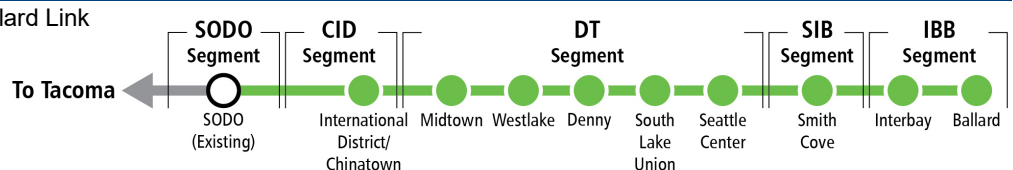
Noise levels in the Ballard Link Extension study area are dominated by transportation-related sources, including traffic on 15th Avenue West, heavy rail noise from the Balmer Rail Yard, shipping facilities, and general commercial and industrial activities. Lesser contributors to the noise environment include aircraft noise, residential activities, and unrelated construction activities. The Ldn noise levels near noise-sensitive uses in the South Interbay and Interbay/Ballard segments typically range from 54 dBA and 74 dBA. Average daytime Leq sound levels range from 52 dBA to 70 dBA, and median daytime Leq sound levels in the Ballard Link Extension study area are 59 dBA. Average nighttime Leq sound levels range between 47 dBA and 64 dBA, and the median nighttime sound level in the Ballard Link Extension is 54 dBA. The lowest noise levels were measured in areas that are well shielded from nearby major roadways such as 15th Avenue West, 15th Avenue Northwest, and Northwest Market Street.

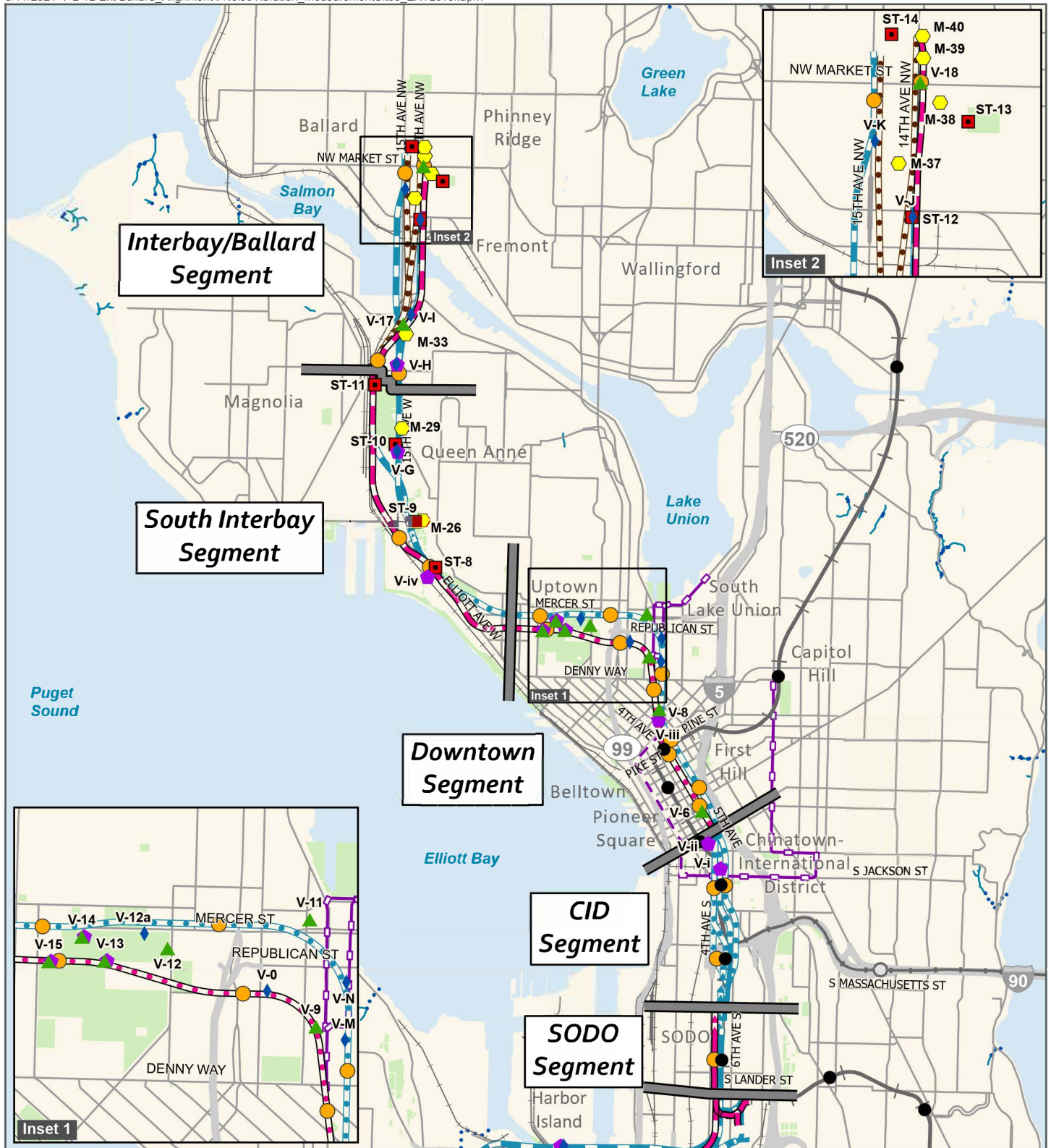
Complete data summaries and tables, along with photographs of the noise monitoring sites, are provided in Attachment N.3A, Noise Measurement Data, Site Details, and Photographs.

4.3.7.1.2 Vibration Testing and Measurements

Sound Transit performed vibration propagation tests at five at-grade sites and eight below-grade sites in the Ballard Link Extension study area, as shown on Figure 4.3.7-1. Eight of the vibration propagation tests were in residential areas, and five were at Category 1 land uses. These tests indicate how vibration levels would change as vibration travels through the ground, and the test data is used in the vibration prediction model. At Category 1 land uses, vibration propagation data were also collected inside the sensitive buildings, and information on sensitive equipment or spaces was gathered to determine appropriate vibration limits. Ambient vibration measurements were completed at highly vibration-sensitive buildings such as research laboratories and near existing rail lines where vibration might be above human perception.

Measured vibration levels from existing streetcar and light-rail operations were below the 72-VdB limit for vibration at residential land uses. The existing vibration levels from the at-grade freight tracks operating through the South Interbay Segment averaged 74 VdB at 60 feet from the freight line. Although the existing freight vibration levels in the South Interbay Segment exceed the FTA limit for residential land uses, the freight trains operate much less frequently than the proposed Ballard Link Extension light rail line. Detailed results of testing and measurements are provided in Attachment N.3H, Vibration Analysis of Category 1 Uses and Special Buildings, to Appendix N.3, Noise and Vibration Technical Report.





Source: City of Seattle, King County (2019, 2020, 2021).

Alternatives

- Preferred Alternative
- Preferred Alternative with Third-party Funding
- Other Alternatives

Alternative Profile

- Elevated
- At-Grade
- Tunnel
- Retained Cut

Station

- New
- Existing

- Segment Line
- Existing Link Light Rail
- East Link Light Rail (Under Construction)
- Existing Streetcar
- Center City
- Connector Streetcar (Construction Paused)
- Railroad
- Stream
- Piped Stream
- Park

Noise Monitoring Sites

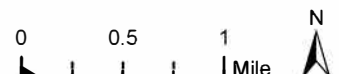
- Short Term Monitoring Site
- Long Term Monitoring Site

Vibration Measurement Sites

- Existing Vibration Measurement
- At-grade Vibration Propagation
- Below-grade Vibration Propagation

FIGURE 4.3.7-1
Noise and Vibration
Measurement Sites
Ballard Link Extension

West Seattle and
Ballard Link Extensions



4.3.7.2 Environmental Impacts of the No Build Alternative

Under the No Build Alternative, there would be no light rail constructed. Noise along the Ballard Link Extension project corridor would continue to be dominated by traffic and various industrial, commercial, and construction activities; therefore, no light rail-related noise or vibration impacts would occur. Modeled traffic noise levels under existing conditions and the No Build Alternative are provided in Appendix N.3.

4.3.7.3 Environmental Impacts of the Build Alternatives during Operation

Noise levels were predicted using FTA methods described in Section 4.3.7.1 and used to establish a noise study area. More than 2,500 noise- and/or vibration-sensitive properties were identified within the study area.

There are no noise-sensitive receivers in the SODO Segment or in the Chinatown-International District Segment where the alternatives would be above ground. An airborne noise analysis was not conducted where the alternatives would travel through tunnels (Chinatown-International District and Downtown segments); however, a groundborne noise analysis is included with the vibration analysis for these segments. Vibration levels were predicted for all sensitive receivers in the Ballard Link Extension study area. Figures 4.3.7-2 through 4.3.7-5 summarize the Ballard Link Extension noise and vibration impacts by segment. The following sections discuss key differences between alternatives. Appendix N.3 includes attachments that summarize the following:

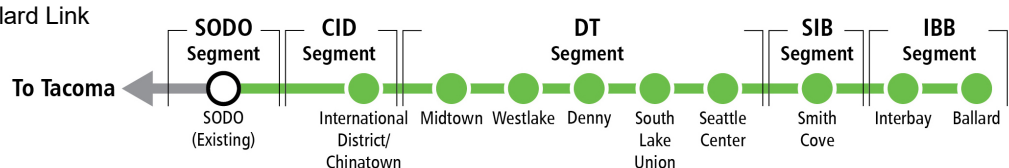
- Noise measurement locations and results with site photographs (Attachment N.3A)
- Vibration measurement site photographs and maps (Attachment N.3B)
- Vibration propagation measurement results (Attachment N.3C)
- Maps of noise impacts before mitigation and proposed mitigation (Attachment N.3D)
- Maps of vibration and groundborne noise impacts before mitigation and proposed mitigation (Attachment N.3E)
- Tables of noise predictions and proposed mitigation (Attachment N.3F)
- Tables of vibration predictions (Attachment N.3G)
- Vibration analysis of Category 1 land uses and special buildings (Attachment N.3H)

Project Noise and Background Noise: An Example

Given the complex nature of the FTA criteria, the following example is provided to clarify how impacts are identified.

Consider a residential land use (FTA Category 2) with an existing Ldn of 65 dBA. If the noise from light rail operations is below 61 dBA, there is no noise impact. A moderate impact would occur if light rail noise levels were between 61 and 66 dBA, and a severe noise impact would occur if light rail noise were above 66 dBA. If noise from the light rail is 62 dBA Ldn (a moderate impact), the total future noise would be rounded up to 67 dBA Ldn, for a 2-decibel increase in the overall noise (adding the existing 65 dBA Ldn with the light rail noise of 62 dBA Ldn = 66.8 dBA Ldn). Typically, for transportation noise sources, an increase of less than 3 dBA is not perceptible to an average person. More importantly, although the 2 dBA increase may not be perceptible, it would still be identified as an impact under FTA criteria and mitigation would be considered.

This example shows how the light rail noise level could be lower than the existing noise levels, and still result in a noise impact. It also shows how the FTA criteria help to prevent increasing noise levels in areas that already have high levels of background noise. Section 2.1.2 in Appendix N.3, Noise and Vibration Technical Report, provides information on how total sound level with the project and ambient noise is calculated.





Source: City of Seattle, King County (2019, 2020, 2021).

Alternatives

- Preferred Alternative
- Preferred Alternative with Third-party Funding
- Other Alternatives

Alternative Profile

- Elevated
- At-Grade
- Tunnel
- Retained Cut

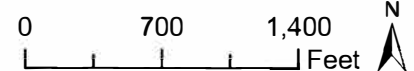
Station

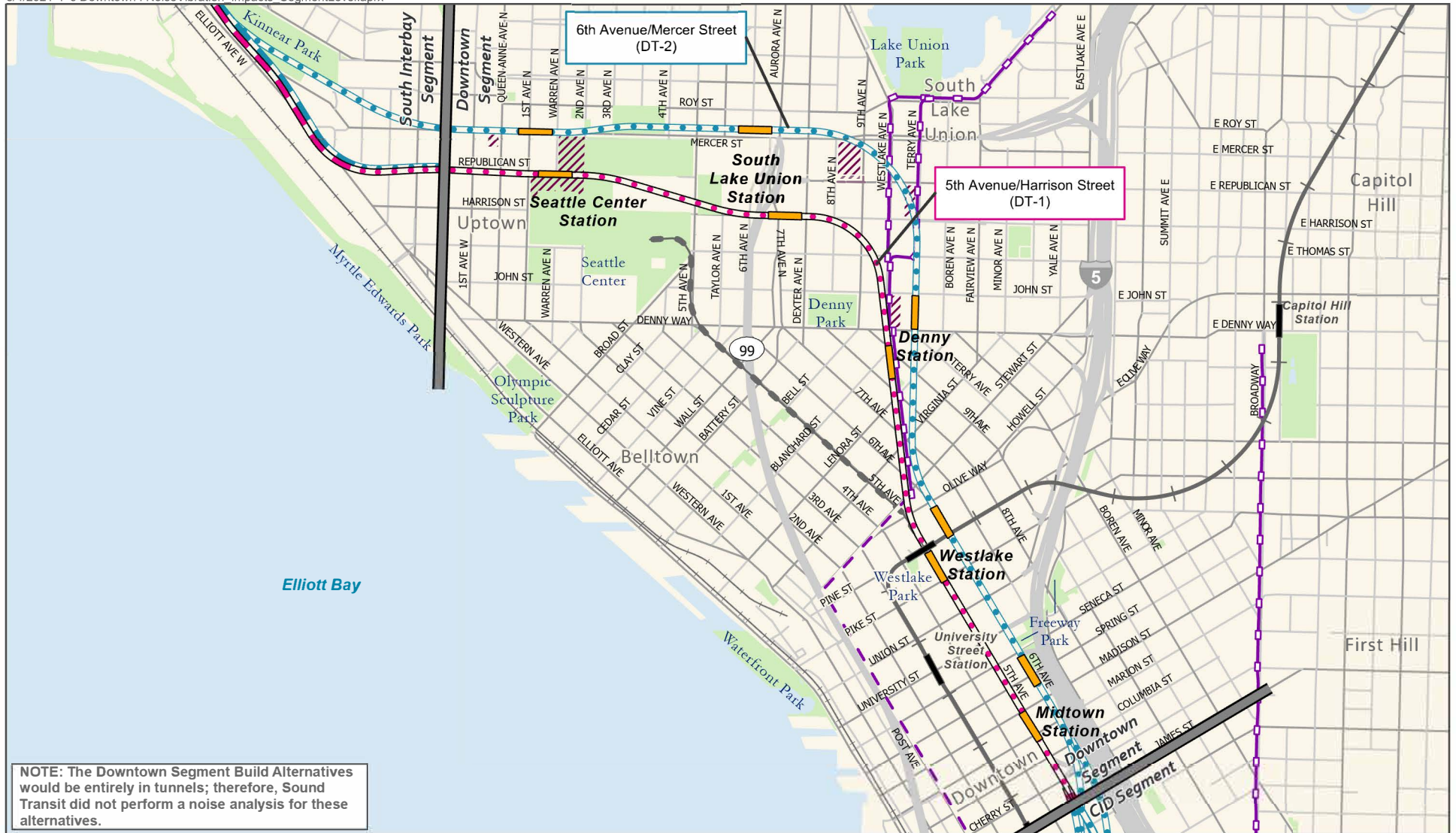
- New
- Existing

- Segment Line
- Existing Link Light Rail
- East Link Light Rail (Under Construction)
- Existing Streetcar
- Center City
- Connector Streetcar (Construction Paused)
- Railroad
- SODO Busway
- Proposed Overpass
- Park

- Area of Vibration or Groundborne Noise Impact

FIGURE 4.3.7-2
Noise and Vibration Impacts
(before mitigation)
 Ballard Link Extension -
 Chinatown-International
 District Segment
 West Seattle and
 Ballard Link Extensions





Source: City of Seattle, King County (2019, 2020, 2021).

Alternatives

- Preferred Alternative
- Preferred Alternative with Third-party Funding
- Other Alternatives

Alternative Profile

- Elevated
- Tunnel
- At-Grade
- Retained Cut

Station

- New
- Existing

Segment Line

Existing Link Light Rail

Monorail

Existing Streetcar

Center City

Connector Streetcar (Construction Paused)

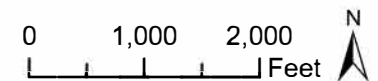
Railroad

Park

Area of Vibration or Groundborne Noise Impact

FIGURE 4.3.7-3
Noise and Vibration Impacts
(before mitigation)
Ballard Link Extension -
Downtown Segment

West Seattle and
Ballard Link Extensions





Source: City of Seattle, King County (2019, 2020, 2021).

Alternatives

- Preferred Alternative
- Preferred Alternative with Third-party Funding
- Other Alternatives

Alternative Profile

- Elevated
- At-Grade
- Tunnel
- Retained Cut

Station

- New

Segment Line

Railroad

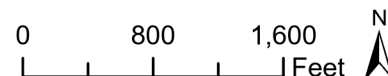
Park

Area of Vibration or Groundborne Noise Impact

Area of Noise Impact

FIGURE 4.3.7-4
Noise and Vibration Impacts
(before mitigation)
Ballard Link Extension -
South Interbay Segment

West Seattle and
Ballard Link Extensions





Source: City of Seattle, King County (2019, 2020, 2021).

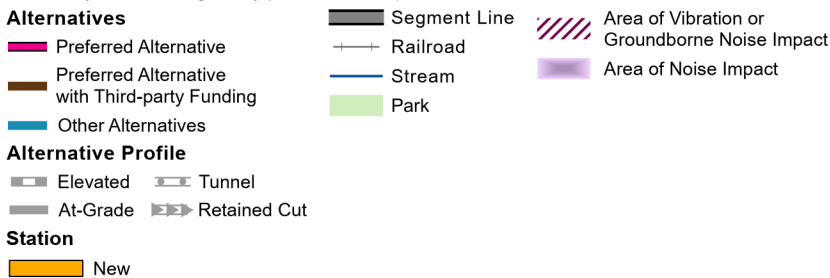
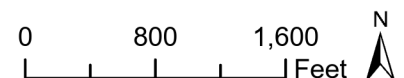


FIGURE 4.2.7-5
Noise and Vibration Impacts
(before mitigation)
 Ballard Link Extension -
 Interbay/Ballard Segment

*West Seattle and
 Ballard Link Extensions*



Potential noise impacts on fish and wildlife are described in Section 4.3.9, Ecosystems.

4.3.7.3.1 SODO Segment

Land uses in the SODO Segment are predominantly industrial and commercial. No FTA noise- or vibration-sensitive properties were identified in this segment.

The Ballard Link Extension-only M.O.S. would result in a moderate noise impact at Fire Station 14 in the West Seattle Link Extension's Duwamish Segment with the connection to the existing Operations and Maintenance Facility Central. If the Ballard Link Extension-only M.O.S. is constructed, this impact would no longer occur with the West Seattle Link Extension.

4.3.7.3.2 Chinatown-International District Segment

Noise

The Chinatown-International District Segment alternatives would be mostly in tunnels or where there are no FTA noise-sensitive receivers; therefore, Sound Transit did not perform a noise analysis for this segment.

Vibration

Alternative CID-1a*, Option CID-1b*, and Option CID-2b would not result in any vibration or groundborne noise impacts due to their deeper profile (Table 4.3.7-3). Alternative CID-2a would impact one large multi-family residential building when connecting to either Downtown Segment alternative. The diagonal station configuration would have more impacts because it would pass closer to more dwelling units within the building. Alternative CID-2a would have additional impacts at a multi-family residential property at South Washington Street and 5th Avenue when connecting to Alternative DT-2.

Table 4.3.7-3. Groundborne Noise and Vibration Impacts – Chinatown-International District Segment

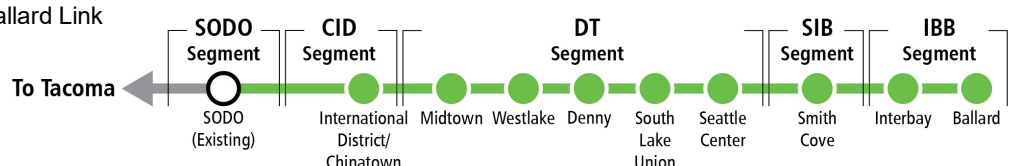
Alternative	Number of Predicted Vibration or Groundborne Noise Impacts ^a			Total Predicted Vibration or Groundborne Noise Impacts
	Category 1	Category 2 ^b	Category 3	
4th Avenue Shallow (CID-1a)*	0	0	0	0
4th Avenue Deep Station Option (CID-1b)*	0	0	0	0
5th Avenue Shallow (CID-2a)	0	24 to 74	0	24 to 74
5th Avenue Deep Station Option (CID-2b)	0	0	0	0

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement, some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Note: Ranges reflect differences from connecting to different alternatives in adjacent segments. The total impacts are based on individual alternatives and connection options and not the high and low of each impact type shown in the table.

^a See Appendix N.3 for a more detailed summary of groundborne noise and vibration impacts.

^b Number of predicted impacts for Category 2 land uses is the number of dwelling units, not the number of buildings.



4.3.7.3.3 Downtown Segment

Noise

The Downtown Segment Build Alternatives would be entirely in tunnels; therefore, Sound Transit did not perform a noise analysis for these alternatives.

Vibration

Preferred Alternative DT-1 would have vibration impacts at Seattle Center special buildings but no impacts at residential or institutional land uses (Table 4.3.7-4). The Category 1 special buildings impacted would include the K.E.X.P. radio station, Seattle Repertory Theatre, the Seattle International Film Festival (SIFF) Film Center, and The Vera Project. There would be no impacts from the Preferred Alternative DT-1 crossover. Alternative DT-2 would impact two buildings on the UW Medicine South Lake Union Campus. Alternative DT-2 would also have Category 2 impacts, all in a multi-family building near the crossover west of the Seattle Center Station.

Table 4.3.7-4. Groundborne Noise and Vibration Impacts – Downtown Segment

Alternative	Number of Predicted Vibration or Groundborne Noise Impacts ^a			Total Predicted Vibration or Groundborne Noise Impacts
	Category 1	Category 2 ^b	Category 3	
Preferred 5th Avenue/Harrison Street (DT-1)	4	0	0	4
6th Avenue/Mercer Street (DT-2)	2	34	0	36

^a See Appendix N.3 for a more detailed summary of groundborne noise and vibration impacts.

^b Number of predicted impacts for Category 2 land uses is the number of dwelling units, not the number of buildings.

4.3.7.3.4 South Interbay Segment

Noise

Within the South Interbay Segment, noise impacts would occur at multi-family residences on 17th Avenue West and single- and multi-family residences along the slope east of 15th Avenue West, and near the Republican Street tunnel portal at multi-family residences on Elliott Avenue West and West Republican Street (Table 4.3.7-5).

Alternative SIB-2 would have the most noise impacts because of the multi-family residences near tunnel portals and along the Queen Anne hillside east of 15th Avenue West and Elliott Avenue West. This alternative is predicted to cause severe noise impacts at multi-family residences along 15th Avenue West and on Gilman Drive West as well as at Fire Station 20. Preferred Alternative SIB-1 and Alternative SIB-3 would have fewer impacts because these alternative alignments would be along the existing railyard, farther from residences and other noise-sensitive land uses east of 15th Avenue West and Elliott Avenue West, and would have higher background noise levels from existing rail operations.

Preferred Alternative SIB-1 and Alternative SIB-2 would have a potential exterior noise impact at an FTA Category 1 use, iHeart Media, at 645 Elliott Avenue West. Because iHeart Media is currently operating at this location with existing high noise levels and appears to have excellent exterior to interior noise reduction, and light rail would not increase the overall noise in the area,

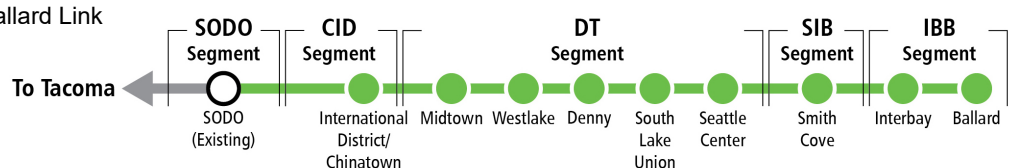


Table 4.3.7-5. Predicted Number of Noise Impacts – South Interbay Segment

Alternative	Noise Impacts				Total Noise Impacts
	Category 1 ^a	Category 2 Moderate Impacts	Category 2 Severe Impacts	Category 3	
Preferred Galer Street Station/Central Interbay (SIB-1)	1	418	37	0	456
Prospect Street Station/15th Avenue (SIB-2)	2	599	144	0	745
Prospect Street Station/Central Interbay (SIB-3)	0	532	0	0	532

Notes:

The numbers presented are the number of units, counted by individual residences, including individual units of multi-family structures, and number of structures for other uses, like schools, places of worship and parks. Category 2 parcels are evaluated with the 24-hour Ldn and Category 1 and 3 are evaluated with the peak hour Leq.

Ranges represent possible combinations of different alternative alignments and their connection o alternatives in adjacent segments. The total impacts provided are based on the whole alternative and connection, not individual impact types.

^a Exterior noise impacts and interior noise levels are predicted to meet operational requirements of the business.

Sound Transit assumes that the Ballard Link Extension would not impact operations at this facility. Alternative SIB-2 would result in a noise impact on Victory Studios at 2247 15th Avenue West, an FTA Category 1 land use. This facility is on a busy roadway with high existing noise levels. For sensitive uses, the noise levels inside the building are situated away from the roadway noise or in areas with acoustical shielding. Sound Transit assumes that the Ballard Link Extension would not impact operations at this facility. Additional testing could be performed to verify interior noise levels if either of these alternatives were selected for the Ballard Link Extension.

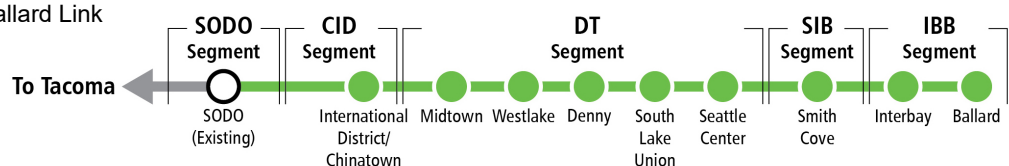
Both Preferred Alternative SIB-1 and Alternative SIB-2 have potential for wheel squeal at a curve where the trackway transitions from the tunnel to an elevated guideway along Elliott Avenue West. Preferred Alternative SIB-1 has potential for wheel squeal at two additional curves, one south of the Smith Cove Station and another at the connection to the Interbay/Ballard Segment at the West Dravus Street overcrossing. Alternative SIB-3 would not have any curves with potential for wheel squeal.

Preferred Alternative SIB-1 and Alternative SIB-2 each would have crossovers as the trackway transitions from the tunnel to an elevated guideway along Elliott Avenue West and are near multi-family residences along West Mercer Place and Elliott Avenue West. Preferred Alternative SIB-1 would have an additional crossover for access to a set of storage tracks. The crossovers would contribute to noise impacts identified in this area. Alternative SIB-3 would have one crossover along Elliott Avenue West, just north of the tunnel portal that contributes to noise impacts.

Sound Transit did not identify potential noise impacts at Kinnear Park and the Southwest Queen Anne Greenbelt because of the distance between the tracks and frequently used parts of the parks and existing noise levels.

Vibration

Preferred Alternative SIB-1 and Alternative SIB-2 would have the most vibration or groundborne noise impacts at residential dwelling units, all of which would be near the tunnel portal (Table



4.3.7-6). Alternative SIB-2 would also have a groundborne noise impact at an FTA Category 1 land use, Victory Studios. Some of the impacts with these two alternatives would be caused by crossovers. Alternative SIB-3 would not have any vibration or groundborne noise impacts in this segment because it would have a tunnel portal farther north, away from residential land uses that would be impacted by the other alternatives.

Table 4.3.7-6. Groundborne Noise and Vibration Impacts – South Interbay Segment

Alternative	Number of Predicted Vibration or Groundborne Noise Impacts ^a			Total Predicted Vibration or Groundborne Noise Impacts
	Category 1	Category 2 ^b	Category 3	
Preferred Galer Street Station/Central Interbay (SIB-1)	0	351	0	351
Prospect Street Station/15th Avenue (SIB-2)	1	351	0	352
Prospect Street Station/Central Interbay (SIB-3)	0	0	0	0

^a See Appendix N.3 for a more detailed summary of groundborne noise and vibration impacts.

^b Number of predicted impacts for Category 2 land uses is the number of dwelling units, not the number of buildings.

4.3.7.3.5 Interbay/Ballard Segment

Noise

Sound Transit identified potential noise impacts at Category 2 single- and multi-family residences within the Interbay/Ballard Segment (Table 4.3.7-7). Noise levels at all Category 3 institutional land uses, including schools and places of worship, would be below the FTA criteria.

Option IBB-1b would have the most noise impacts because of the number of multi-family units east of 15th Avenue West near where it would connect to Alternative SIB-2 in the South Interbay Segment. Option IBB-1b would also result in a moderate impact at the Seattle Film Institute, and FTA Category 1 sensitive receiver. Both this design option and Preferred Alternative IBB-1a would have severe noise impacts at single- and multi-family buildings near the northern end of the alignment on 14th Avenue Northwest.

Noise impacts with Alternative IBB-3 would occur south of Salmon Bay, along 15th Avenue West, and also north of the bridge at single- and multi-family residences west of 15th Avenue Northwest. Alternative IBB-3 is not predicted to impact Fire Station 18, based on high existing noise level and slow speed of the light rail train near the fire station. The two tunnel alternatives, Preferred Alternative IBB-2a* and Preferred Option IBB-2b*, are not predicted to have any noise impacts.

Option IBB-1b has no curves with a radius of less than 1,250 feet. Under Option IBB-1b that connects to Alternative SIB-3, there are two crossovers providing access to a 420-foot storage track just north of the Interbay Station near Thorndyke Avenue West and 17th Avenue West. Alternative IBB-3 would have a curve with the potential for wheel squeal along 15th Avenue Northwest between Northwest 52nd Street and Northwest 53rd Street as well as two crossovers providing access to storage tracks north of the Interbay Station.

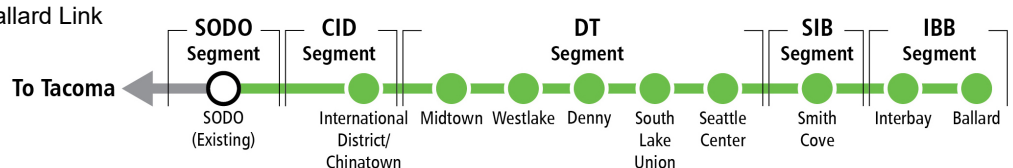


Table 4.3.7-7. Predicted Number of Light Rail Noise Impacts – Interbay/Ballard Segment

Alternative	Noise Impacts				Total Noise Impacts
	Category 1 ^a	Category 2 Moderate Impacts	Category 2 Severe Impacts	Category 3	
Preferred Elevated 14th Avenue (IBB-1a)	0	214 to 237	132 to 164	0	369 to 378
Elevated 14th Avenue Alignment Option (from Prospect Street Station/15th Avenue) (IBB-1b)	1	531	173	0	705
Preferred Tunnel 14th Avenue (IBB-2a)*	0	0	0	0	0
Preferred Tunnel 15th Avenue Station Option (IBB-2b)*	0	0	0	0	0
Elevated 15th Avenue (IBB-3)	0	267	89	0	356

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement, some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Notes:

The numbers presented are the number of units, counted by individual residences, including individual units of multi-family structures, and number of structures for other uses, like schools, places of worship and parks. Category 2 parcels are evaluated with the 24-hour Ldn and Category 1 and 3 are evaluated with the peak hour Leq. The totals impact provided are based on the full alternative and connection, not individual impact types.

Ranges reflect differences from connecting to different alternatives in adjacent segments. The total impacts are based on individual alternatives and connection options and not the high and low of each impact type shown in the table.

^a Exterior noise impacts and interior noise levels are predicted to meet operational requirements of the business.

Vibration

Vibration-sensitive land uses in the Interbay/Ballard Segment are primarily single- and multi-family residences (Table 4.3.7-8). There are also institutional land uses such as schools and places of worship, but no impacts are predicted at these land uses.

Preferred Alternative IBB-1a would have impacts at multi-family buildings near the south end of the Salmon Bay crossing and in Ballard near Northwest 50th Street. When connecting to Alternative SIB-3, there would be fewer impacts. Option IBB-1b, which would have the most impacts, would have impacts at the same location as Preferred Alternative IBB-1a as well as additional impacts south of Emerson Street Interchange. Preferred Alternative IBB-2a* would impact one single-family residence near Northwest 54th Street that is near a crossover and the Seattle Maritime Academy. None of the impacts from the other alternatives would be caused by crossovers. Preferred Option IBB-2b* would also impact the Seattle Maritime Academy. Alternative IBB-3 would have no vibration or groundborne noise impacts.



Table 4.3.7-8. Groundborne Noise and Vibration Impacts – Interbay/Ballard Segment

Alternative	Number of Predicted Vibration or Groundborne Noise Impacts ^a			Total Predicted Vibration or Groundborne Noise Impacts
	Category 1	Category 2 ^b	Category 3	
Preferred Elevated 14th Avenue (IBB-1a)	0	35 to 39	0	35 to 39
Elevated 14th Avenue Alignment Option (from Prospect Street Station/15th Avenue) (IBB-1b)	0	43	0	43
Preferred Tunnel 14th Avenue (IBB-2a)*	0	1	1	2
Preferred Tunnel 15th Avenue Station Option (IBB-2b)*	0	0	1	1
Elevated 15th Avenue (IBB-3)	0	0	0	0

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement, some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Note: Ranges reflect differences from connecting to different alternatives in adjacent segments. The total impacts are based on individual alternatives and connection options and not the high and low of each impact type shown in the table.

^a See Appendix N.3 for a more detailed summary of groundborne noise and vibration impacts.

^b Number of predicted impacts for Category 2 land uses is the number of dwelling units, not the number of buildings.

4.3.7.4 Environmental Impacts of the Build Alternatives during Construction

4.3.7.4.1 Noise

Except for underground tunnel construction, Sound Transit estimates that most project construction noise levels, such as elevated guideway and station construction, would be between 84 and 89 dBA (hourly Leq) at a distance of 50 feet.

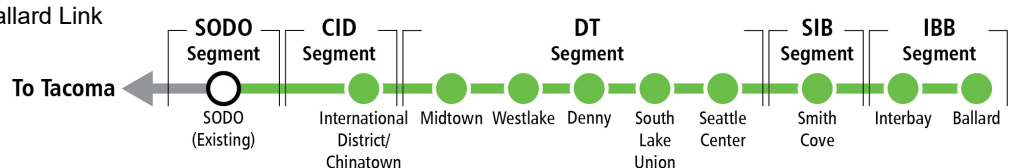
During construction of elevated structures such as guideways and stations, the loudest sources of noise would be cranes, excavators, concrete pumps, and pneumatic tools. Construction of elevated structures might result in sound levels of up to 87 dBA at a distance of 50 feet.

Above-grade activities at tunnel portals would mainly consist of material deliveries and hauling materials. Ventilation fans might run 24 hours a day at tunnel portals and access shafts to supply fresh air into the tunnel. Sound levels from tunnel construction at tunnel portals are anticipated to be approximately 86 dBA at a distance of 50 feet. Nighttime construction near tunnel portals would likely be necessary throughout tunnel construction.

Cut-and-cover tunnel and station construction would likely occur during the daytime and might result in sound levels of approximately 88 dBA at a distance of 50 feet during the loudest phases of construction, such as backfilling.

During retained cut construction, the loudest pieces of construction equipment would be cranes, backhoes, jackhammers, excavators, pneumatic tools, and concrete mixers. Retained cut construction may result in sound levels of up to 89 dBA at a distance of 50 feet.

At-grade construction is anticipated to occur primarily within the SODO and Chinatown-International District segments. Construction equipment that could be used for at-grade



construction include excavators, backhoes, concrete mixers, concrete pumps, and haul trucks. Construction noise from at-grade construction could result in sound levels up to 87 dBA at a distance of 50 feet.

Construction noise is subject to City of Seattle code requirements, and noise levels for all construction would be required to stay within those requirements unless the project obtained a variance from the City. Nighttime construction work required for tunneling and elevated guideway construction would require a noise variance from the City. Sound Transit would ensure that the construction contractor minimize noise impacts from nighttime construction as described in Section 4.3.7.6, Mitigation Measures, and noise levels would meet requirements set forth in the variances. For detailed information on construction noise impacts, refer to Section 6 of Appendix N.3.

The SODO Segment consists of primarily industrial land uses, which are less sensitive to construction noise. The SODO Segment alternatives are not expected to result in construction noise impacts.

In the Chinatown-International District Segment, Option CID-1b* and Option CID-2b might result in fewer construction noise impacts to noise-sensitive residential land uses than the shallow alternatives (Alternative CID-1a* and Alternative CID-2a) because the International District/Chinatown Station would be constructed using mining and not cut-and-cover methods, which may minimize work above grade. The diagonal station configuration for Alternative CID-2a would avoid cut-and-cover construction along 5th Avenue South, which could potentially reduce some noise for nearby residential properties.

In the Downtown Segment, construction noise could impact noise sensitive land uses where there would be cut-and-cover construction for stations, as well as at station areas in general for improvements at the surface. At the Midtown Station for Preferred Alternative DT-1, cut-and-cover construction could be required on portions of 5th Avenue and Madison Street when connecting to all alternatives in the Chinatown-International District Segment except Alternative CID-2a. This work would be near residential properties, the Seattle Public Library-Central Library, and hotels. Mined station construction when connecting to Alternative CID-2a would have lower potential for noise impacts. Alternative DT-2 may result in higher construction noise levels at nearby multi-family residential properties and hotels due to the shorter distance to station construction activities. Construction noise impacts are not expected for the Westlake Station for Preferred Alternative DT-1 or Alternative DT-2, because it would be a mined station and there are no residential properties in close proximity to areas of surface construction. Alternative DT-2 would have station construction closer to hotels on Pine Street, which could experience some disruption. At the Denny, South Lake Union, and Seattle Center stations for both alternatives, noise impacts could occur from cut-and-cover construction in close proximity to residential buildings. Cut-and-cover construction of the Seattle Center Station for Preferred Alternative DT-1 would likely result in noise impacts at the Northwest Rooms at Seattle Center, which house several noise-sensitive spaces including K.E.X.P., the Vera Project, the SIFF Film Center, and the A/NT Art Gallery. The construction noise would also impact spaces in the north end of Seattle Center, including Seattle Repertory Theatre and Cornish Playhouse. Cut-and-cover construction of the Seattle Center Station for Alternative DT-2 could result in noise impacts at the Seattle Repertory Theatre and Cornish Playhouse.

In the South Interbay Segment, construction of Alternatives SIB-2 and SIB-3 may require retained-cut construction near the Magnolia Bridge. This construction would happen within the Southwest Queen Anne Greenbelt, which is near a residential area, and may require 9 months to complete. Construction of Preferred Alternative SIB-1 would likely result in fewer noise



impacts than the other alternatives in this segment because it would be farther from residences overall and not require retained-cut construction methods.

In the Interbay/Ballard Segment, Preferred Alternative IBB-1a and Option IBB-1b would require construction within the residential area southeast of the Ballard Bridge and in the residential area north of Northwest Market Street. Alternative IBB-3 would have construction near noise-sensitive receivers both north and south of Salmon Bay, but is expected to result in less potential for construction noise impacts at noise-sensitive receivers than Preferred Alternative IBB-1a and Option IBB-1b because it is farther from residential properties, east of Ballard Bridge. Preferred Alternative IBB-1a, Option IBB-1b, and Alternative IBB-3 would construct a bridge over Salmon Bay, which could involve pile-driving in the bay, and would generate noise levels that may exceed 101 dBA at 50 feet. This could result in elevated sound levels at properties southeast of the Ballard Bridge. Noise from pile-driving would be required to meet City of Seattle regulations, or the project would obtain a noise variance, which may allow construction noise to exceed the City's construction sound level limits under specific circumstances. While tunnel alternatives would generally avoid construction noise impacts in most areas, construction noise impacts in residential areas north of Northwest Market Street could occur where there would be cut-and-cover construction for the Ballard Station and tail track with Preferred Alternative IBB-2a* and Preferred Option IBB-2b*. See Section 3.1.3 of Appendix N.3 for more information on construction noise criteria.

4.3.7.4.2 Vibration

Vibration caused by construction activities could potentially damage nearby structures and annoy occupants. The construction activity most likely to generate high levels of vibration is pile-driving. Within the Interbay/Ballard Segment, pile-driving near the proposed Salmon Bay crossing could result in potential cosmetic damage to structures within 100 feet of pile locations. The number and severity of vibration impacts would depend on the location of the piles and the method of installation.

When operating at distances greater than 20 feet, most other construction equipment has a low risk of causing vibration damage. No buildings were identified within 20 feet of construction activities. Vibration from the tunnel boring machine cutterhead and supply train would likely remain below the damage and annoyance thresholds for residential and institutional land uses, and there are no Category 1 or special buildings close to the tunnel alternatives.

Category 1 and special building land uses have the same limits for assessing construction impacts as for assessing long-term impacts based on the sensitivity of equipment to vibration. The potential for construction vibration impacts at Category 2 and Category 3 land uses is based on the structural damage criteria in Section 7 of the FTA *Transit Noise and Vibration Impact Assessment Manual*. Sound Transit assessed potential construction vibration effects to structures using peak particle velocity, which is the maximum velocity recorded during a particular event, such as from a jackhammer.

Table 4.3.7-9 shows where there would be groundborne noise and vibration impacts at Category 1 and special building land uses in the Downtown Segment from surface construction and the supply train during tunneling, assuming Sound Transit would use steel-wheeled supply trains with no vibration reduction measures. There are no predicted groundborne noise or vibration impacts from tunnel construction for Category 2 and 3 land uses. Pile-driving in Salmon Bay might result in potential cosmetic damage at buildings within 100 feet of pile locations if an impact pile driver is used. The number and severity of the vibration impacts would depend on the location of the piles and method of installation. Detailed vibration predictions and mitigation measures would be included in a Vibration Control Plan for Category 1 and special building land uses, as well as buildings where there is potential for cosmetic damage.



Table 4.3.7-9. Groundborne Noise and Vibration Impacts at Category 1 and Special Buildings During Construction – Ballard Link Extension

Sensitive Receiver	Alternatives with Impact
Kineta, Biodesix, and Genewiz (219 Terry Avenue North)	6th Avenue/Mercer Street (DT-2)
Seattle Children's Research Institute Center for Global Infectious Disease Research	5th Avenue/Harrison Street (DT-1)
Allen Institute	6th Avenue/Mercer Street (DT-2)
Institute of Systems Biology and Just Biotherapeutics (401 Terry Avenue North)	6th Avenue/Mercer Street (DT-2)
Juno Therapeutics (400 Dexter Avenue North)	5th Avenue/Harrison Street (DT-1)
UW Medicine South Lake Union Campus	6th Avenue/Mercer Street (DT-2)
Cascade Public Media (KCTS 9)	6th Avenue/Mercer Street (DT-2)
Seattle Opera and KING FM	6th Avenue/Mercer Street (DT-2)
McCaw Hall	6th Avenue/Mercer Street (DT-2)
Cornish Playhouse	5th Avenue/Harrison Street (DT-1)
Seattle Repertory Theatre	5th Avenue/Harrison Street (DT-1) and 6th Avenue/Mercer Street (DT-2)
SIFF Film Center	5th Avenue/Harrison Street (DT-1)
The Vera Project	5th Avenue/Harrison Street (DT-1)
K.E.X.P.	5th Avenue/Harrison Street (DT-1)
Victory Studios	Prospect Street Station/15th Avenue (SIB-2)
iHeartMedia, Nexelis, Luminex (645 Elliott Avenue West)	Galer Street Station/Central Interbay (SIB-1) and Prospect Street Station/15th Avenue (SIB-2)
Seattle Film Institute	Elevated 14th Avenue Alignment Option (IBB-1b)
Specialty Vet Path	Elevated 15th Avenue (IBB-3)

4.3.7.5 Indirect Impacts of the Build Alternatives

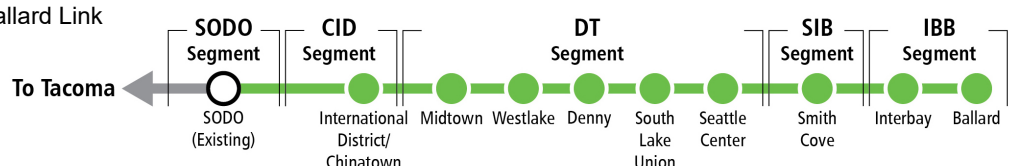
Indirect noise and vibration impacts could be associated with transit-oriented development. Although noise associated with future development could increase noise in the project corridor, any increase would likely be minimal and any new developments would be required to meet the City of Seattle noise regulations.

4.3.7.6 Mitigation Measures

4.3.7.6.1 Noise

Light Rail Noise

Sound Transit is committed to minimizing project noise levels at their source for all of its light rail corridors. When noise would exceed FTA moderate or severe impact criteria, Sound Transit would provide noise mitigation measures consistent with its Link Noise Mitigation Policy (Motion No. M2004-08, Sound Transit 2004) the *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018), and the Sound Transit *Design Criteria Manual* (2021). The Link Noise Mitigation



Policy provides the hierarchy for implementation of mitigation measures. It prioritizes reduction at the noise source, followed by measures to disrupt the noise path, such as sound walls. Lastly it considers residential sound insulation. The policy also guides coordination with the affected property owners and reconsideration of noise impacts and mitigation during final design.

Sound walls are the primary noise mitigation option for Ballard Link Extension operations because they are effective at reducing noise near the source. Sound walls for elevated profiles would be along the side of the top of the guideway; for other profiles, they would be next to the guideway on the ground or retaining structures. Sound walls are currently proposed for all areas where light rail noise impacts were identified.

Wheel squeal reduction measures, including non-oil-based lubrication and friction modifiers, would be included in the project design following the Sound Transit policy in the *Design Criteria Manual*.

For noise from crossovers, recommended mitigation would include special trackwork, such as moveable-point or spring-rail “frogs” (a mechanical installation enabling trains to be guided from one track to another, such as at a junction or where a spur or siding branches off), to eliminate the noise- and vibration-causing gap between tracks.

When source mitigation measures or sound barriers are infeasible or not entirely effective at reducing exterior noise levels below the FTA impact criteria, and where the affected building does not already achieve a sufficient exterior-to-interior reduction of noise levels, Sound Transit would provide residential sound insulation. Most newer buildings have effective exterior-to-interior noise reduction, and additional sound insulation might not be necessary.

Sound Transit would mitigate most noise impacts with sound walls along the guideway and with special trackwork at track crossover locations. Table 4.3.7-10 summarizes the sound walls for the Ballard Link Extension. Limited sound insulation might also be needed.

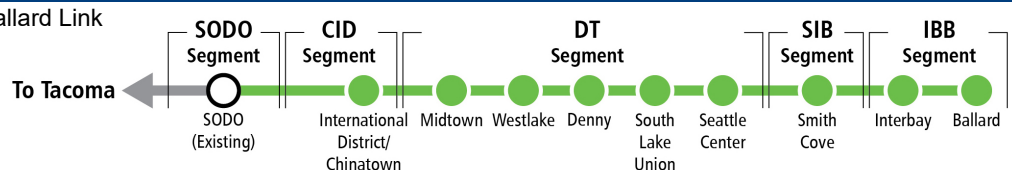
Table 4.3.7-10. Recommended Noise Mitigation – Ballard Link Extension

Segment	Alternative	Mitigation Recommendation
South Interbay	Preferred Galer Street Station/Central Interbay (SIB-1)	Sound Walls: 4 to 8 feet
	Prospect Street Station/15th Avenue (SIB-2)	Sound Walls: 4 to 8 feet
	Prospect Street Station/Central Interbay (SIB-3)	Sound Walls: 4 to 6 feet
Interbay/Ballard	Preferred Elevated 14th Avenue (IBB-1a)	Sound Walls: 4 feet
	Elevated 14th Avenue Alignment Option (from Prospect Street Station/15th Avenue) (IBB-1b)	Sound Walls: 4 feet
	Elevated 15th Avenue (IBB-3)	Sound Walls: 4 feet

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Note: Sound wall height is determined by assessing the degree of noise impact and the height needed to mitigate the impact.

With the potential mitigation, it is expected that project noise levels would be below FTA criteria. The modeling process is conservative, and proposed mitigation is based on the current project design. During final design, the detailed noise analysis would be updated based on more advanced design. All predicted noise levels and mitigation measures would be reviewed.



Mitigation would be modified as needed to reduce noise levels to below the FTA impact criteria. If equivalent mitigation could be achieved by a less costly means or if the final design analysis shows no impact, then the mitigation measure may be modified or eliminated. After light rail operations begin, if the resulting noise were to exceed FTA criteria, Sound Transit would evaluate the need for additional mitigation. More details on light rail noise mitigation are available in Appendix N.3. Attachment N.3D shows detailed maps of noise impacts with proposed mitigation, and Attachment N.3F shows tables of noise predictions and includes predicted levels with mitigation.

In the South Interbay Segment, Sound Transit currently recommends sound walls near West Mercer Place and Elliott Avenue West and along 15th Avenue West for a portion of Alternative SIB-3 and for all of Alternative SIB-2. Sound walls would also be built along Preferred Alternative SIB-1. In the Interbay/Ballard Segment for alternatives along 15th Avenue West, sound walls would be on both sides of the guideway in the residential area in Ballard near Northwest Market Street.

Construction Noise

Through compliance with applicable construction permits and the incorporated best management practices, such as using broadband backup alarms during nighttime hours, minimizing the use of public address systems, ensuring internal combustion equipment are fitted with mufflers, and locating equipment away from noise-sensitive properties to the extent feasible, no mitigation for noise impacts would be needed. Sound Transit would obtain a noise variance from the City of Seattle to complete work during nighttime hours. For the construction staging areas near tunnel portals, mitigation measures could include construction of temporary noise barriers adjacent to the staging area.

Where construction would be in close proximity to sensitive Category 1 performance or recording spaces, Sound Transit would work with the venue to coordinate periods of the loudest construction noise around their events. The loudest period of time is expected to be during construction of cut-and-cover stations boxes. If the loudest work could not be scheduled around performances, Sound Transit would coordinate with the venue regarding modifications to their facility or temporary relocation. Sound Transit would prepare a construction management plan in coordination with Seattle Center that would include measures to minimize impacts during larger events where construction noise could interfere with the activity.

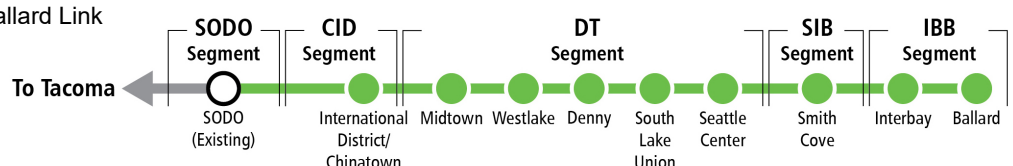
Complete information on construction noise mitigation can be found in Appendix N.3.

4.3.7.6.2 Vibration

Operations

Sound Transit would mitigate vibration and groundborne noise impacts that exceed FTA criteria. Vibration impacts are projected at several special trackwork locations as the wheels travel through the gap between tracks at these locations. Sound Transit would use low-vibration designs for special trackwork, referred to as low-impact frogs, to mitigate these impacts.

For vibration impacts not caused by special trackwork, high-resilience direct-fixation fasteners would be used to reduce vibration levels. Fasteners are used to attach the rail to the concrete track slab. At some locations, high-resilience direct-fixation fasteners might not be sufficient to reduce projected vibration levels to below the FTA criteria. At these locations, project design modifications during final design, such as refining the depth of the tunnel or placement of columns, could eliminate or reduce these impacts. Continuous-mat floating slabs are



recommended where impacts are predicted at highly sensitive Category 1 land uses, where high-resilience fasteners would not provide sufficient mitigation. As project design advances, some impacts may be eliminated or the type of mitigation needed may change. Alternative vibration mitigation approaches that may be applied under specific circumstances include increasing the thickness of the concrete under the track, specifying straighter rails, and building the track on top of pile foundation systems where the track would traverse very soft sections of soil.

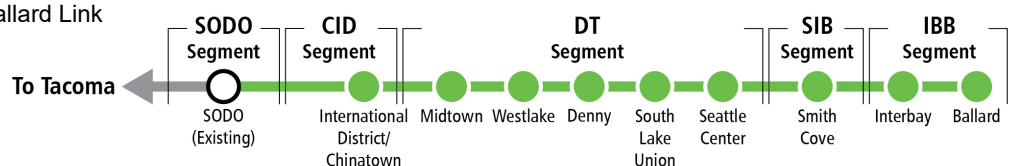
With the potential mitigation, project vibration and groundborne noise levels are expected to be below FTA criteria. In addition, the modeling process is conservative, and additional measurement information at affected buildings might show no or reduced impact. During final design, the detailed vibration analysis would be updated based on more advanced design and would evaluate the specific buildings, and alternative mitigation measures might be warranted. All predicted vibration levels and mitigation measures would be reviewed. Mitigation would be modified as needed to reduce vibration levels to below the FTA impact criteria. The recommended mitigation measures for each alternative with impact are shown in Table 4.3.7-11. Additional information on light rail vibration mitigation can be found in Appendix N.3. Attachment N.3E shows detailed vibration impacts with proposed mitigation, and Attachment N.3G shows tables of vibration predictions and includes predicted levels with mitigation.

Table 4.3.7-11. Recommended Groundborne Noise and Vibration Mitigation – Ballard Link Extension

Segment	Alternative	Mitigation Recommendation
Chinatown-International District	5th Avenue Shallow (CID-2a)	High-resilience direct-fixation fastener
Downtown	Preferred 5th Avenue/Harrison Street (DT-1)	High-resilience direct-fixation fastener
	6th Avenue/Mercer Street (DT-2)	Low-impact frog (monoblock), continuous-mat floating slab, and high-resilience direct-fixation fastener ^a
South Interbay	Preferred Galer Street Station/Central Interbay (SIB-1)	High-resilience direct-fixation fastener and low-impact frog (moveable point)
	Prospect Street Station/15th Avenue (SIB-2)	High-resilience direct-fixation fastener and low-impact frog (moveable point)
Interbay/Ballard	Preferred Elevated 14th Avenue (IBB-1a)	High-resilience direct-fixation fastener
	Elevated 14th Avenue Alignment Option (from Prospect Street Station/15th Avenue) (IBB-1b)	High-resilience direct-fixation fastener
	Preferred Tunnel 14th Avenue (IBB-2a)*	High-resilience direct-fixation fastener and low-impact frog (moveable-point)
	Tunnel 15th Avenue Station Option (IBB-2b)*	High-resilience direct-fixation fastener

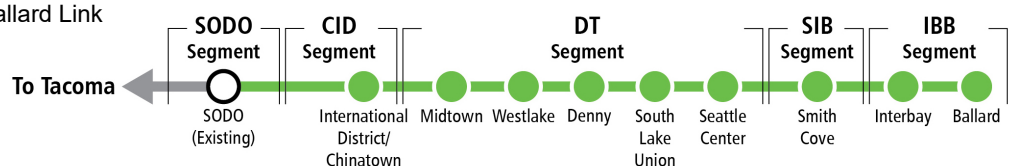
* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

^a The mitigation for the predicted vibration impacts in South Lake Union for Alternative DT-2 would be finalized in a future design phase with site-specific vibration propagation measurements. If the predicted exceedance is greater than or equal to 5 decibels at 40 hertz and above, a continuous-mat floating slab should be installed. If the predicted exceedance is less than 5 decibels at 40 hertz and above, high-resilience fasteners should be installed.



Construction

The primary means of mitigating vibration from construction activities is to require the contractor to prepare and implement a detailed Construction Vibration Control Plan. Appendix N.3 provides more information on this plan. The Construction Vibration Control Plan would include Category 1 land uses and any other structures where predicted construction vibration would exceed the applicable thresholds. Where surface construction would be in close proximity to sensitive Category 1 performance or recording spaces, mitigation would be the same as described above for noise. If pile-driving is planned within 100 feet of structures, alternative methods of pile installation or vibration monitoring would be considered. Options for mitigating vibration from the supply train during tunneling are reducing the operation speed of the supply train, smoothing the running surface, or using rubber-tired supply train vehicles. Pre-construction surveys would be conducted to document the existing conditions of buildings, and the contractor would be responsible for repairing damage resulting from the project. During final design, all impacts and potential mitigation measures would be reviewed for verification.



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4.3.8 Water Resources

4.3.8.1 Affected Environment

The study area for the Ballard Link Extension consists of the City of Seattle and King County combined sewer basins along the project corridor draining to the Duwamish Waterway and Puget Sound (Water Resource Inventory Area 9), and the Ship Canal/Lake Union basin (Water Resource Inventory Area 8). The potential area of effect encompasses locations where water resources would be altered by construction and operation of the project, and where resources would likely receive direct runoff from the project during construction and/or in long-term operation. The general conditions, land uses, hydrology, flooding, and water quality for the major drainages and surface waterbodies potentially affected by the Ballard Link Extension were assessed. These waterbodies, drainage basins, and associated floodplains are shown on Figure 4.3.8-1. The study area is highly developed and is mostly road corridors consisting of pollution-generating impervious surface and sidewalks and trails with non-pollution-generating impervious surfaces.

4.3.8.1.1 Surface Water

Surface water, including stormwater runoff, in the Ballard Link Extension study area drains into either a combined sewer system (city or county) or to designated receiving waters through direct discharge, or stormwater drains in partially separated sewer systems. Within the study area, stormwater in partially separated systems drains to either Puget Sound directly, to the Duwamish Waterway, or to the Lake Union/Lake Washington Ship Canal system. Stormwater runoff that drains to a combined sewer system is treated at the West Point Wastewater Treatment Plant before being discharged into Puget Sound. Figure 4.3.8-1 shows the major waterways in the study area. The primary surface waterbody in the Ballard Link Extension study area is Salmon Bay, a highly industrialized saltwater and freshwater bay that connects to Puget Sound at Shilshole Bay. All three surface waters discussed below are identified as Designated Receiving Waters, which are large enough to not require flow control of runoff to them.

Ecology has assigned designated water uses to define applicable water quality standards for waterbodies (see Appendix L4.8, Water Resources).

These uses define applicable water quality standards for each waterbody. Elliott Bay and Salmon Bay have designated uses of aquatic life, recreation, and water supply (see Table 1-1 in Appendix L4.8, Water Resources). More information on fish habitat is provided in Section 4.3.9, Ecosystems.

Stormwater Drainage in the Study Area

Combined Sewer System

Wastewater and stormwater travel in the same pipes to treatment plants. In the study area, there are both county and city combined sewer systems.

Separated Sewer System

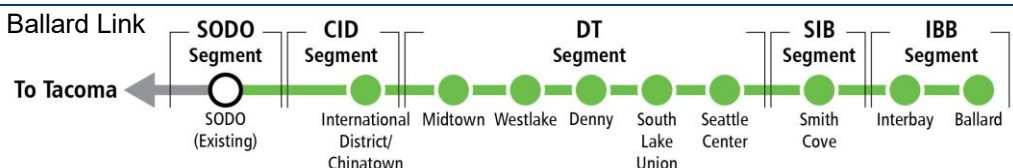
Wastewater and stormwater travel in separate pipes: the wastewater is conveyed to treatment plants and stormwater is conveyed to drainage outlets.

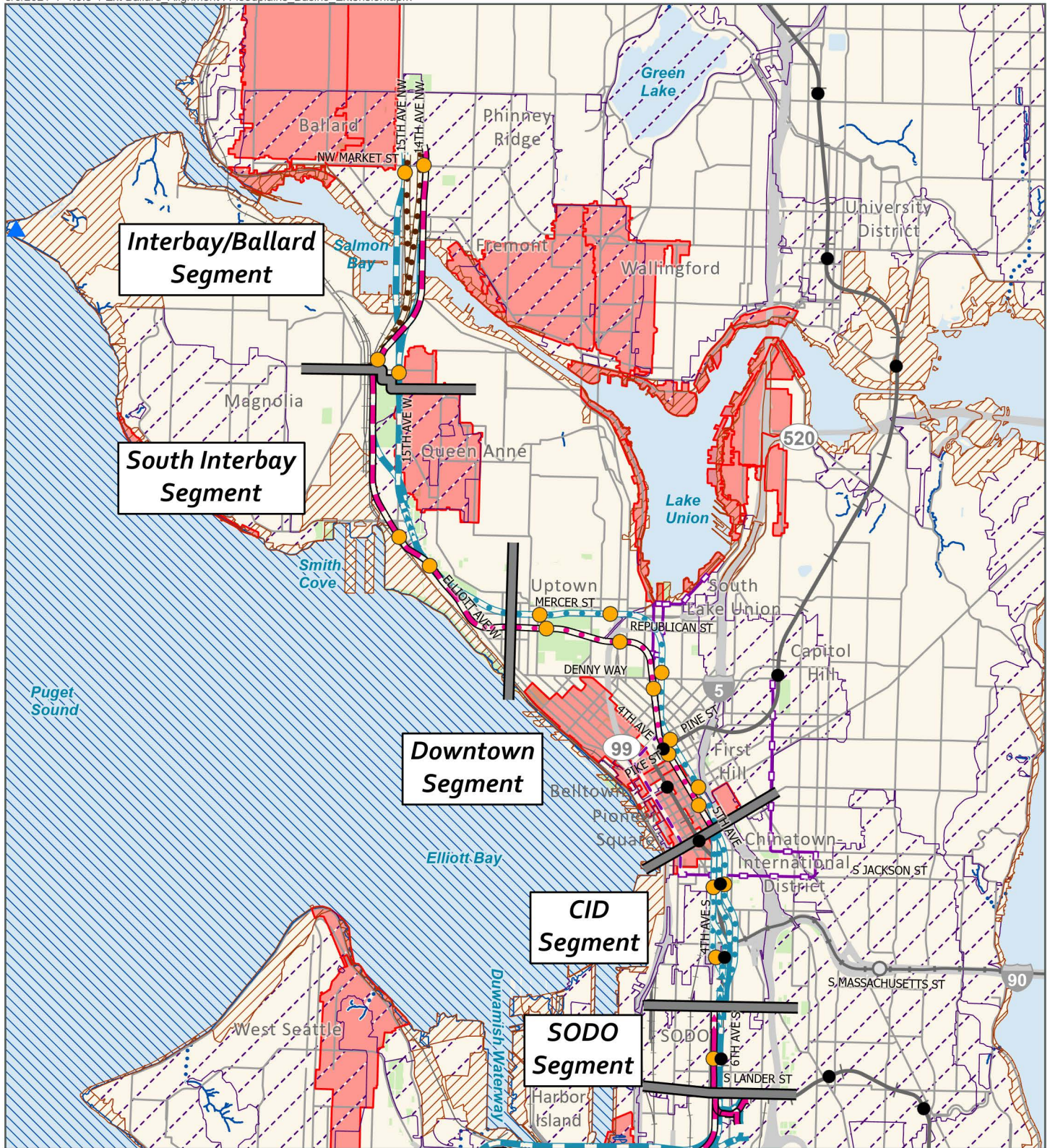
Partially Separated Sewer System

Similar to the separated sewer system except that some stormwater (e.g., from roof drains) joins the wastewater in pipes leading to treatment plants. In the study area, stormwater in these areas drains to designated receiving waters via city drainage systems.

Direct Discharge

Water flows over impervious surfaces, through ditch/culvert systems, or through small private drainage systems to a receiving waterbody.





Source: City of Seattle, King County (2019, 2020, 2021).

Alternatives

- Preferred Alternative
- Preferred Alternative with Third-party Funding
- Other Alternatives

Alternative Profile

- Elevated
- At-Grade
- Tunnel
- Retained Cut

Station

- New
- Existing

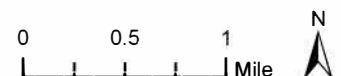
- Segment Line
- Existing Link Light Rail
- East Link Light Rail (Under Construction)
- Existing Streetcar
- Center City Connector Streetcar (Construction Paused)
- Railroad
- Stream
- Piped Stream
- Park

- ▲ West Point Waste Water Treatment Plant (WWTP)
- ▨ FEMA 100-year Floodplain
- ▨ Direct Discharge Areas
- ▨ City of Seattle Combined Sewer Basins
- ▨ Drainage Areas to Receiving Waterbodies

Notes: 1) Areas outside of the basins shown are served by King County Combined Sewer.
2) Within drainage areas to receiving waters, stormwater is collected and conveyed in city storm drain systems.

**FIGURE 4.3.8-1
Floodplains and Basins
Ballard Link Extension**

*West Seattle and
Ballard Link Extensions*



Duwamish Waterway

Runoff from the SODO Segment of the project corridor drains untreated into the East Duwamish Waterway through existing storm drains. The lowermost 4.6 miles of the Duwamish Waterway are in the city of Seattle. This area is an estuary where saltwater from Puget Sound and freshwater from the river mix. This area includes the East and West Duwamish Waterways, separated by Harbor Island and referred to collectively as the Duwamish Waterway. Because the Duwamish Waterway drains into Elliott Bay, its water levels are tidally influenced. It supports commercial and recreational navigation and salmon fishing, most especially in the estuarine area.

The Duwamish Waterway receives flows from numerous combined sewer outfalls and separate storm drain outfalls within the study area. Ecology classifies the Lower Duwamish Waterway as a Category 5 waterbody and it was included in the Ecology 303(d) list of impaired waterbodies in 2014 because of exceedances of more than 40 water quality criteria. A Category 5 waterbody means that Ecology has data showing that the water quality standards have been violated for one or more pollutants, and that there is no pollution-control program in place (Ecology 2016). Of special concern are dissolved oxygen and fecal coliform which frequently exceed the state standard. The Duwamish Waterway has also seen a trend of increasing water temperatures since the 1970s (King County 2016a). See Section 4.2.8 for discussion of Superfund sites on this waterbody.

Elliott Bay

Elliott Bay is the part of Puget Sound adjacent to the Seattle downtown waterfront. Some runoff from the Chinatown-International District and South Interbay segments of the project corridor drains untreated into Puget Sound through existing stormwater system infrastructure. This resource is categorized as “Salmonid rearing and migration only” for aquatic life use (Ecology 2016) and is included in 303(d) listings for exceedances in bacteria levels.

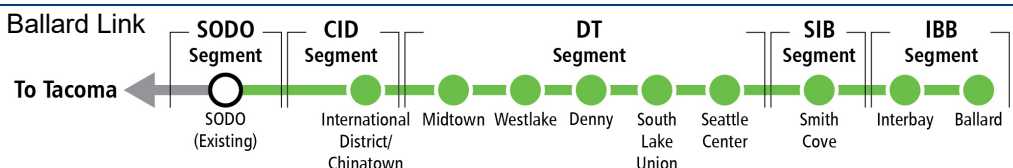
Smith Cove

Smith Cove is a portion of Elliott Bay in an industrial area between Queen Anne Hill and Magnolia. Piers 90 and 91 in Smith Cove serve the cruise industry and related services. Some runoff from the South Interbay Segment of the project corridor drains untreated into Smith Cove through existing stormwater infrastructure.

Salmon Bay

Salmon Bay lies between the Ballard Locks and the Fremont Cut and includes the Ballard Bridge, within the Lake Washington Ship Canal. It is an important area for shipping, the commercial fishing industry, water-dependent and other industrial and commercial businesses, and recreation as the Lake Washington Ship Canal passes through it. Salmon Bay is also an important area for fish and wildlife habitat because it is a migration corridor for salmon entering and leaving the Lake Washington watershed. See Section 4.3.9, Ecosystems, for additional habitat information. Runoff from portions of the Interbay/Ballard Segment of the project corridor drain untreated into Salmon Bay through existing storm drains.

Ecology has classified Salmon Bay as a Category 5 waterbody on the Ecology 303(d) list since 2014. A Category 5 waterbody means that Ecology has data showing that the water quality standards have been violated for one or more pollutants, that there is no pollution-control program in place, and it requires a water quality improvement project. The pollutants



that exceed state water quality standards in Salmon Bay are lead, pH, Aldrin, and bacteria (Ecology 2016).

Combined Sewer Service Areas

The Downtown Segment, most of the Chinatown-International District Segment, and portions of the South Interbay Segment and the Interbay/Ballard Segment are served by the combined sewer collection system. This is a network of City pipelines collecting both storm and sanitary sewer flows that are conveyed to King County interceptor pipes and the West Point Treatment Plant. Portions of Downtown and South Lake Union are also served by the Elliott West Combined Sewage Overflow Treatment Facility, located on Elliot Bay at the end of West Mercer Street (see Figure 3-7 in Appendix L-4.8).

4.3.8.1.2 Shorelines

The Elliott Bay and Salmon Bay shorelines are designated as Urban Industrial in the City of Seattle's Shoreline Master Program (City of Seattle 2019). The shorelines are highly developed and industrialized. Less than 5 percent of the Ship Canal shoreline (including the part in Salmon Bay) has natural vegetation (City of Seattle 2019).

4.3.8.1.3 Floodplains

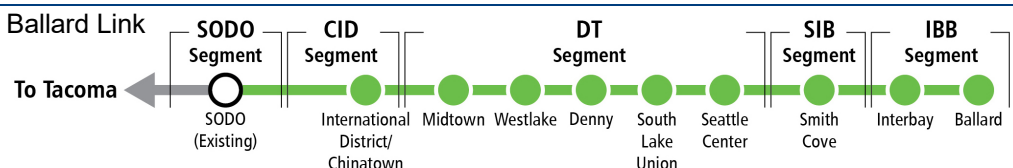
There are no FEMA floodplains designated within the Ballard Link Extension study area. As such, this resource is not discussed for this study area.

4.3.8.1.4 Groundwater

There are no designated sole-source aquifer areas, critical aquifer recharge, or wellhead protection areas that occur within the study area. The hydrogeologic regime and groundwater flow in the Puget Sound area are highly variable. Groundwater recharge typically occurs in the upland areas of Seattle, including First Hill and Queen Anne Hill. From these locations, groundwater predominantly flows downward to the discharge areas, and eventually to major surface waterbodies, such as Lake Union, Salmon Bay, and Puget Sound. More information regarding groundwater and aquifers, as well as the depths to groundwater, can be found in Section 4.3.11, Geology and Soils.

4.3.8.2 Environmental Impacts of the No Build Alternative

Under the No Build Alternative, light rail would not be extended to Ballard and the potential impacts on water resources identified for the Build Alternatives would be avoided. The No Build Alternative would have no direct impacts on any waterbodies, stormwater flow in combined sewer service areas, shorelines, or floodplains and floodways. There would also be no construction impacts. However, the potential water quality benefits associated with the project would also not be realized, such as reduced pollution from motor vehicles and the addition of water quality treatment for pollution-generating impervious surfaces that are currently not treated.



4.3.8.3 Environmental Impacts of the Build Alternatives during Operation

4.3.8.3.1 Impacts Common to All Alternatives

As design advances, Sound Transit would continue to coordinate with the City of Seattle on issues related to water resources, including the following:

- Approved points of discharge and discharge basin
- Flow control and water quality requirements
- Opportunities for infiltration
- Extension of utility mainlines
- Temporary and permanent dewatering
- Potential for onsite stormwater management when outside of the public right-of-way

Water Quality

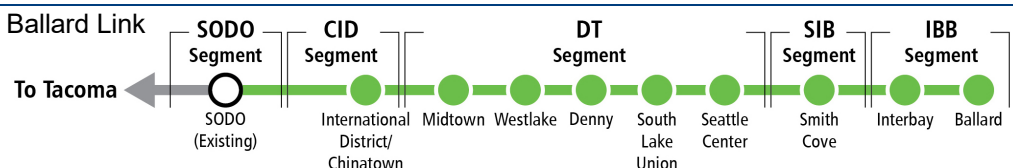
All alternatives would increase impervious surfaces. In this project, pollution-generating impervious surfaces are the pavement areas of road improvements needed to accommodate the project. The pollutants from vehicular traffic on these surfaces accumulate on the road surface and are transported to waterbodies by stormwater runoff that, if not treated, can degrade water quality in receiving waters. If not treated, the potential impacts of added pollution-generating impervious surfaces are greater in drainage basins that drain directly to surface water resources than in basins draining to combined sewers, which are treated before discharging to surface water resources. However, Sound Transit would provide required treatment for runoff from pollution-generating impervious surfaces before discharging to the surface water resource. In areas where project runoff would flow to a combined sewer, the runoff would be subject to flow control where required. This would prevent the additional runoff from the project from overloading and affecting the City and County pipe networks, and other combined sewer system infrastructure.

Impervious Surfaces

Impervious surfaces are hard surfaces that do not allow rainwater to seep through and enter groundwater beneath the surface. Impervious surfaces increase runoff volumes that can also increase pollutant runoff, flooding, and stream erosion. New impervious surfaces are areas that would replace existing pervious surfaces, where rainwater can seep through the surface and enter groundwater. Existing pervious surface areas are generally vegetated or bare ground.

Non-pollution-generating impervious surfaces in this project are guideways,¹ station buildings, and sidewalks. In general, runoff from non-pollution-generating impervious surfaces would not generate pollutants and would not be treated. Though these surfaces will not degrade water quality, additional impervious surface area could increase stormwater volumes and flow rates to affected waterbodies and decrease groundwater infiltration. Table 4.3.8-1 summarizes the estimated total impervious surface added with each alternative (these totals combine pollution-generating and non-pollution-generating impervious surfaces). For further details, see

¹ Sound Transit and Ecology entered into a Memorandum of Understanding dated December 9, 2019, in which Sound Transit agreed to conduct a study to characterize the quality of the stormwater discharged from light rail projects that are scheduled in the Sound Transit 3 Plan to be completed between 2030 and 2041, and Sound Transit will identify all known, available, and reasonable methods of prevention, control, and treatment to define light-rail specific best management practices.



Appendix L4.8, Water Resources, which quantifies the types of impervious surfaces added to areas not served by combined sewer systems.

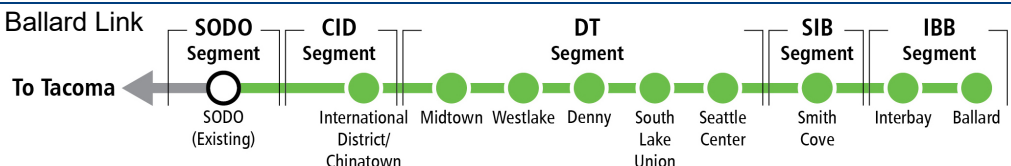
Best management practices included as part of the project would minimize the effects of increased impervious surface. Where required by the City of Seattle, flow-control vaults would be added in areas of added impervious surfaces, such as roadway improvements, guideway, and at stations. Exceptions may include where runoff would flow to flow-exempt waterbodies or combined sewer systems if the City determines that the existing system has the capacity to handle the additional flow. The vaults would control the volume, rate, frequency, and flow duration of stormwater runoff. Stormwater vaults consist of concrete boxes sited below ground level, with access covers or grates at the surface. Water quality treatment would be provided when pollutant-generating impervious surface (roadway) runoff discharges into a storm drainage basin rather than a combined sewer system. In addition, at intersections that would experience higher traffic volumes and that are improved, additional oil control treatment would be provided. This provides supplemental removal of pollutants from areas with higher vehicle use. As noted, if areas discharge to a combined sewer system, water quality treatment is not required as the runoff collected in these systems is directed to a wastewater treatment plant.

Table 4.3.8-1. Summary of Added Impervious Areas for Ballard Link Extension Alternatives

Segment	Alternative	Total New Impervious Surface (square feet)
SODO	Preferred At-Grade (SODO-1a)	6,100
	At-Grade South Station Option (SODO-1b)	6,700
	Mixed Profile (SODO-2)	6,100
Chinatown-International District	4th Avenue Shallow (CID-1a)*	9,600
	4th Avenue Deep Station Option (CID-1b)*	5,300
	5th Avenue Shallow (CID-2a)	13,100
	5th Avenue Deep Station Option (CID-2b)	8,100
Downtown	Preferred 5th Avenue/Harrison Street (DT-1)	18,600
	6th Avenue/Mercer Street (DT-2)	20,700
South Interbay	Preferred Galer Street Station/Central Interbay (SIB-1)	139,900
	Prospect Street Station/15th Avenue (SIB-2)	109,800
	Prospect Street Station/Central Interbay (SIB-3)	139,000
Interbay/Ballard	Preferred Elevated 14th Avenue (IBB-1a)	30,500
	Elevated 14th Avenue Alignment Option (from Prospect Street Station/15th Avenue) (IBB-1b)	29,100
	Preferred Tunnel 14th Avenue (IBB-2a)*	25,900
	Preferred Tunnel 15th Avenue Station Option (IBB-2b)*	23,100
	Elevated 15th Avenue (IBB-3)	24,600

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

In addition, there are areas in all the project segments where older, existing impervious surfaces on the streets will be replaced with newer surfaces to improve their strength and durability.



Where required, runoff from replaced surfaces will also receive water quality treatment prior to discharging to surface waters. Some of these replaced surfaces are pollutant-generating but currently do not receive treatment, because such treatment was not required when they were constructed. Adding treatment for these surfaces will result in additional reductions of pollutants, providing additional benefits to surface waters. These areas will be identified during subsequent design of the projects, based on pavement condition data to be collected.

A City requirement to direct stormwater from the project to storm drains that are within 300 feet of the project's long-term footprint will be incorporated where opportunities exist. This will reduce flows to the combined sewer system, increasing available capacity. These opportunities will be identified as the projects develop.

Groundwater

Increases in impervious area from the project could reduce the amount of groundwater recharge because there would be less pervious area available for precipitation to directly infiltrate into the ground. Low-impact design (also referred to as onsite stormwater management), which encourages natural processes of managing stormwater such as infiltration, evaporation, and dispersion, would be used where possible based on available property and soil infiltration, which could offset the effects of decreases in pervious area by increasing infiltration in some locations. As a result, the project is not expected to substantially impact groundwater levels.

Subsurface drainage systems would be required in certain locations where groundwater would be present behind foundations and retaining walls. The subsurface drainage systems would be designed to protect the project and manage the groundwater. Although tunnels would be tightly waterproofed, all tunnel alternatives would have a drainpipe to convey groundwater that may seep into the tunnel. The Sound Transit tunnel design criteria assume 0.2 gallon per minute of seepage per 250 feet of tunnel. These small flows would be pumped into the nearest storm or combined sewer system for disposal and are not expected to substantially affect the groundwater level around the tunnel alternatives. In addition, project stormwater runoff from pollution-generating impervious surfaces would be treated as required before release, such that groundwater quality would not be adversely impacted. The following segment-specific sections mention locations where groundwater systems are currently expected to be needed; other locations may be identified during design after additional subsurface data are collected.

4.3.8.3.2 SODO Segment

There would be no additional impacts to water resources in the SODO Segment beyond the applicable impacts common to all alternatives.

4.3.8.3.3 Chinatown-International District Segment

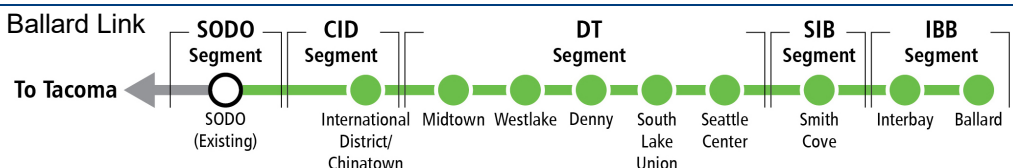
There are no additional impacts to water resources in the Chinatown-International District Segment beyond the applicable impacts common to all alternatives.

4.3.8.3.4 Downtown Segment

There would be no additional impacts to water resources in the Downtown Segment beyond the applicable impacts common to all alternatives.

4.3.8.3.5 South Interbay Segment

For Alternative SIB-2 and Alternative SIB-3, groundwater conditions along the slopes of West Queen Anne Hill, adjacent to the Smith Cove Station, would require a subsurface drainage



system beneath the slope and along the retained cut. This would control seepage, providing slope stability adjacent to the improvements. Because the system would control groundwater flows upslope of the project and discharge flows to a location downslope of the project, it is not anticipated to negatively impact groundwater or Elliott Bay.

4.3.8.3.6 Interbay/Ballard Segment

Preferred Alternative IBB-1a, Option IBB-1b, and Alternative IBB-3 would include bridges across Salmon Bay requiring columns in the water. A summary of the water displaced from bridge columns is shown in Table 4.3.8-2. Preferred Alternative IBB-1a and Option IBB-1b would have a greater volume of water displaced within Salmon Bay than Alternative IBB-3. This is because the foundations would be larger for a taller bridge structure. Preferred Alternative IBB-1a and Option IBB-1b would require relocation of a 96-inch Seattle Public Utilities storm drain outfall and a public boat ramp on the north side of Salmon Bay. The permanent impact area for this relocated outfall combined with the boat ramp impact would be about 0.6 acre and below the ordinary high-water mark. Alternative IBB-3 would require relocation of a stormwater outfall in Salmon Bay. The permanent impact area for this relocated outfall would be less than 0.1 acre and would be below the ordinary high-water mark. All outfall relocations are related to conflicts with bridge column foundation locations. Impacts to surface habitat in Salmon Bay from the column footprint and outfall relocations are discussed in Section 4.3.9, Ecosystem Resources.

Table 4.3.8-2. Summary of Bridge Column Volumes in Salmon Bay

Alternative	Approximate Volume of Columns Below Ordinary High-Water Mark (cubic yards)
Preferred Elevated 14th Avenue (IBB-1a) and Elevated 14th Avenue Alignment Option (from Prospect Street Station/15th Avenue) (IBB-1b)	8,400 to 15,750
Preferred Tunnel 14th Avenue (IBB-2a)*	0
Preferred Tunnel 15th Avenue Station Option (IBB-2b)*	0
Elevated 15th Avenue (IBB-3)	8,200 to 12,300

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Notes:

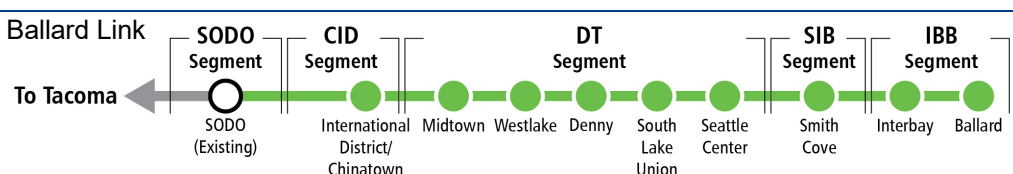
Ranges reflect impacts from different possible bridge types.

In-water column volumes include the volume of the columns (including pier caps) that are fully or partially in-water.

4.3.8.4 Environmental Impacts of the Build Alternatives during Construction

4.3.8.4.1 Impacts Common to All Alternatives

Construction-related impacts to water resources would be similar for all Build Alternatives because construction equipment and techniques would be similar. Alternatives with more at-grade or cut-and-cover portions would disturb more ground area and require more water pollution protective measures.



The following construction activities could affect water resources:

- **Earthwork, stockpiling, and material transport:** Soil exposed in sloped excavations or fills is especially susceptible to local erosion until vegetation is established. Wind can erode dry, exposed soil. Water or wind can carry loose soil into adjacent stormwater drains. Construction vehicle tires can carry soil onto roadways, where the soil could wash into ditches and storm drains during storms.
- **Concrete work and paving:** Runoff that encounters process water or slurry from concrete work or curing concrete can increase the pH in surface water to levels harmful to fish and wildlife.
- **Construction machinery:** Equipment leaks, or spills can affect water quality in nearby water resources. Construction-related pollutants can increase turbidity and affect other water quality parameters, such as oils and grease, pH levels, and/or the amount of available oxygen in the water.
- **Construction below the groundwater table:** In locations along the project corridor where construction of tunnels and underground stations would be at or below the groundwater table, groundwater dewatering would occur to keep construction excavations free of water to provide safe and workable spaces. This is a temporary impact to groundwater levels and flow. If the groundwater meets City and King County pollutant criteria, it would be discharged to an existing separated storm drain system, where available, or to the existing combined sewer system. Discussion of hazardous materials and procedures can be found in Section 4.3.12, Hazardous Materials. This has the potential to temporarily increase flow to existing infrastructure. Construction below the groundwater table also has the potential to impact the water quality of groundwater because of the construction machinery itself. In upland areas, where groundwater flows downward to surface waterbodies, this potential water quality impact would also apply to the nearby surface waterbodies.

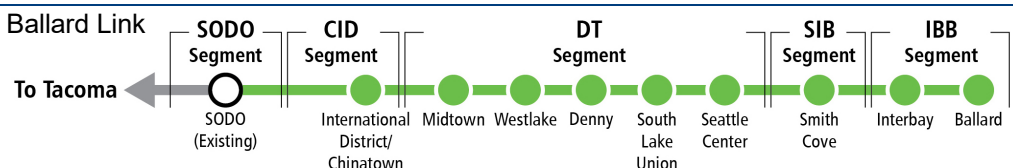
Sound Transit would develop and implement a Construction Stormwater Pollution Prevention Plan, with the following plans (for further details, see Appendix L4.8, Water Resources):

- Temporary Erosion and Sediment Control Plan
- Spill Prevention, Control, and Countermeasures Plan
- Concrete Containment and Disposal Plan
- Dewatering Plan
- Fugitive Dust Plan

Sound Transit would use a variety of best management practices to avoid or minimize impacts during construction such as erosion, sedimentation, dust, and other water quality impacts. Best management practices could include stabilized construction site entrances, silt fencing, and the mulching or covering of stockpiles and other disturbed sites.

In upland areas, conventional best management practices such as construction limit fencing and mulching or other temporary covering of exposed soils as with plastic would reduce the erosion during construction. For example, in areas with steep slopes, workers would minimize disturbance and place erosion blankets over reseeded areas at the conclusion of construction. More information on best management practices can be found in Appendix L4.8, Water Resources.

Construction impacts specific to working in or near waterbodies are outlined in the subsections of the project containing waterbodies and/or where the project would affect groundwater.



4.3.8.4.2 SODO Segment

There would be no additional impacts to water resources in the SODO Segment beyond the applicable impacts common to all alternatives.

4.3.8.4.3 Chinatown-International District Segment

There would be no additional impacts to water resources in the Chinatown-International District Segment beyond the applicable impacts common to all alternatives.

4.3.8.4.4 Downtown Segment

There would be no additional impacts to water resources in the Downtown Segment beyond the applicable impacts common to all alternatives.

4.3.8.4.5 South Interbay Segment

There would be no additional impacts to water resources in the South Interbay Segment beyond the applicable impacts common to all alternatives.

4.3.8.4.6 Interbay/Ballard Segment

Construction in the vicinity of Salmon Bay has potential to impact water quality from pollutant spills, stormwater runoff, sediment transport, and/or wind deposition of stockpiled materials. Soil exposed in sloped excavations or fills during construction is especially susceptible to local erosion until vegetation is established. Water or wind can carry loose soil into adjacent waterbodies. Construction vehicle tires can carry soil onto roadways, where the soil could wash into the storm drainage system or waterbodies during storms.

Preferred Alternative IBB-1a, Option IBB-1b, and Alternative IBB-3 all have potential to impact water quality in Salmon Bay during bridge construction activities. Column construction activities within Salmon Bay for the bridge structures, including coffer dams and work trestle foundations, would disturb sediments, potentially impacting water quality. Outfall relocations would also disturb sediments, but to a lesser degree than bridge columns because the area disturbed would be smaller and the construction duration would be less. Work barges used during construction to transport supplies or provide work cranes could also stir up sediments. Table 4.3.8-3 shows Alternative IBB-3 would have a greater area of construction within Salmon Bay and thus greater potential impact than Preferred Alternative IBB-1a and Option IBB-1b. The tunnel alternatives would avoid these impacts.

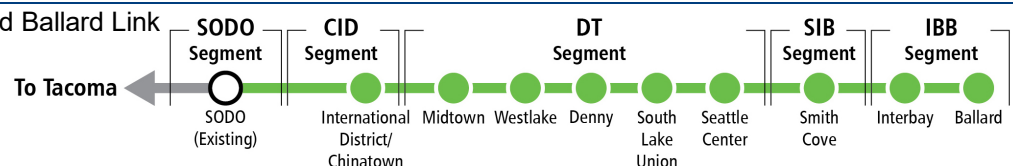
Table 4.3.8-3. Summary of Construction Impacts to Salmon Bay

Alternative	Approximate Area of Construction Impacts in Waterbody (acres)
Preferred Elevated 14th Avenue (IBB-1a) and Elevated 14th Avenue Alignment Option (from Prospect Street Station/15th Avenue) (IBB-1b)	0.4 to 1.4 ^a
Preferred Tunnel 14th Avenue (IBB-2a)*	0
Preferred Tunnel 15th Avenue Station Option (IBB-2b)*	0
Elevated 15th Avenue (IBB-3)	0.7 to 1.7 ^b

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

^a About 0.2 acre of impact is associated with the 96-inch storm drain outfall.

^b Less than 0.1 acre of impact is associated with the storm drain outfall.



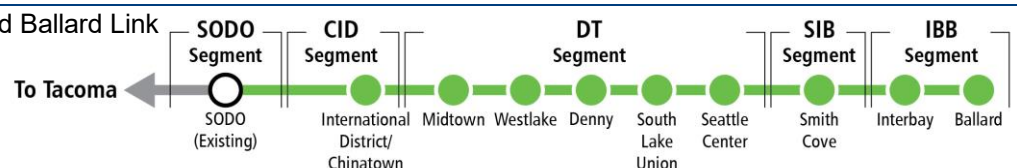
4.3.8.5 Indirect Impacts of the Build Alternatives

Population in Washington state is expected to increase, which would increase demand for development and vehicular traffic in many parts of the state. The project would convert some future vehicle traffic to light rail and reduce vehicle-related stormwater pollutants. This would be a benefit to water quality in the region.

The project could also indirectly attract residents and increase density near the new stations, reducing development pressure and associated increases in stormwater runoff in undeveloped areas in other portions of the watershed. The project would also support redevelopment around station areas, which could lead to associated infrastructure improvement. These redevelopment projects would be required to provide stormwater treatment which would improve water quality.

4.3.8.6 Mitigation Measures

The project would adhere to regulations and implement best management practices. Alternatives that have impacts in Salmon Bay (Preferred Alternative IBB-1a, Option IBB-1b, and Alternative IBB-3) would require compensatory mitigation for those impacts. See Section 4.3.9, Ecosystems, for additional information on compensatory mitigation.



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4.3.9 Ecosystems

4.3.9.1 Affected Environment

The ecosystem study area for the Ballard Link Extension consists of all species and habitat within 200 feet of the project limits, as well as wetlands within 300 feet of the project limits. At water crossings, the study area extends up to 300 feet downstream and 100 feet upstream of the project limits, or to the extent that sound could travel underwater (e.g., to where sound reaches the nearest land mass). Documented observations of sensitive federal or state-listed species within 0.25 mile of the project limits are also included. The project limits include permanent project improvements and areas needed for project construction. Key ecosystem resources are present along the South Interbay and Interbay/Ballard segments of this extension (Figures 4.3.9-1 and 4.3.9-2).

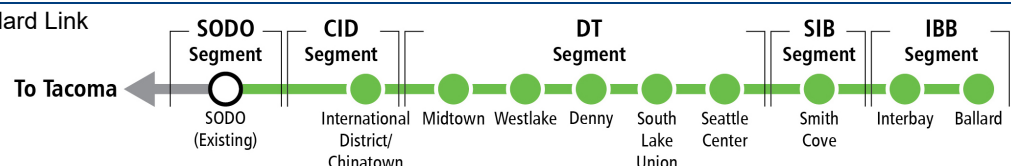
Sound Transit evaluated ecosystem components by using:

- Scientific literature
- Federal and state resource agency websites
- Consultation with Muckleshoot Indian Tribe, the Suquamish Tribe, the Confederated Tribes and Bands of the Yakama Nation, the Snoqualmie Indian Tribe, the Stillaguamish Tribe of Indians of Washington, the Tulalip Tribes of Washington, and federal, state, and local resource agencies
- Field investigations (especially at wetlands, streams, and waterbodies crossed by the project footprint)
- Aerial maps, GIS maps, and aerial images

4.3.9.1.1 Aquatic Species and Habitat

Salmon Bay is the waterbody between the Hiram M. Chittenden Locks and the Fremont Cut and is within the study area for the Ballard Link Extension. The Lake Washington Ship Canal passes through Salmon Bay. The shoreline habitat in Salmon Bay in the study area is urban and industrial. Much of the shoreline is covered by piers, including over-water parking areas, industrial yard space, and the Fishermen's Terminal piers and drydocks. Where daylighted, the shoreline has rock armoring, with some gravel or cobble substrate. Below the waterline, substrates are gravel/cobble close to shore, then silty sediment farther from shore. Invasive aquatic plants grow extensively in shallow waters outside the navigable channel. East of Ballard Bridge there are many old pilings present in the sediment, cut off at or near the mudline. At Seattle Central College's Seattle Maritime Academy (on the northeastern side of the Ballard Bridge), unarmored shoreline is present in a constructed cove and restoration area. A narrow beach with woody debris is backed by native and non-native shoreline vegetation.

Native shoreline vegetation is also present at the 11th Avenue Northwest Street-end on the northern side of the bay. This patch of shoreline has a beach below the armored riprap and was restored with native plantings in 2015 by the Seattle Department of Transportation and the University of Washington. Salmon Bay provides habitat for many native and non-native fish species, including anadromous salmonids migrating between Puget Sound and Lake Washington and its tributaries where spawning may occur. Salmon Bay is the only migration passage available for salmonids entering or exiting the Lake Washington basin. Habitat for aquatic species here is low quality because of the industrialized shoreline.





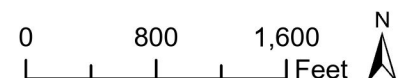
Source: City of Seattle, King County (2019, 2020, 2021), Washington Department of Fish and Wildlife (2019).

- | | | |
|--|--------------|-----------------------|
| Alternatives | Segment Line | Herring Spawning Site |
| Preferred Alternative | Railroad | Critical Habitat |
| Preferred Alternative with Third-party Funding | Park | WDFW Priority Habitat |
| Other Alternatives | | Wetland |
| Alternative Profile | | Wetland Buffer |
| Elevated | | |
| At-Grade | | |
| Retained Cut | | |
| New | | |

Notes: 1) The critical habitat shown is for Chinook salmon, killer whale, bocaccio, and yelloweye rockfish. 2) Bull trout critical habitat follows the shoreline. 3) City and federal mapping of wetlands was reviewed and field verified where possible. Mapping may differ from other public wetland mapping sources.

FIGURE 4.3.9-1
Ecosystem Resources
Ballard Link Extension -
South Interbay Segment

West Seattle and
Ballard Link Extensions





Source: City of Seattle, King County (2019, 2020, 2021), Washington Department of Fish and Wildlife (2019).

Alternatives

- Preferred Alternative
- Preferred Alternative with Third-party Funding
- Other Alternatives

Alternative Profile

- Elevated
- At-Grade
- Tunnel
- Retained Cut

Station

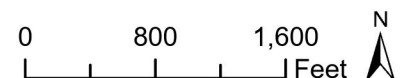
- New

- Segment Line
- Railroad
- Stream
- Park

Notes: 1) The critical habitat shown is for Chinook salmon and bull trout. 2) The WDFW Salmon Stock Inventory maps wild populations of salmon in Salmon Bay. 3) No wetlands are present along the Interbay/Ballard alignment.

FIGURE 4.3.9-2
Ecosystem Resources
Ballard Link Extension -
Interbay/Ballard Segment

West Seattle and
Ballard Link Extensions



Exceptions are present at Seattle Maritime Academy's cove and the shoreline of the 11th Avenue Northwest Street-end, which provide some rearing habitat for salmonids primarily during migration. These parks also provide habitat for resting or foraging for waterfowl, shorebirds, and great blue herons. The benthic habitat in this waterway also provides nutrient cycling services and niches for macroinvertebrates, which are prey for many of the above species.

Ecology lists Salmon Bay as a Category 5 waterbody (having exceedances of water quality criteria and requiring additional pollution controls). The bay exceeds water quality standards of several contaminants, including lead, pH, Aldrin, and bacteria. The Lake Washington Ship Canal, including Salmon Bay, also has periods of high temperatures and low dissolved oxygen in spring and summer that can change the behavior and health of resident fish, and can reduce or block migratory fish passage through the bay when those conditions extend to the bottom of the channel. Some stormflow from surrounding urban areas drains untreated into the bay or flushes into the bay during combined sewer overflow events.

4.3.9.1.2 Vegetation, Terrestrial Wildlife, and Wildlife Habitat

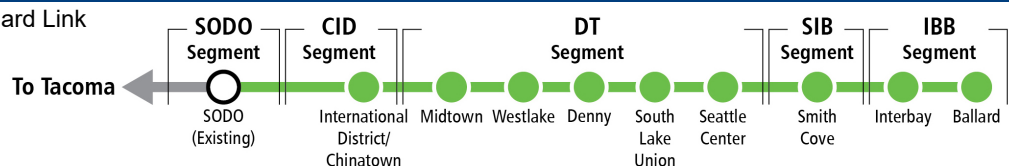
The study area along the Ballard Link Extension is a mix of high-density commercial, high- to moderate-density residential, and industrial land uses (about 90 percent of the study area; National Land Cover Database 2016). Forested habitat makes up only 4 percent of the study area and is found primarily in the Southwest Queen Anne Greenbelt/Kinnear Park. The greenbelt contains primarily deciduous trees (including red alder and bigleaf maple), with a few conifers and downed woody debris, multiple vegetation layers (herbs, shrubs, and canopy), and snags. A heritage tree is present within the greenbelt (see Section 4.2.9.1.2 under West Seattle for more discussion of heritage trees and other trees protected within environmentally critical areas). Great blue herons likely forage within the study area, because there is a great blue heron rookery at Commodore Park near the Hiram M. Chittenden Locks, about 1 mile west of the Ballard Bridge.

The Southwest Queen Anne Greenbelt, as well as patches of trees and shrubs within the Interbay Golf Center and the Interbay Athletic Complex, provide potential habitat for wildlife species tolerant of proximity to urban areas, including deer, coyote, raccoon, squirrel, opossum, and many species of birds. The habitat provides potential nesting for raptors such as red-tailed hawk, nesting and stopover habitat for songbirds and roosting for bats. Snags within the greenbelt provide foraging or nesting habitat for woodpeckers. The Interbay Golf Center provides potential foraging opportunities for raptors. Seattle Maritime Academy's upland vegetation along Salmon Bay includes dogwoods and other low trees and shrubs that could provide potential stopover habitat for songbirds during migration. The Washington Department of Fish and Wildlife notes that purple martins nest along the downtown shoreline about 0.2 mile west of Kinnear Park, and a peregrine falcon nest box is present on the Ballard Bridge.

Other vegetation in the Ballard Link Extension study area mostly consists of native and non-native vegetation along roadsides, backyard landscape plants, and many species of native and ornamental street trees. Invasive plants are common in the study area, and occur in Kinnear Park, Southwest Queen Anne Greenbelt, Interbay Golf Center, and along Salmon Bay.

4.3.9.1.3 Wetlands

Six wetlands are present in the study area, covering a total of about 0.9 acre. All the wetlands are in areas altered by human development and have relatively low quality ratings (Category IV and Category III). These wetlands receive water from groundwater and precipitation, as well as stormwater runoff inputs. Four wetlands are found in the Southwest Queen Anne Greenbelt and may provide some limited habitat for wetland-associated wildlife such as amphibians or small



mammals. Two wetlands are identified along the western and southern boundaries of the Interbay Golf Center; these wetlands are primarily dominated by non-native vegetation (Himalayan blackberry and reed canary grass). The Ecosystem Resources Technical Report (Appendix N.4) contains more detail on wetlands in the study area.

4.3.9.1.4 *Threatened and Endangered Fish and Wildlife Species, Species of Concern, Essential Fish Habitat, and Washington Department of Fish and Wildlife Priority Species and Habitat*

Table 4.3.9-1 summarizes species of concern that are known to occur or potentially occur in the Ballard Link Extension study area.

Federally listed Chinook salmon and steelhead pass through Salmon Bay during migration, and bull trout have been documented. Salmon Bay is mapped as critical habitat for Chinook salmon and bull trout. Recovery plans for Chinook salmon and steelhead include guidance on preserving or improving water quality; the Chinook plan specifies the importance of preserving shoreline habitat in the Lake Washington Ship Canal to increase the survival of juvenile salmonids.

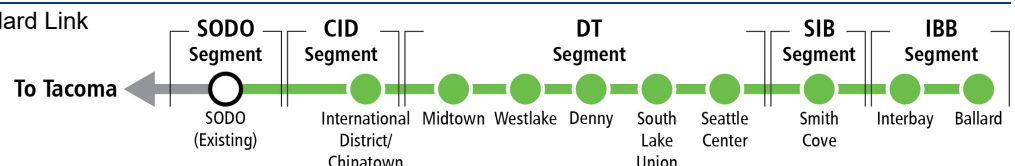
Table 4.3.9-1. Listed Species and Species of Concern Potentially Occurring in the Ballard Link Extension Study Area

Common Name	Status	Occurrence in Study Area
Bull trout	Federal Threatened; State Candidate	Documented in Salmon Bay; critical habitat in Salmon Bay.
Chinook salmon	Federal Threatened; State Candidate	Documented in Salmon Bay; critical habitat and essential fish habitat in Salmon Bay.
Steelhead trout	Federal Threatened	Documented in Salmon Bay.
Marbled murrelet	Federal Threatened; State Threatened	Possible; could land or forage in Salmon Bay when transiting between inland nesting sites and foraging areas in Puget Sound.
Coho salmon	Federal Species of Concern	Documented in Salmon Bay; essential fish habitat in Salmon Bay.

Sources: United States Fish and Wildlife Service 2019, National Oceanographic and Atmospheric Administration 2019, Washington Department of Fish and Wildlife 2019.

No listed marine species would be present along the Ballard Link Extension as all alternatives remain more than 200 feet from marine waters, and Salmon Bay is separated from marine waters by the Hiram M. Chittenden Locks (although salt water passing through the locks does cause saline or brackish conditions to extend into the Lake Washington Ship Canal). The bay is mapped as essential fish habitat for all life stages of groundfish. Water Resource Inventory Area 8 (which includes Salmon Bay) is listed as essential fish habitat for all Puget Sound salmon species.

Washington Department of Fish and Wildlife documents the presence of priority fish species in Salmon Bay (including coho and sockeye salmon, and resident coastal cutthroat and steelhead trout). Washington Department of Fish and Wildlife has identified the Southwest Queen Anne Greenbelt/Kinnear Park area as a Biodiversity Area and Corridor, a priority habitat. Terrestrial priority species that could occur in the greenbelt include Townsend's big-eared bat, pileated woodpecker, band-tailed pigeon, and Vaux's swift. Great blue heron, also a priority species, are known to forage along the shorelines or piers at Salmon Bay when traveling from the nesting colony outside the study area near the Hiram M. Chittenden Locks.



4.3.9.2 Environmental Impacts of the No Build Alternative

The No Build Alternative would not have any direct impacts on ecosystem resources.

4.3.9.3 Environmental Impacts of the Build Alternatives during Operation

Sound Transit analyzed the potential long-term impacts of operation of the Ballard Link Extension Build Alternatives on ecosystem resources in the study area. These impacts would include permanent loss of habitat that is replaced with light rail facilities. Permanent changes in habitat adjacent or nearby the light rail facilities are also considered.

4.3.9.3.1 Impacts Common to All Alternatives

The Ballard Link Extension would have long-term impacts on ecosystem resources in the study area except in the SODO, Chinatown-International District, and Downtown segments, where limited ecosystem resources are present. Portions of the guideway in the South Interbay Segment would be within or near existing forested habitat. Vegetation and wildlife habitat within and 15 feet beyond the footprint of the guideway would be permanently converted from forested vegetation to light rail or scrub/shrub vegetation. During operations, Sound Transit would continue to remove “hazard trees” (trees that might cause a hazard to light rail operations) near the operational footprint as needed.

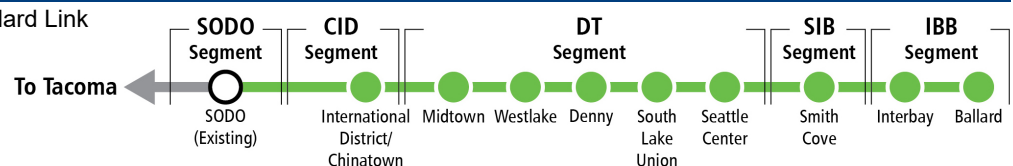
Based on the urban environment of the study area, the operation of any alternatives has a low potential to affect the viability of local wildlife populations. Directly impacted land cover is highly modified and dominated in many areas by impervious surface or invasive species. Most vegetation has low value for wildlife. The alternatives would primarily be along existing road and rail corridors (existing barriers to wildlife movement) so would not affect areas that currently serve as connective corridors to wildlife.

Although the potential for adverse effects would be low, operations could impact vegetation and wildlife over the long term. For example, maintenance activities that involve the removal of vegetation during the breeding season could require removal of nests, eggs, or birds protected under the Migratory Bird Treaty Act. At-grade guideways would reduce the amount of habitat for small mammal species. Vegetated areas would be changed to impervious surfaces, which increases runoff volumes. However, as described in Section 4.3.8, Water Resources, stormwater from project-related impervious surfaces would receive flow control as required by the City of Seattle and, where appropriate, water quality treatment.

Some of the guideway and other features would be elevated. This reduces the amount of light and rainfall reaching vegetation. Based on the existing high levels of noise and vehicle traffic throughout the study area, as well as human activity associated with residential, commercial, and industrial development in the study area, wildlife that use habitats adjacent to the light rail alternatives are likely accustomed to noise and human activity. Therefore, the potential is low for disturbance from increased human access, noise, and light. Some species may move farther into greenbelt habitat to avoid the immediate area of the light rail, but these minor localized movements would not affect these species' viability.

4.3.9.3.2 SODO, Chinatown-International District, and Downtown Segments

The SODO, Chinatown-International District, and Downtown segments are in developed urban areas where limited ecosystem resources are present and there would be no impacts to ecosystems. Most surfaces are impervious in the study area for these segments, and the



segments do not include any wetlands, wetland buffers, waterbodies, shorelines of the state, aquatic habitats, riparian areas, or other critical areas. Peregrine falcons are known to use downtown buildings for nesting; the type of tall buildings the falcons use would not be removed for the project.

4.3.9.3.3 South Interbay Segment

The ecosystem resources impacts of the South Interbay Segment alternatives are shown in Table 4.3.9-2. Preferred Alternative SIB-1 would affect one of two wetlands along the Interbay Golf Center, and Alternative SIB-2 would affect two of the four wetlands in the Southwest Queen Anne Greenbelt, as well as their buffers along the slope. Alternative SIB-3 would impact three wetlands. Alternative SIB-2 would have the least wetland impacts. Slope drains installed along the Southwest Queen Anne Greenbelt could reduce the flow of water to the greenbelt's wetlands, which may in turn reduce the size or characteristics of these wetlands.

Table 4.3.9-2. Long-term Impacts to Ecosystems – South Interbay Segment

Alternative	Wetlands (acres) ^a	Wetland Buffers (acres) ^a	Biodiversity Area (acres) ^b
Preferred Galer Street Station/Central Interbay (SIB-1)	0.2	1.4	<0.1
Prospect Street Station/15th Avenue (SIB-2)	0.1	0.5	3.7 to 3.8
Prospect Street Station/Central Interbay (SIB-3)	0.2	1.9	5.5

Note: Ranges reflect differences from connecting to different alternatives in adjacent segments.

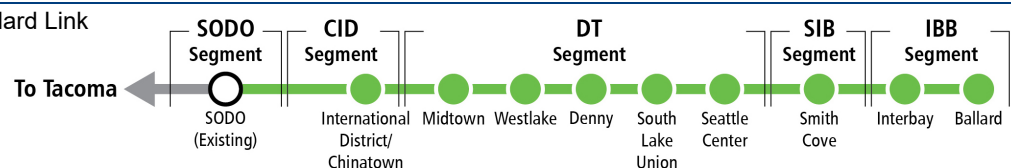
^a To estimate wetland impacts, the impact analyses for all alternatives assumed areas under elevated guideways as permanently impacted.

^b Biodiversity areas are forested corridors mapped by the City of Seattle and identified by Washington Department of Fish and Wildlife as priority habitats.

Impacts to habitat in Kinnear Park would be limited to the southwestern boundary or northwestern corner. Preferred Alternative SIB-1 would largely avoid direct impacts. Alternative SIB-2 would be on elevated guideway along Kinnear Park's southwestern edge. Although Alternative SIB-2 primarily crosses over existing impervious surface, it would require some tree removal and also shade some vegetation along the western boundary of the park. Alternative SIB-3 would be in a tunnel under most of the park until it reaches Smith Cove Station north of the park. Trees and vegetation would be removed for the tunnel portal in the northern area of the park.

Impacts to biodiversity habitat areas would occur mainly in the Southwest Queen Anne Greenbelt. Preferred Alternative SIB-1 would avoid direct impacts to the Southwest Queen Anne Greenbelt. Alternatives SIB-2 and SIB-3 would both pass through the greenbelt using a retained-cut guideway, reducing forested wildlife habitat, and would introduce train noise that could affect wildlife species. Impacts in Kinnear Park under these alternatives would be restricted to the southwestern boundary or northwestern corner. Alternative SIB-3 would have the greatest impacts to the Southwest Queen Anne Greenbelt because it would be farther east into the greenbelt and would have a longer length of retained cut.

Preferred Alternative SIB-1 and Alternative SIB-3 would shade the slope on the western edge of the Interbay Golf Center that is currently covered in Himalayan blackberry. A line of deciduous trees along the boundary of the Interbay Athletic Complex would be removed, reducing habitat for birds in the area.



4.3.9.3.4 Interbay/Ballard Segment

All alternatives in the Interbay/Ballard Segment would pass through industrial and dense residential areas. See Table 4.3.9-3 for the ecosystem impacts of alternatives in this segment.

Table 4.3.9-3. Long-term Impacts to Ecosystems – Interbay/Ballard Segment

Alternative	Shoreline (linear feet)	Over-water Structures (acres) ^{a, b}	In-water (Benthic Surface) Impacts (acres) ^{b, c}
Preferred Elevated 14th Avenue (IBB-1a)	400 ^d	0.7 to 0.9	0.8 to 1.2 ^e
Elevated 14th Avenue Alignment Option (from Prospect Street Station/15th Avenue) (IBB-1b)	400 ^d	0.7 to 0.9	0.8 to 1.2 ^e
Preferred Tunnel 14th Avenue (IBB-2a)*	0	0	0
Preferred Tunnel 15th Avenue Station Option (IBB-2b)*	0	0	0
Elevated 15th Avenue (IBB-3)	500	1.2 to 1.3	0.2 to 0.8 ^f

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

^a This area represents the total area of elevated bridge features over Salmon Bay; this does not include bridge guideway columns and pile caps in the water; these are shown in the permanent in-water (benthic surface) impacts column.

^b The range of impacts shown represents impacts from different bridge types; the number of guideway columns, amount of decking and position of pile caps would vary by bridge type. An alternative and design option using tunnels instead of bridges could avoid in-water work.

^c These in-water impacts represent the total footprint area of guideway columns and pile caps either fully or partially in water.

^d These shoreline impacts include 74 linear feet of permanent impact from the relocation of the 14th Avenue outfall, and 64 linear feet associated with relocation of the 14th Avenue Northwest Boat Ramp.

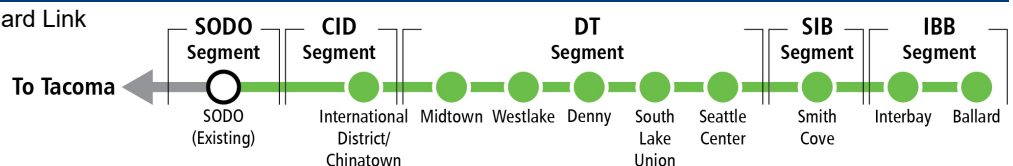
^e These in-water impacts include 0.6 acre of impact associated with relocation of the 14th Avenue outfall and <0.1 acre of impact associated with relocation of the 14th Avenue Northwest Boat Ramp.

^f Less than 0.1 acre of impact is associated with storm drain outfall relocation.

All alternatives would avoid the unarmored shorelines of Seattle Maritime Academy's cove and the 11th Avenue Northwest Street-end; however, Preferred Alternative IBB-1a and Option IBB-1b would cross over Salmon Bay east of the Ballard Bridge with a high-level fixed bridge and would require guideway columns in-water and in the 200-foot shoreline buffer area. Columns in the shoreline buffer would be in locations where very little natural habitat exists (with most locations covered by buildings and other impervious areas).

These alternatives would also include a pier-protection system on either side of the navigation channel. The guideway columns and pier-protection systems would remove benthic habitat in waters that are essential fish habitat and critical habitat for listed fish species, including salmon and trout, and would require migrating fish to move around them during their passage through the bay.

All alternatives with bridges over Salmon Bay (Preferred Alternative IBB-1a, Option IBB-1b, and Alternative IBB-3) would likely be high enough that their over-water shade would not noticeably change temperatures or productivity in the waters below, although guideway columns could create direct over-water shade. The guideway columns could cover or directly shade up to 0.8 acre of bottom habitat that is currently accessible to fish and benthic invertebrates. The covered area of benthic habitat could reduce the amount of productivity (i.e., macroinvertebrates, aquatic



vegetation, and potential prey species for larger fish) in these benthic locations. Sound Transit is evaluating several high-level fixed bridge types for crossing Salmon Bay. Depending on the bridge type, the benthic habitat, essential fish habitat, and critical habitat impacts vary as shown in Table 4.3.9-3.

For all alternatives with bridges over Salmon Bay (Preferred Alternative IBB-1a, Option IBB-1b, and Alternative IBB-3), navigation lighting on the bridge guideway columns could also alter fish behavior near the bridge, possibly making them more exposed to predation from other fish. The lighting is not expected to result in any major long-term increases in nighttime illumination because industrial lighting is already present around the bay and on the existing Ballard Bridge.

Alternative IBB-3 would have a moveable bridge west of Ballard Bridge over Salmon Bay that would require more in-water guideway columns than Preferred Alternative IBB-1a or Option IBB-1b because it would cross a wider part of the bay. The additional columns might change fish movement patterns.

Stormwater runoff from the guideway would not impact water quality, as described in more detail in Section 4.3.8.

The tunnel alternatives, Preferred Alternative IBB-2a* and Preferred Option IBB-2b*, would avoid long-term ecosystem impacts to the shoreline and Salmon Bay.

4.3.9.4 Environmental Impacts of the Build Alternatives during Construction

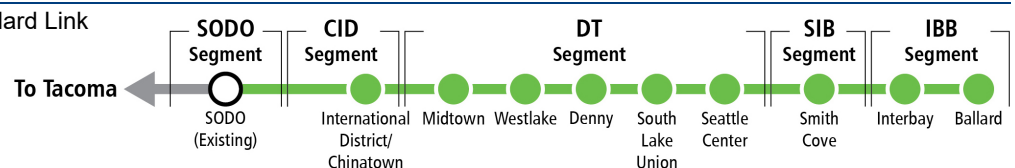
4.3.9.4.1 Impacts Common to All Alternatives

Construction would last 1 to 5 years at any one location along the alternatives (2 to 3 years for elevated or at-grade guideway, 2 to 5 years for stations, and 3 to 4 years for a bridge over Salmon Bay). For the tunnel alternatives, construction would last 4 to 5 years and ground disturbance would happen at tunnel portals. For surface alternatives, ground-disturbing activities would include clearing existing vegetation, soil fill, excavation and grading, relocating drainage systems, ground improvement activities, and dewatering. Ground-disturbing activities could introduce sediment and contaminants (e.g., runoff from stockpiled soils, spilled fuels from construction equipment) to aquatic habitat or stormwater features. Temporarily disturbed sites that are currently vegetated would be replanted immediately following construction in each project segment to restore or improve upon pre-construction conditions (e.g., replacing non-native weeds with native plants), and low-growing vegetation would likely become reestablished within a year or two. Some areas of currently forested greenbelt would be restored with herbaceous or shrub species close to the guideway.

All alternatives would require removal of or disturbance to street trees. Several alternatives would also require removal of native trees and other existing vegetation within habitat biodiversity areas. During construction, removing street trees with trunks larger than 6 inches in diameter or any trees in critical areas would require coordination with the City of Seattle. Some of these trees could be removed entirely; others would be replaced with the same or similar trees.

4.3.9.4.2 SODO, Chinatown-International District, and Downtown Segments

As described in Section 4.3.9.3, Environmental Impacts of the Build Alternatives during Operation, limited ecosystem resources are present in the SODO, Chinatown-International District, and Downtown segments. Alternatives in these segments would only affect street trees and urban vegetation. Preferred Alternative DT-1 would impact part of Donnelly Gardens, which



provides urban wildlife habitat next to the Seattle Repertory Theatre, during construction of the Seattle Center Station entrance. Sound Transit would work with the Seattle Center to replace these functions following construction. Construction would not impact falcons nesting on downtown buildings.

4.3.9.4.3 South Interbay Segment

Table 4.3.9-4 compares potential construction impacts along the South Interbay Segment. Construction of Preferred Alternative SIB-1 would directly impact the Category IV wetland along the western edge of the Interbay Golf Center. Alternative SIB-2 would avoid these impacts but would require slope drains installed beneath the surface of the Queen Anne Hill slopes to dewater and stabilize the hillside. The installation points at the toe of the slope could require some vegetation and soil disturbance within the wetlands but they would not directly impact the wetlands farther upslope because the drains would be routed farther underground by directional drilling. Construction of Alternative SIB-3 would impact two of the greenbelt's wetlands and the Interbay Golf Center wetland at the south end and would have construction impacts to the buffers of these wetlands. There would also be impacts to an additional wetland buffer south of the golf center.

Table 4.3.9-4. Construction Impacts to Ecosystems – South Interbay Segment

Alternative	Wetlands and Other Waters of the United States (acres) ^{a, b}	Wetland Buffers (acres) ^a	Biodiversity Area (acres) ^c
Preferred Galer Street Station/Central Interbay (SIB-1)	0.2	0.9	<0.1
Prospect Street Station/15th Avenue (SIB-2)	0	0	0.3 to 0.5
Prospect Street Station/Central Interbay (SIB-3)	0.2	0.9	0.7

Notes:

Ranges reflect differences from connecting to different alternatives in adjacent segments.

Construction impacts represent areas temporarily impacted by the project, outside of the long-term project footprint.

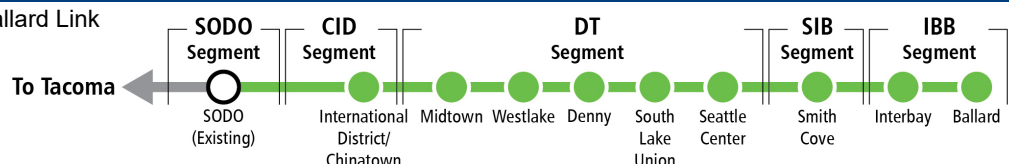
^a To estimate wetland impacts, the impact analyses for all alternatives assumed a complete loss of wetland or buffer within the construction footprint.

^b Construction impacts include impact to a jurisdictional ditch.

^c Biodiversity areas are forested corridors mapped by the City of Seattle and identified by Washington Department of Fish and Wildlife as priority habitats.

In Kinneer Park, all three South Interbay Segment Build Alternatives' construction impacts are limited to the park's southwest edge, where there would be minimal change to existing vegetation. Alternative SIB-3 would construct a tunnel under the park, but at the north end of the tunnel, a limited area of cut-and-cover construction would be required, which would remove trees and vegetation. Alternative SIB-3 would require more temporary vegetation removal in the park than Alternative SIB-2.

Construction of Alternatives SIB-2 and SIB-3 would require removing trees and other vegetation in the Queen Anne Greenbelt, and wildlife would be disturbed by construction noise. These effects on wildlife are expected to be minimal, as wildlife in the greenbelt is already habituated to noise and migration barriers are already present. The slope drains installed in the hillside could disturb vegetation and soil along the toe of the slope, where they would initially be only 5 to 10 feet underground.



Preferred Alternative SIB-1 and Alternative SIB-3 would both have construction impacts to managed vegetation along the Interbay Golf Center and Interbay Athletic Complex. Alternative SIB-2 would avoid impacts to the athletic complex and the deciduous trees along the western boundary, but would require construction along the eastern edge of the Interbay Golf Center and Interbay P-Patch in areas with street trees and mowed lawn.

4.3.9.4.4 Interbay/Ballard Segment

Construction impacts to ecosystems in the Interbay/Ballard Segment are shown in Table 4.3.9-5. The primary impacts would occur where the alternatives pass over Salmon Bay, as they would create several types of disturbances within the aquatic habitat and bay shorelines. No heritage trees or trees within Seattle Maritime Academy's shoreline vegetation would be affected. However, birds such as great blue herons, shorebirds, raptors, and migratory songbirds using Seattle Maritime Academy's cove area as well as purple martins using the nest boxes at the 11th Avenue Northwest Street-end could be disturbed by noise during construction of Preferred Alternative IBB-1a and Option IBB-1b.

Table 4.3.9-5. Construction Impacts to Ecosystems – Interbay/Ballard Segment

Alternative	Shoreline (linear feet)	Approximate Area of Impacts in Waterbody (acres) ^{a, b}
Preferred Elevated 14th Avenue (IBB-1a)	1,000 ^c	0.5 to 1.5 ^d
Elevated 14th Avenue Alignment Option (from Prospect Street Station/15th Avenue) (IBB-1b)	1,000 ^c	0.5 to 1.5 ^d
Preferred Tunnel 14th Avenue (IBB-2a)*	0	0
Preferred Tunnel 15th Avenue Station Option (IBB-2b)*	0	0
Elevated 15th Avenue (IBB-3)	800	0.7 to 1.7 ^e

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Note: Construction impacts represent areas temporarily impacted by the project, outside of the long-term project footprint.

^a These in-water impacts represent the total area of the cofferdam footprints and work trestle piling footprints that would be placed on the benthic surface, minus the area of guideway columns and pile caps that will remain permanently within that same footprint. All in-water work would occur in Chinook salmon and bull trout critical habitat and essential fish habitat for Puget Sound salmon species.

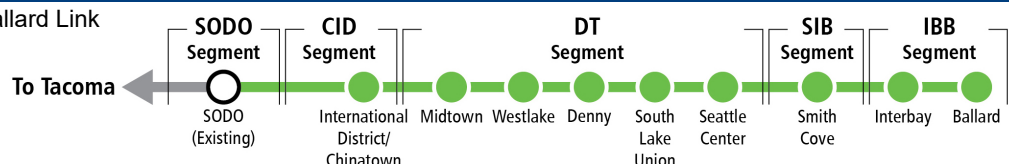
^b The range of in-water impacts shown represent different bridge types; the number and position of cofferdams and work trestles could vary by bridge type.

^c These shoreline impacts include 116 linear feet of impact associated with the relocation of the 14th Avenue outfall and 91 linear feet of impact associated with relocation of the 14th Avenue Northwest Boat Ramp.

^d This area includes 0.1 acre of impact associated with the relocation of the 14th Avenue outfall and 0.2 acre of impact associated with relocation of the 14th Avenue Northwest Boat Ramp.

^e Less than 0.1 acre of impact is associated with storm drain outfall relocation.

Preferred Alternative IBB-1a and Option IBB-1b would require bridge guideway columns in Salmon Bay. Construction of in-water guideway columns is described in Chapter 2, including how a temporary cofferdam system would be installed. Temporary work trestles on in-water support pilings would also be used during construction. The cofferdam and trestle placement (and eventual removal) would disturb benthic habitat and sediments and create temporary turbidity in the vicinity, in areas of critical fish habitat. When placing the cofferdam walls using



pile-driving or vibratory driving, noise could reach levels that may injure fish or change their movement patterns through the area. While the cofferdam is in place, the dewatered areas would temporarily exclude Chinook salmon and bull trout critical habitat from use by these fish species. Dewatering of the cofferdam would cause mortality of benthic organisms present in the cofferdam area. Work barges would also be used during construction to transport supplies or provide work cranes; these barges could stir up sediments, create construction noise, and temporarily create shade and artificial lighting that could affect fish movements through the waterway. Best management practices would be used during all over-water construction or construction adjacent to the bay to contain any spills of fuel, oil, or other contaminants from construction equipment. Alternative IBB-3 would have similar types of impacts to Salmon Bay; however, it would require construction of more in-water supports and thus more noise and dewatering activities compared to the other bridge alternatives.

Construction of the tunnel options (Preferred Alternative IBB-2a* and Preferred Option IBB-2b*) would not impact Salmon Bay and aboveground work would occur outside the shoreline buffer.

4.3.9.5 Indirect Impacts of the Build Alternatives

Indirect impacts common to all alternatives (potential spread of noxious weeds, changes to hydrology, increased noise disturbance in greenbelts, potential to improve vegetation conditions in restored areas, and potential reduction in prey species because bridge guideway columns cover benthic habitat) would be similar to those under the West Seattle Link Extension. Where areas of the Southwest Queen Anne Greenbelt and Kinnear Park are disturbed during construction, native vegetation would be used to revegetate the area. In the greenbelt, this would be a likely improvement on the dominant non-native herbaceous and shrub cover. Where retained-cut or at-grade, guideway along the Southwest Queen Anne Greenbelt could create a partial barrier to wildlife moving through the greenbelt.

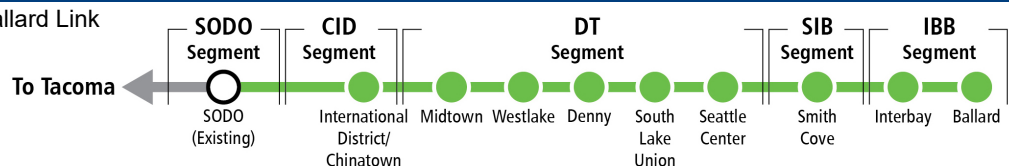
The introduction of light rail transit to the area could result in a slight reduction in vehicle traffic compared to current levels. This effect, in turn, would slightly decrease (in the short term) or slow the increase (in the long term) of the expected automotive emissions and pollutant-laden stormwater runoff associated with increased traffic under the No Build Alternative. Reducing or slowing the increase of pollutants and traffic would be a benefit for the water quality in wetlands and waterways, and would lessen the disruptive effects of increased traffic and poor air quality on wildlife living in the area's greenbelts.

4.3.9.6 Mitigation Measures

4.3.9.6.1 Avoidance and Minimization Measures

The design of the Ballard Link Extension already incorporates avoidance and minimization techniques, although further avoidance and minimization measures would continue to be pursued as the project enters final design and permitting stages. Attachment N4.F of Appendix N4, Ecosystems Technical Report, provides a compilation of best management practices that could be used to avoid or minimize project construction and operational impacts on sensitive ecosystem resources, including state and federal protected species and their habitats, wetlands, and aquatic resources. Avoidance and minimization measures include the following design features:

- Reducing the size and number of guideway columns in water or near wetlands where possible.



- Minimizing the placement of construction staging areas in wetland and stream buffers and forested areas.
- Replanting cleared areas and implementing best management practices to minimize the risk of introducing or spreading invasive species.
- Reducing the use of herbicides and fertilizers when restoring disturbed areas by using mulching, ground cover, and other planting strategies that discourage growth of undesirable species.
- Restricting clearing activities to outside the active bird nesting period, to the extent possible, to comply with the Migratory Bird Treaty Act that is administered by the United States Fish and Wildlife Service. If avoidance scheduling is infeasible, Sound Transit would work with staff at the United States Fish and Wildlife Service to conduct pre-construction surveys to determine the presence or absence of nesting migratory birds and assist Sound Transit in complying with the Migratory Bird Treaty Act.

In-water work windows would be followed during construction work in Salmon Bay to minimize the effects on salmonids and other fish species. Measures would be taken to manage noise and turbidity of any in-water work to minimize impacts to fish and benthic invertebrates.

4.3.9.6.2 Compensatory Mitigation

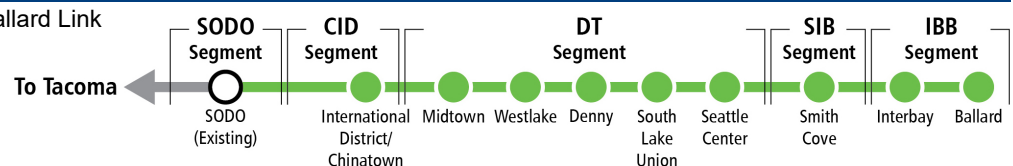
To the extent that impacts cannot be avoided or minimized, Sound Transit would provide compensatory mitigation to achieve no net loss of ecosystem function and acreage.

Sound Transit plans to mitigate long-term impacts on fisheries and benthic habitat, wetlands, stream buffers, and forested areas using one or more of the following methods, if available:

- In-lieu fee program through the King County Mitigation Reserves Program
- Approved mitigation bank through the Port of Seattle
- Advance offsite compensatory mitigation
- Project-specific mitigation developed concurrently by Sound Transit and approved by appropriate regulatory agencies

Sound Transit would implement compensatory mitigation in accordance with applicable federal, state, and local requirements and guidelines. This mitigation would address both permanent and temporary impacts, as required. To the extent practical, mitigation sites would be identified close to project impacts and compensate in-kind for lost values. Sound Transit would determine final mitigation actions in coordination with Tribes and federal, state, and local resource agencies during final design and permitting.

Sound Transit would provide mitigation for unavoidable impacts on other ecosystem components (e.g., benthic habitat, streams, stream buffers, and wildlife habitat) protected under federal, state, and local regulations. With the exception of Salmon Bay, the project design would avoid impacts on existing streams. Mitigation for impacts on shorelines, wetlands, and benthic habitat in Salmon Bay would need to be approved by the appropriate permitting agencies and jurisdictions prior to construction. Mitigation actions could include removing over-water structures or planting shoreline vegetation (per recommendations in salmon recovery plans), or installing upland plantings to improve areas vegetated with non-native plants. Sound Transit would mitigate for impacts on forested vegetation using applicable policies and regulations, and would coordinate with the City of Seattle on tree replacement requirements.



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4.3.10 Energy Impacts

4.3.10.1 Affected Environment

The energy use study area for the project covers the Puget Sound Regional Council four-county region of King, Pierce, Kitsap, and Snohomish counties. Consistent with the Council's regional travel demand model, the analysis includes vehicular travel on all facilities, including freeways, ramps, collector-distributors, arterials, and collector streets. This scale of analysis is the most comprehensive and accounts for mode shifts between private vehicles and public transit; that is, this scale primarily illustrates the effects of travel demand. According to the Energy Information Administration, Washington state consumed over 2,097 trillion British thermal units of energy in 2017 (Energy Information Administration 2019), enough energy to meet the needs of approximately 23 million households (United States Department of Energy 2019). Approximately 32 percent of total energy use was consumed for transportation purposes.

Table 4.3.10-1 presents daily vehicle miles traveled and energy consumption by mode for the region. According to the Puget Sound Regional Council traffic model and the Sound Transit ridership model, the existing daily total for the region is approximately 88.8 million vehicle miles traveled. The daily energy use by the different transportation modes is approximately 620 billion British thermal units.

Table 4.3.10-1. Existing Energy Consumption by Mode in King, Pierce, Kitsap, and Snohomish Counties

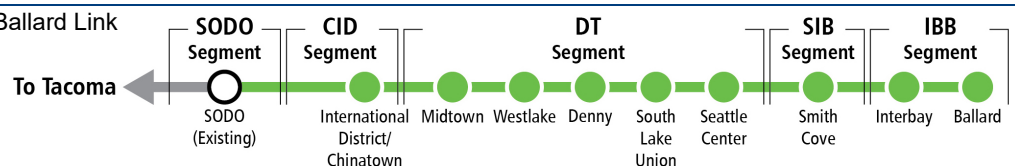
Vehicle Type	Energy Consumption Rate in British Thermal Units per Mile	Existing Conditions Daily Vehicle Miles Traveled	Existing Conditions in Billion British Thermal Units
Cars and Light Trucks	5,277	79,532,000	419,705
Heavy Trucks	21,335	9,012,000	192,271
Transit Buses	37,404	205,100	7,672
Streetcar	29,333	700	21
Light Rail	25,129	11,700	294
Commuter Rail	108,252	6,500	704
Total	Not Applicable	88,768,000	620,666

Sources: Oak Ridge National Laboratory 2019, Sound Transit 2019a, Roos 2019, Puget Sound Regional Council 2019.

Seattle City Light is a municipally owned utility that provides electricity to Seattle and other nearby King County communities. Its electricity is generated using a number of different resources, including utility-owned hydro facilities and purchased power. In 2017, hydroelectric power accounted for 91 percent of the utility's power portfolio (City of Seattle 2018). The remaining power sources include nuclear, natural gas, wind, and other sources. Seattle City Light has been providing its service area with carbon neutral power since 2005 using utility-owned and purchased clean power sources.

4.3.10.2 Environmental Impacts of the No Build Alternative

Under the No Build Alternative, there would be no long-term or construction-related energy consumption.



4.3.10.3 Environmental Impacts of the Build Alternatives during Operation

The energy analysis evaluates operational energy use by the project and the demand on regional energy supply. The West Seattle and Ballard Link extensions were analyzed together for long-term effects because energy effects would be the same for both of these Link lines during operation.

Energy-related impacts during operation of the WSBLE Project are not anticipated. Sound Transit estimated long-term (operational) impacts from the vehicle-miles-traveled estimates by mode presented in the Puget Sound Regional Council traffic forecast model. The regional total light rail vehicle-miles-traveled estimates were modeled based on the projected operations plan for the combined Link light rail system. The regional vehicle-miles-traveled total was separated into passenger miles and heavy truck miles to account for differences in energy consumption levels. All energy consumed was converted to British thermal units to provide a common measure among all energy sources. The British-thermal-unit consumption rate per mile for each mode was obtained from the Transportation Energy Data Book, Edition 37 (Oak Ridge National Laboratory 2019), from Sound Transit, and from the American Public Transit Authority. The consumption rates in British thermal units for each mode are listed in Table 4.3.10-1.

The long-term direct energy impacts of the WSBLE Project are based on projected year 2042 regional traffic volumes and daily vehicle miles traveled, consistent with Puget Sound Regional Council data (2019) and the transit modeling performed by Sound Transit (2019a). The vehicle miles traveled, energy consumption rate, and total energy consumption for the No Build and the Build Alternatives are presented in Table 4.3.10-2.

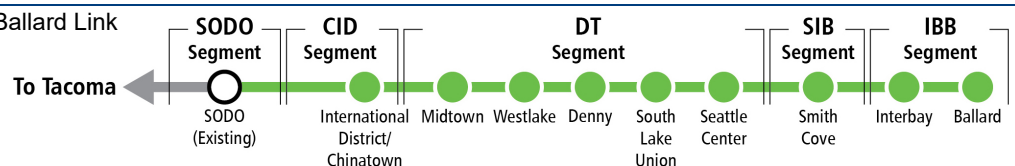
Table 4.3.10-2. Energy Consumption by Mode for the No Build and Build Alternatives

Vehicle Type	Consumption Rate in British Thermal Units per mile	2042 No Build Daily Vehicle Miles Traveled	2042 No Build Million British Thermal Units	2042 Build Daily Vehicle Miles Traveled	2042 Build Million British Thermal Units	Percent Change in Million British Thermal Units from No Build
Cars and Light Trucks	5,277	85,364,000	450,481	85,247,000	449,864	-0.1%
Heavy Trucks	21,335	11,269,000	240,424	11,269,000	240,424	0.0%
Transit Buses	37,404	257,700	9,639	259,900 ^a	9,721	0.9%
Streetcar	29,333	3,500	103	3,500	103	0.0%
Light Rail	25,129	135,700	3,410	151,700	3,812	11.8%
Commuter Rail	108,252	17,500	1,894	17,500	1,894	0.0%
Total	Not Applicable	97,047,400	705,952	96,948,600	705,819	0.0%^b

Sources: Oak Ridge National Laboratory 2019, Sound Transit 2019a, Roos 2019, Puget Sound Regional Council 2019.

^a Because of the shift from cars and trucks to light rail and transit buses, the Build Alternatives would result in an increase in transit bus miles compared to the No Build Alternative.

^b The total percentage change represents the change from the 2042 No Build Alternative to the 2042 Build Alternative total and includes all vehicle types.



The Build Alternatives are expected to reduce miles travelled by cars and light trucks by nearly 117,000 miles per day but would increase light rail miles by approximately 16,000 miles per day when compared to the No Build Alternative. This would result in a slight reduction of car and light truck vehicle miles as demand shifts to the light rail system and transit buses. Overall, energy use during project operation is expected to result in slightly less energy use than with the No Build Alternative.

Operation of the WSBLE Project would place a demand on the local electricity utility, Seattle City Light. The light rail energy consumption for the WSBLE Project is expected to be approximately 402 million British thermal units more energy per day than the No Build Alternative, which is 17.6 megawatt hours per day of electricity. On an annual basis, this translates to approximately 6,400 megawatt hours of electricity per year. This represents less than 0.5 percent of Seattle City Light's total 2018 power generation. The WSBLE Project operation is not expected to have a notable impact on the electric utility because the utility could purchase additional electricity on the open market if necessary.

For the M.O.S. to the West Seattle Link Extension's Delridge Station and to the Ballard Link Extension's Smith Cove Station, there would be less shift in demand to light rail; therefore, the decrease in energy use would be less than shown in Table 4.3.10-2.

4.3.10.4 Environmental Impacts of the Build Alternatives during Construction

Energy-related impacts during construction of the Ballard Link Extension would be short term in nature and not anticipated to be adverse. Table 4.3.10-3 presents the project inputs used to estimate construction-related energy consumption for the Ballard Link Extension. The low-cost estimate includes Alternative CID-2a, Preferred Alternative DT-1, Preferred Alternative SIB-1, and Preferred Alternative IBB-1a. The high-cost estimate includes Alternative CID-1a*, Alternative DT-2, Alternative SIB-3, and Preferred Alternative IBB-2b*. Alternative CID-1a* would require the existing Stadium Station to be rebuilt.

Table 4.3.10-3. Ballard Link Extension Energy Model Inputs

Scenario	Number of At-Grade Stations	Number of Elevated Stations	Number of Tunnel Stations	Miles of At-Grade Guideway	Miles of Elevated Guideway	Miles of Guideway in Tunnel
Build Alternatives: Low Cost	0	3	6	0.6	7.4	7.0
Build Alternatives: High Cost ^a	2	1	7	2.5	1.9	11.4

^a The high-cost alignment includes rebuilding Stadium Station. Alternative CID-1a* would require the existing Stadium Station to be rebuilt.

Table 4.3.10-4 shows the estimated energy that would be consumed during construction for both the low- and high-cost alternatives. The high-cost alternative is estimated to consume approximately 1.5 times more energy than the low-cost alternative. Tunneling and tunnel station construction would use more energy than at-grade and elevated construction. The M.O.S. to Smith Cove Station would result in less energy consumption than what is shown in Table 4.3.10-4 because it would have a shorter alignment.

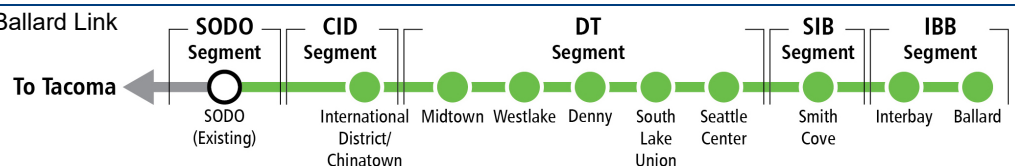


Table 4.3.10-4. Estimated Energy Consumed During Construction – Ballard Link Extension

Scenario	Upstream Energy Materials (million British thermal units)	Direct Energy Construction Equipment (million British thermal units)	Total Energy Consumption
Build Alternatives: Low Cost	13,299,558	21,707,391	35,006,949
Build Alternatives: High Cost ^a	17,752,723	35,228,268	52,980,991

^a The high-cost alignment includes rebuilding Stadium Station. Alternative CID-1a* would require the existing Stadium Station to be rebuilt.

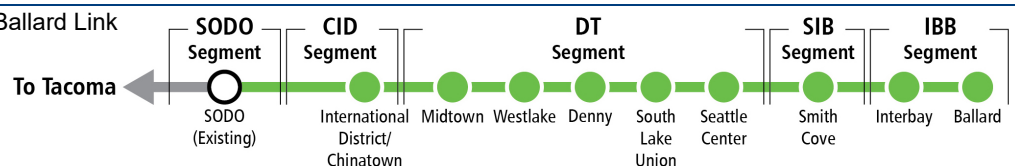
Assuming an 10-year construction period, the average annual energy consumed by project construction would represent approximately 0.3 percent or less of the energy consumed in Washington state. Sound Transit's commitment to sustainability practices includes minimizing greenhouse gas emissions, which could be achieved by conserving energy during construction. Such measures could include, but would not be limited to, conserving fuel use through reductions in construction vehicle idling, setting minimum United States Environmental Protection Agency-tier requirements for construction vehicles, and providing for pre-demolition extraction of salvageable/reusable/recyclable materials. Sound Transit would work with the contractor regarding the implementation of mitigation measures.

4.3.10.5 Indirect Impacts of the Build Alternatives

There would be no long-term indirect energy impacts associated with the WSBLE Project because the energy consumed during operations is considered a direct impact. Short-term indirect impacts related to the upstream energy consumption from the extraction, production, and transportation of construction materials for the WSBLE Project are included in the energy consumed during construction units identified in Table 4.3.10-4.

4.3.10.6 Mitigation Measures

With the implementation of Sound Transit's Sustainability Plan (Sound Transit 2019b), impacts on energy use from the project would be minimized and, therefore, no mitigation is proposed. Additionally, Sound Transit's *Design Criteria Manual*, Chapter 30 (Sustainability), outlines specific measures around energy efficient design at the station level to minimize impacts on energy use and adopts requirements in line with the United States Green Building Council Leadership in Energy & Environmental Design transit rating system. Lastly, each construction phase of the project would pursue Envision certification, which includes elements of construction and operational reductions in energy consumption.



4.3.11 Geology and Soils

4.3.11.1 Affected Environment

Sound Transit assessed geologic units and soil characteristics along each alternative within the study area to establish the affected environment for geology and soils. The study area for geology and soils covers the area within 100 feet of the project limits. The project limits include permanent project improvements and areas needed for project construction. Regional geology was also considered to understand the mechanisms that created the local geology in the study area. Sound Transit assessed geologic units and soil characteristics using maps—including topographic maps, surficial soils maps, geologic maps, and geologic hazard maps—published by the City of Seattle, the United States Department of Agriculture, and United States Geological Survey. Sound Transit also assessed available site-specific geotechnical information for each alternative based on geotechnical explorations conducted for the project and as part of other projects in the study area.

4.3.11.1.1 Topography and Regional Geology, and Seismicity

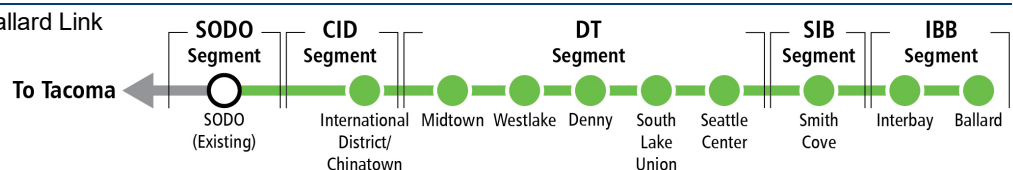
The WSBLP Project is in the central portion of the Puget Sound Basin, an elongated, north-south trending depression situated in western Washington between the Olympic Mountain Range to the west and the Cascade Mountain Range to the east. The regional topography consists of a series of north-south trending ridges separated by deep troughs, which are now occupied by streams, lakes, and waterways, including Puget Sound, Elliott Bay, Lake Union, and Lake Washington. Land elevations range from about 20 to approximately 200 feet (North American Vertical Datum of 1988) across the Ballard Link Extension (see Figure L4.11-13 in Appendix L4.11). This regional topography was shaped mainly by glaciations that moved back and forth across the region over 10,000 years ago. The glaciers were sometimes several thousand feet thick. Soils that were over-ridden by glaciers are generally very hard or compact as a result of the weight of the glaciers. More recently, erosional processes and landform changes resulting from human development of the area have modified the regional topography.

Geology in the region generally includes recently developed surficial soils (created within the last 10,000 years) over a thick sequence of glacially consolidated soils and then bedrock (see Figures L4.11-14 to L4.11-18 in Appendix L4.11 for geologic units). Bedrock along the Build Alternative alignments is generally more than 500 feet below the ground surface. The region is seismically active—the project vicinity has been subject to earthquakes in the historical and recent past and will undoubtedly experience earthquakes again in the future. Earthquakes in the Puget Sound region result from any one of three sources: the Cascadia subduction zone off the coast of Washington, the deep intraslab subduction zone approximately 20 to 40 miles below the Puget Sound area, or shallow crustal faults.

The northern terminus of Link light rail in Ballard would be within 5 miles of the Seattle Fault Zone, which is present just south of the SODO Segment, as shown on Figure L4.11-7 in Appendix L4.11.

4.3.11.1.2 Site Geology and Groundwater Conditions

Based on the geologic mapping and existing geotechnical reports, the SODO, Chinatown-International District, and South Interbay segments' areas include tidelands and reclaimed tidelands. The Downtown Segment area north of Main Street and the Interbay/Ballard Segment area are primarily glacially consolidated soils. Groundwater levels in the SODO and Chinatown-International District segments range from 20 feet to 40 feet below ground surface and might be



tidally influenced near the shoreline, while farther north in the Downtown Segment, groundwater is approximately 80 to 100 feet deep. From the tunnel portal to Salmon Bay, the depth to groundwater will be approximately 10 feet. North of Salmon Bay, the depth to groundwater is approximately 10 feet and occurs within the fill above the Vashon Till (Sound Transit 2020). Due to the complex glacial stratigraphy in the Seattle area and its influence on the nature and flow of groundwater, multiple perched groundwater-bearing layers might be encountered.

4.3.11.1.3 Geologic Hazard Areas

Steep Slopes and Landslide-Prone Areas

Earth slopes and retaining wall structures could be a hazard if not permanently stabilized. Earth slopes include existing slopes, slopes that could be steepened as part of the project, and slopes for embankment fills needed to support the light rail alignment. Slope instability could result in damage to structures in the path of moving soil or in a loss of the soil's supporting capacity for structures on or near the slope. The risk of inadequate slope stability would be greater if a large seismic event occurred. Locations in the study area where landslides have occurred are likely to occur, or that have steep slopes in excess of 40 percent are reflected in the City of Seattle's Environmentally Critical Area mapping and are shown on Figures L4.11-20 through L4.11-23 and L4.11-24 through L4.11-27 in Appendix L4.11.

Steep slopes hazard areas are slopes greater than 40 percent, with a vertical rise of more than 10 feet. Landslide-prone areas are based on slope, soil types, and evidence of past slide activity.

At the south end of the Downtown Segment, two known landslides occurred more than 50 years ago on the east side of 5th Avenue near Terrace Street, where slopes reach 40 percent or greater. Surficial signs of these slides were removed by subsequent development of this area, but slide-prone soils could still be present.

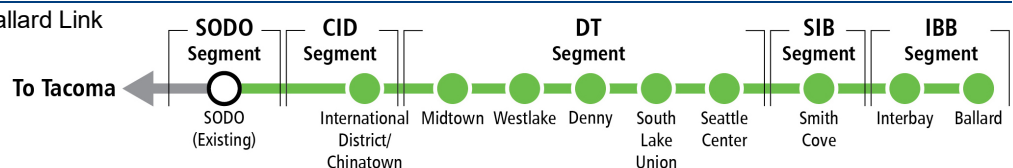
At the southeastern end of the South Interbay Segment, two landslides have occurred on steep slopes east of Elliott Avenue West (see Figure L4.11-22 in Appendix L4.11). One occurred in 1960 on the north side of Republican Street between 4th Avenue West and 5th Avenue West. The second landslide occurred above Elliott Avenue West in 2006. The southwest side of Queen Anne Hill has steep slopes that are within a potential landslide area and where many known landslides have occurred. Elliott Avenue West and 15th Avenue West, to the west of these slopes, are outside of the potential landslide area.

Liquefaction-Prone Areas

Many of the shoreline and nearshore areas along Elliott Bay and Puget Sound are composed of historical fill over former Elliott Bay tide flats. These areas are susceptible to liquefaction during a large earthquake. During and following the magnitude 6.8 Nisqually earthquake on February 28, 2001, the region experienced localized building settlements, cracked concrete slabs and walls, and soil liquefaction. Earthquakes in the Puget Sound region with magnitudes of 6 and greater could affect these liquefaction-prone areas.

Liquefaction-prone areas have loose, saturated soils that lose the strength needed to support structures during earthquakes.

Areas with liquefaction-prone soils in the Ballard Link Extension project corridor are shown on Figures L4.11-19 through L4.11-23. Liquefaction-prone areas are present from the south end of the project corridor to approximately South King Street. Groundwater levels in this area range from 20 feet to 40 feet below ground surface and are tidally influenced. Other areas with liquefaction-prone soils are along Elliott Avenue West, 15th Avenue West, south of West Armory Street, and the south bank of Salmon Bay.



Potentially liquefiable soils might also be present in other portions of the alignment where drainage channels were formed by glacial withdrawal and filled with post-glacial granular deposits.

Peat Settlement-Prone Areas

Peat is an accumulation of decaying organic plant material that typically forms in wetland environments and is highly compressible and prone to settlement when loaded by new structures and fill or when the groundwater table is lowered.

Peat settlement-prone areas contain substantial deposits of peat-rich soils that are susceptible to settling.

Listed below are the two such areas in the Ballard Link Extension study area, as shown on Figures L4.11-20 and L4.11-21 in Appendix L4.11:

- Chinatown-International District Segment: Between 1st Avenue South and 6th Avenue South, between South Jackson Street and Yesler Way
- Downtown Segment: Between Westlake Avenue North and Terry Avenue North, between West Republican Street and Mercer Street

Seismic Hazard Areas

The Puget Lowland is in the geologic basin of the Cascadia subduction zone. The tectonics and seismicity of the region are the result of the northeastward subduction of the Juan de Fuca Plate beneath the North American Plate offshore beneath the Pacific Ocean. The nearest potentially active fault to the study area is the east-west trending Seattle Fault Zone, which extends from Bremerton on the west through the Alki peninsula and West Seattle, then passes just north of and parallel to the West Seattle Bridge, and continues eastward.

Seismic hazard areas include liquefaction-prone areas and areas subject to ground shaking and tsunamis.

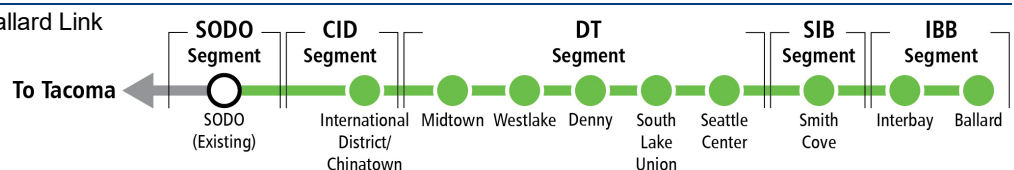
Tsunamis are large water waves created from seafloor movement during seismic events. The SODO and South Interbay segments could experience tsunamis during a large regional seismic event.

Volcanic Hazard Areas

While ashfall from any of the five Cascade volcanoes in Washington could pose statewide risks, Mount Rainier poses the most substantial threat to Seattle in the form of lahars and post-lahar sedimentation. Lahars from Mount Rainier have buried the Kent valley, but there is no evidence that a lahar has reached Seattle in the past 10,000 years. It is possible for a lahar to reach Seattle along the Duwamish Waterway, but it would be extremely unlikely (Sound Transit 2020).

Volcanic hazard areas are subject to inundation by lahars (mudflows and debris flows that originate from the slopes of a volcano) or flooding resulting from volcanic activity on Mount Rainier.

Post-lahar sedimentation occurs after a lahar, when rivers are choked with debris and mud, which blocks the normal drainage channels and causes increased flooding and progressive burial by remobilized sediment. Sediment deposition is exacerbated by rainstorms that transport loose materials from the lahar down the drainage channel.



4.3.11.2 Environmental Impacts of the No Build Alternative

Under the No Build Alternative, the existing geology and soils environment would remain unchanged. The existing risks from seismic hazards would remain. New development would continue to take place in existing steep slope, erosion, and seismic hazard areas as allowed by City code.

4.3.11.3 Environmental Impacts of the Build Alternatives during Operation

4.3.11.3.1 Impacts Common to All Alternatives

Slope Stability, Retaining Structures, and Landslides

Earth slopes and retaining wall structures could be a hazard if not permanently stabilized. Earth slopes include existing slopes, slopes that could be steepened as part of the project, and slopes for embankment fills needed to support the light rail alignment. Slope instability could result in damage to structures in the path of moving soil or in a loss of the soil's supporting capacity for structures on or near the slope. The risk of inadequate slope stability would be greater if a large seismic event occurred. See Figures L4.11-7.2 through L4.11-7.5 and L4.11-8.1 through L4.11-8.4 in Appendix L4.11 for locations of known landslide hazard areas and steep slopes. The extent of steep slopes in the study area is limited, and the slope ground conditions are generally stable in most areas along the Build Alternatives alignments (exceptions are present in the South Interbay Segment). Land clearing in steep slope areas could increase soil erosion, but Sound Transit would implement erosion-control management practices to reduce hazards and keep the overall risk low. Sound Transit would use measures such as slope stabilization or retaining walls to stabilize the areas of potential risk. Some structures could require permanent soil anchors or tiebacks that extend underground into adjacent properties.

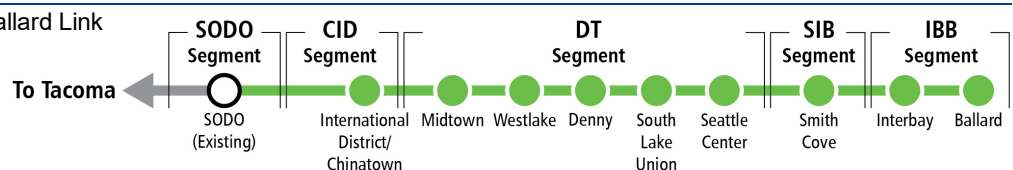
Seismic Hazard

The primary seismic hazard is ground shaking caused by a seismic event. Potential impacts are listed below:

- Seismic ground shaking during light rail operation would be transmitted to the guideway structures supporting the light rail system.
- If the project is built on sloping ground, the shaking could result in permanent movement of the ground and supported facilities.
- Seismic ground shaking could also lead to liquefaction of loose, saturated soils; settlement from densification of loose soils; increased risk of unstable earth slopes and retaining walls; and increased earth pressures on retaining walls.

Although these impacts would pose a risk to light rail facilities and users, Sound Transit would minimize the risk by designing the elevated, at-grade, and below-grade light rail support systems and retaining structures to withstand the effects of seismic ground shaking. Ground improvements in liquefaction-prone soils could include the following:

- Installing stone columns, which are vertical columns of stone injected into the ground to stabilize the soil
- Jet grouting, where grout is injected into the soil from the ground surface



- Deep soil mixing, which mixes a slurry material into existing soil from the surface to bind it together and stabilize it

Groundwater

Groundwater depths throughout the project corridor range from approximately 10 feet to 100 feet below the ground surface. Retaining structures such as walls and subsurface structures such as tunnels can affect or be affected by local groundwater movement and seepage. Retaining structures could block or redirect groundwater. Retaining structures and subsurface structures could change shallow or perched groundwater flow directions.

Bored and sequential excavation mined tunnels would generally pass through or be within layers of water-bearing soils. Construction of shafts from the surface for station access and ancillary facilities, such as vents, would excavate through layers of water-bearing soils. Sound Transit would provide waterproofing gaskets in bored tunnel lining, and sequential excavation mined tunnels and shafts would be lined with waterproofing membrane to prevent groundwater seepage into the facilities and to avoid permanent drawdown of groundwater levels. These structures could change shallow or perched groundwater flow directions. During design, Sound Transit would consider groundwater conditions and provide appropriate means of draining or waterproofing for controlling groundwater. Disposal of any groundwater seepage is discussed in Section 4.2.8, Water Resources.

Settlement and New Earth Fills

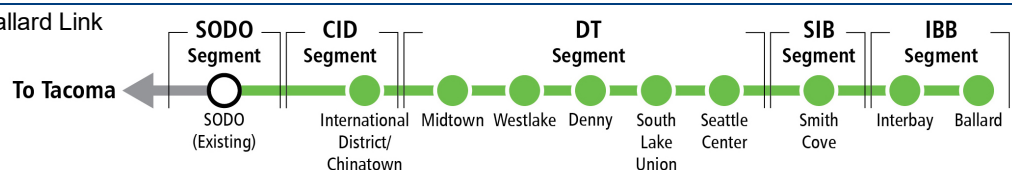
Retained fills would be used in some areas where the project facilities would be above the existing grade to transition between profiles. The fill would cause increased loads on the existing soil, which would result in soft soil settling. Loads at foundations for stations and guideway structures could also have this effect. Without implementation of appropriate design measures, this settlement could damage light rail structures and nearby structures, roadways, and utilities. The overall risk of settlement for all Build Alternatives is low in the Chinatown-International District, Downtown, and Ballard segments, which are areas underlain by glacially consolidated soils and are not expected to experience settlement because these soils have already been loaded with much higher pressures from glaciers. There would be greater potential for settlement in the South Interbay Segment, where poorer quality soils are present. The project design would incorporate measures to improve the soils where the potential for settlement is identified, or use lightweight fills to limit settlement, or would allow tolerances for anticipated settlement.

4.3.11.3.2 SODO Segment

All of the SODO Segment alternatives would be in liquefaction-prone soils. The Preferred Alternative SODO-1a and Option SODO-1b would be almost entirely at-grade and are not expected to require ground improvements. Alternative SODO-2 would require ground improvements around guideway columns for stability or enlarged foundations in the liquefaction-prone soils.

4.3.11.3.3 Chinatown-International District Segment

Similar to the SODO Segment, all of the Chinatown-International District Segment alternatives would be in liquefaction-prone soils. These alternatives would transition from above grade into tunnels and would need tunnel portal structures. The tunnel portals would be located between South Massachusetts Street and Interstate 90. In the Chinatown-International District neighborhood north of Interstate 90, these soils have resulted in a large number of tiebacks and



pilings to support existing buildings, which the tunnel boring or mining would need to avoid during excavation. Alternative CID-1a* and Alternative CID-2a would be more likely to encounter these tiebacks and pilings.

All of the Chinatown-International District Segment alternatives would pass through a peat settlement area mapped by the City of Seattle west of 5th Avenue between Jackson Street and Yesler Way, although the 5th Avenue alternatives would travel through this for a shorter distance. Geotechnical borings completed for this project did not identify this peat layer.

4.3.11.3.4 Downtown Segment

The Downtown Segment alternatives would be tunneling through more stable glacial soils. Tunnels would generally be within groundwater levels, but mining from the surface for station access and ancillary facilities such as vents and traction power substations would require excavation through layers of groundwater. Sound Transit would construct tunnel and stations with watertight lining to avoid groundwater seepage and effects on surrounding groundwater levels. There is a large number of buildings in this segment with tiebacks in their foundations that extend into the street right-of-way where the tunnel would be bored. The tunnel boring or mining activities would need to avoid these tiebacks during excavation or cut them back.

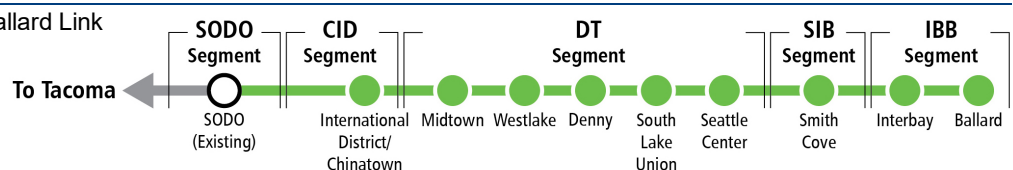
Although there are steep slopes east of 5th Avenue, they would not be affected because the alternatives in this area would be in a tunnel. Alternative DT-2 would pass under the corner of a peat-settlement area in South Lake Union but would be below the peat and not require any excavation from the surface in this area.

4.3.11.3.5 South Interbay Segment

The Preferred Alternative SIB-1 would have a tunnel portal in an area with steep slopes and historical landslides at the west end of West Republican Street. After exiting the portal, it would avoid other steep slope and landslide prone areas but would be constructed on liquefaction-prone soils along the west side of Elliott Avenue West and along the BNSF Railway in central Interbay. Ground improvements such as stone columns or enlarged foundations could be required in liquefaction-prone soils. Steep slopes between the Interbay Golf Center and BNSF Railway could affect the size of guideway foundations in this area. Sound Transit would use typical soil stabilization measures to reduce future erosion potential.

Alternative SIB-2 would use the same portal as Preferred Alternative SIB-1 but would continue along the bottom of the southwest Queen Anne hill slope and require slope stabilization measures for guideway columns. North of the Magnolia Bridge, this alternative would be on 15th Avenue West, outside of the liquefaction-prone soils in central Interbay.

Alternative SIB-3 would avoid the landslide-prone area of West Republican Street by having a tunnel portal at the north end of Kinnear Park closer to Elliott Avenue West, where the slope is also not stable. After exiting the tunnel, this alternative would continue north in a retained cut along the bottom of the steep slope and landslide-prone area on the southwest side of Queen Anne Hill. Stabilizing this slope would require a large retaining wall and a subgrade drainage system installed into the hillside to drain groundwater away from the slope above the guideway. This groundwater would be collected and discharged with stormwater from the light rail. North of West Armory Way, this alternative would be in the same liquefaction-prone area as the Preferred Alternative SIB-1 while next to the BNSF Railway in central Interbay and could require similar ground improvements.



4.3.11.3.6 Interbay/Ballard Segment

The Preferred Alternative IBB-1a would be in liquefaction-prone areas at and around the Interbay Station and directly adjacent to both sides of Salmon Bay. North of Northwest 45th Street, it would be in more stable soils. There are no geologic hazard areas along this alternative north of Salmon Bay. Option IBB-1b would avoid this liquefaction-prone area. However, this design option would require a crossover in the South Interbay Segment near Kinnear Park, where it could affect steep slopes and additional slope stabilization would be needed.

The Preferred Alternative IBB-2a* and Preferred Option IBB-2b* would be in liquefaction-prone soils at and around the Interbay Station, including where the tunnel portal would be located. Ground improvements would be needed around the tunnel portal. Alternative IBB-3 would be outside of any geologic hazard areas.

4.3.11.4 Environmental Impacts of the Build Alternatives during Construction

Construction activities have the potential to cause short-term geology- and soils-related impacts on the environment.

4.3.11.4.1 Slope Instability Hazard

Sound Transit would conduct detailed slope stability evaluations during design and, where appropriate, develop and use slope stabilization methods during construction. Earthworks would be designed, and specifications prepared, to avoid creating unstable conditions that could cause landslides. Methods that could help minimize slope stability hazards include, but are not limited to, the following:

- Use retaining structures with catchment for landslide debris
- Use onsite slope reinforcement, such as soil nailing

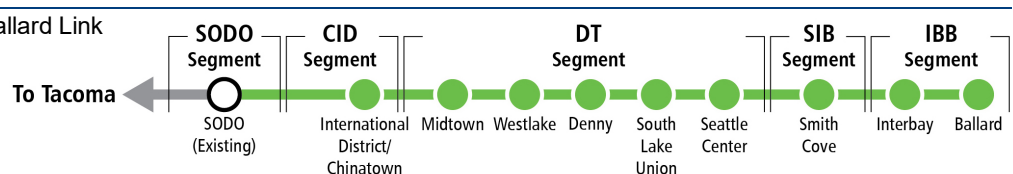
4.3.11.4.2 Erosion Hazards

Clearing vegetation, placing fill, and removing, grading, or stockpiling spoils during construction allow rainfall and runoff to erode soil particles. The risk of erosion and how severe the erosion would be is a function of the area of exposed soil, rainfall intensity and duration, soil characteristics, and the volume and configuration of soils stockpiled. Best management practices that could help minimize erosion hazards include, but are not limited to, the following:

- Maintaining as much vegetation as possible and designing surface water runoff systems
- Installing silt fences downslope of all exposed soil and using straw, mulch, or plastic covering over exposed earth
- Using temporary erosion control blankets and mulching to minimize erosion prior to vegetation establishment

4.3.11.4.3 Groundwater

Light-rail facilities would create new loads and potentially affect groundwater conditions along the alternatives. Retaining structures can affect or be affected by local groundwater movement and seepage. During design of the retaining structures, Sound Transit would consider groundwater conditions and provide appropriate means of drainage or waterproofing for



controlling groundwater during construction. Dewatering could also cause settlement, as described in the following subsection.

High groundwater levels make soils less stable during excavation and could also require dewatering during construction. Dewatering would likely be needed during construction of all Downtown Stations: Midtown, Westlake, Denny, South Lake Union, and Seattle Center. Saturated soils could flow when disturbed and increase the potential for volume loss and settlement.

Removal of groundwater during construction dewatering between the Midtown and Westlake stations could affect Enwave, an energy utility that provides heat to many buildings in the downtown commercial core and First Hill. Sound Transit would coordinate with Enwave prior to construction to minimize impacts to their operations.

4.3.11.4.4 Settlement

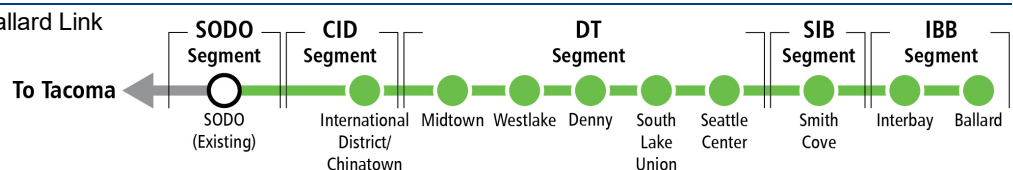
Retaining walls would be used to retain fills to meet track grade requirements. If the retaining walls were not designed correctly, settlement could occur behind the wall. Sound Transit would use standard construction techniques of retaining walls and compaction methods to avoid or minimize settlement impacts from new earth loads.

The Downtown Segment alternatives (Preferred Alternative DT-1 and Alternative DT-2), Alternative SIB-3 in the South Interbay Segment, and the Interbay/Ballard Segment tunnel alternatives (Preferred Alternative IBB-2a* and Preferred Option IBB-2b*) have potential for settlement of the ground above or adjacent to tunneling work. Removal of soil for tunnels could create voids or loose zones in the soil that could progressively migrate upward. This could result in settlement and damage to adjacent facilities such as roadways, utilities, and buildings from loss of foundation bearing support. Loss of ground is most often encountered in poorly graded sands and gravels below groundwater. Settlement above tunnels could also occur from volume loss, which is when the amount of excavated soil is in excess of the calculated geometry of the tunnel. If a greater volume of material is excavated than is displaced by the tunnel, then this material was lost from around the tunnel, which could cause settlement. Volume loss would be minimized by using appropriate tunnel boring machine operations and ground improvement methods such as grouting. Supplemental ground support could be used to support nearby buildings as needed.

Where groundwater is present, sequential excavation mining and excavation could require localized dewatering, which has the potential to result in subsidence or settlement in soft or loose soils. Where soil is settlement-prone, Sound Transit could implement measures to avoid and minimize settlement. Temporary ground improvements might also be needed where cross passages between tunnels would be constructed.

4.3.11.4.5 Seismic Hazards

An earthquake could occur during project construction and cause embankment slope failures, liquefaction, or ground settlement. The risk of seismic hazards to construction is considered low because there is a low probability that an earthquake would occur during the actual construction period. If a large earthquake were to occur, the major risk would be to the ongoing construction activities. Work schedules would likely be delayed as efforts are made to repair damaged components of the work. Utilities or nearby structures could also experience some disruption from the damage to exposed cuts or fills. If needed, ground improvements could be used to stabilize liquefaction-prone soils.

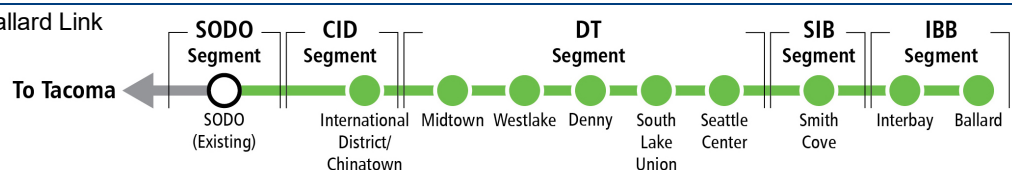


4.3.11.5 Indirect Impacts of the Build Alternatives

Indirect impacts from the Ballard Link Extension could result from permanent soil anchors or tiebacks that would be used in retaining wall structures. These wall support systems could restrict the type of excavation feasible for the future developments within the anchor zones.

4.3.11.6 Mitigation Measures

With appropriate use of engineering design standards and best management practices as described above, no adverse geological or soils impacts are expected. Therefore, no mitigation is needed.



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4.3.12 Hazardous Materials

4.3.12.1 Affected Environment

The Ballard Link Extension study area for hazardous materials extends 1/8 mile from either side of the project limits and the area used for construction. The project limits include permanent project improvements and areas needed for project construction.

Sound Transit acquired information about sites with known contamination or potential contamination within the study area, as well as relevant historical conditions within the study area from several sources that are listed in Appendix L4.12. Based on the information collected and reviewed, Sound Transit categorized sites into three risk categories (high, medium, and low) to prioritize sites and determine the need for avoidance, remediation, or mitigation when considering project impacts. The risk levels are defined as follows:

- **High** – Sites that involve substantial contamination of large areas, including soil and groundwater, and multiple contaminants. High-risk sites might represent a higher risk of further releases of hazardous materials to people or the environment or would be likely to involve high levels of regulatory approvals, extensive or lengthy remediation activities that may create other impacts to the environment, or could pose major delays to the development of the project.
- **Medium** – Sites where the nature of potential contamination is known based on existing investigation data, the potential contaminants are not extremely toxic or difficult to treat, and probable remediation approaches are straightforward.
- **Low** – Sites where the nature of potential contamination is known based on existing investigation data and the sites are not expected to have notable impacts on the project due to their location, or sites where hazardous materials were used but had no or only very small reported releases.

Sites that were considered minimal risk were not reviewed or further counted. Minimal-risk sites include sites that had regulatory interactions not related to the potential release of hazardous materials to soil or groundwater (i.e., permitted air emissions) or sites with a small one-time spill that was reported as cleaned up.

In addition to the high-, medium-, or low-risk designation, sites were further split into two categories: (1) sites with documented release and (2) sites with potential release. Table L4.12-1 in Appendix L4.12 provides a complete list of hazardous materials sites identified in the study area. Tables 4.3.12-1 through 4.3.12-5 list the number of sites in the Ballard Link Extension study area by risk category for each Build Alternative. The high-risk sites are discussed in more detail in Sections 4.3.12.3, Environmental Impacts of the Build Alternatives during Operation, and 4.3.12.4, Environmental Impacts of the Build Alternatives during Construction, and in Appendix L4.12.

The study areas for the Ballard Link Extension and West Seattle Link Extension overlap in the SODO Segment. Because of this, the Ballard Link Extension SODO Segment study area includes many of the sites listed in Section 4.2.12.1, Affected Environment, for the West Seattle Link Extension SODO Segment. To avoid double-counting those sites, the numbers of hazardous materials sites listed in Table 4.3.12-1 include only additional hazardous materials sites beyond the sites identified in the SODO Segment for the West Seattle Link Extension in Table 4.2.12-1 in Section 4.2.12.1.



Table 4.3.12-1. Number of Hazardous Materials Sites by Alternative – SODO Segment, Ballard Link Extension

SODO Segment Alternative	High-Risk Sites	Medium-Risk Sites	Low-Risk Sites
Preferred At-Grade (SODO-1a)	0	3	12
At-Grade South Station Option (SODO-1b)	0	3	13 to 14
Mixed Profile (SODO-2)	0	3	15

Note: Ranges reflect differences from connecting to different alternatives in adjacent segments.

Table 4.3.12-2. Number of Hazardous Materials Sites by Alternative – Chinatown-International District Segment

Chinatown-International District Segment Alternative	High-Risk Sites	Medium-Risk Sites	Low-Risk Sites
4th Avenue Shallow (CID-1a)*	1	14	101
4th Avenue Deep Station Option (CID-1b)*	1	14	100
5th Avenue Shallow (CID-2a)	1	13 to 14	98 to 104
5th Avenue Deep Station Option (CID-2b)	1	13	97

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Note: Ranges reflect differences from connecting to different alternatives in adjacent segments.

Table 4.3.12-3. Number of Hazardous Materials Sites by Alternative – Downtown Segment

Downtown Segment Alternative	High-Risk Sites	Medium-Risk Sites	Low-Risk Sites
Preferred 5th Avenue/Harrison Street (DT-1)	5	20	380 to 403
6th Avenue/Mercer Street (DT-2)	7	32	414 to 416

Note: Ranges reflect differences from connecting to different alternatives in adjacent segments.

Table 4.3.12-4. Number of Hazardous Materials Sites by Alternative – South Interbay Segment

South Interbay Segment Alternative	High-Risk Sites	Medium-Risk Sites	Low-Risk Sites
Preferred Galer Street Station/Central Interbay (SIB-1)	5	10	72 to 73
Prospect Street Station/15th Avenue (SIB-2)	4	7	76 to 77
Prospect Street Station/Central Interbay (SIB-3)	5	7	67

Note: Ranges reflect differences from connecting to different alternatives in adjacent segments.

Table 4.3.12-5. Number of Hazardous Materials Sites by Alternative – Interbay/Ballard Segment

Interbay/Ballard Segment Alternative	High-Risk Sites	Medium-Risk Sites	Low-Risk Sites
Preferred Elevated 14th Avenue (IBB-1a)	12	27	111 to 112
Elevated 14th Avenue Alignment Option (from Prospect Street Station/15th Avenue) (IBB-1b)	12	26	116



Interbay/Ballard Segment Alternative	High-Risk Sites	Medium-Risk Sites	Low-Risk Sites
Preferred Tunnel 14th Avenue (IBB-2a)*	12	25	110
Preferred Tunnel 15th Avenue Station Option (IBB-2b)*	12	22	117
Elevated 15th Avenue (IBB-3)	12	20	116

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Note: Ranges reflect differences from connecting to different alternatives in adjacent segments.

4.3.12.1.1 Historical and Current Uses

The SODO and Chinatown-International District segments were tide flats prior to the 1900s. The filled-in land has been an industrial center since the early 1900s, with past uses including railyards, sawmills, metals works, and manufacturing. The Downtown Segment was originally developed in the late 1800s and has since been a retail and financial center. Portions of the Downtown Segment were regraded between the late 1800s and the 1920s. The most notable regrade was the Denny Regrade, which flattened over 27 blocks of land north of Pine Street along 2nd and 5th avenues (Williams 2015).

Prior to the 1900s, the South Interbay Segment was a tide flat and marsh. The Interbay area was filled during the construction of the Ballard Locks in Salmon Bay, which were completed in 1917. Portions of Ballard were also filled along Salmon Bay. Since the creation of useable land, the Interbay and Ballard areas surrounding the railroad and Salmon Bay have been used primarily for industrial and manufacturing uses, including railroad yards, lumber mills, shipbuilding facilities, wood shingle manufacturing and wood treatment, metals works, and a municipal landfill. Portions of the South Interbay and Interbay/Ballard segments are currently zoned for manufacturing and industrial use.

The Ballard Link Extension is also within the Tacoma smelter plume, which is described in Section 4.2.12.1.1, Historical and Current Uses, for West Seattle Link Extension. Based on investigation within the smelter plume area, the Ballard Link Extension segments have estimated arsenic concentrations below 20 parts per million, which is the level considered protective of both human health and the environment under the Washington State Model Toxics Control Act.

4.3.12.1.2 Superfund Sites

There are no Superfund sites within the Ballard Link Extension study area.

4.3.12.1.3 Abandoned Landfills

The South Interbay Segment is adjacent to one abandoned landfill, the former Interbay Landfill. This landfill is considered an environmentally critical area because of the potential presence of methane. Areas within 1,000 feet of methane-producing landfills may be susceptible to accumulation of hazardous levels of methane gas in enclosed spaces. Development on abandoned landfills is subject to Seattle-King County Health Department requirements specified in Seattle Municipal Code.



4.3.12.1.4 Transportation-Related Uses

Transportation-related land uses in the study area that could contain contamination include BNSF Railway's International Gateway Intermodal Facility west of the SODO Segment, BNSF Railway's Balmer Yard west of the South Interbay Segment and a portion of the Interbay/Ballard Segment, and the Port of Seattle Fishermen's Terminal, on Salmon Bay within the Interbay/Ballard Segment.

4.3.12.2 Environmental Impacts of the No Build Alternative

The No Build Alternative would not provide removal or cleanup of potentially hazardous materials, including contaminated groundwater or soil, within the study area. Contaminated properties would remain in their current state, and the potential for uncontrolled migration of existing contaminants could continue.

4.3.12.3 Environmental Impacts of the Build Alternatives during Operation

4.3.12.3.1 Impacts Common to All Alternatives

This section discusses the potential long-term, operational impacts that the Build Alternatives could have on known contaminated sites and the potential impacts that the contaminated sites could have on project development. Potential impacts would likely be restricted to the areas immediately adjacent to the alternatives. The likelihood of impacts from the normal long-term operation and maintenance activities are low. Because the light rail trains operate on electricity, major spills are unlikely. However, minor hazardous materials releases could result during maintenance activities because hazardous materials, including lubricants, solvents, hydraulic fluids, or other chemicals, could be used at the maintenance facilities or during track maintenance. Light rail vehicles would be serviced at the existing Operations and Maintenance Facility Central in the Duwamish Segment. Sound Transit would manage generated hazardous waste according to applicable regulatory requirements.

Most of the impacts associated with encountering hazardous materials in the environment would occur during project construction, as discussed in Section 4.3.12.4, Environmental Impacts of the Build Alternatives during Construction. However, long-term operational impacts could occur if Sound Transit acquires properties that are a source of contamination, possibly requiring ongoing cleanup responsibility. The following sites could be directly affected and currently have ongoing monitoring or remediation systems in operation:

- Union Station (Map I.D. 532) in the Chinatown-International District Segment. It requires long-term groundwater monitoring as part of the cleanup action, and this site is within the area that could be directly affected of all Build Alternatives and is considered a high-risk site.
- Shell Station 64819 (Map I.D. 1031) in the Chinatown-International District Segment has ongoing groundwater monitoring. The site is within the area that could be directly affected for Alternative CID-2a and Option CID-2b and is considered a medium-risk site.
- Seattle Hilton Hotel Parking Garage (Map I.D. 414a) in the Downtown Segment has an active non-aqueous phase liquid recovery system in operation. This site is within the area that could be directly affected for Alternative DT-2 and is considered a high-risk site.
- The Nash Holland Denny Investors (Map I.D. 414b) in the Downtown Segment site operates a soil vapor extraction system within the Terry Avenue right-of-way. This site is within the area that could be directly affected for Alternative DT-2 and is considered a high-risk site.



4.3.12.4 Environmental Impacts of the Build Alternatives during Construction

The following discussion identifies high-risk sites within each segment study area. Potential impacts would likely be restricted to the areas immediately adjacent to the Build Alternatives. Additional detail on high-risk sites is provided in Appendix L4.12.

4.3.12.4.1 Impacts Common to All Alternatives

Potential construction impacts could result from existing soil or groundwater contamination encountered during construction activities.

Contamination may be found on or adjacent to known contaminated sites or within rights-of-way and utility corridors. Construction methods for each alternative would influence the potential impacts during construction, with bored or mined tunnel construction less likely to encounter contaminated soil or groundwater than excavation and construction activities from or at the ground surface. Construction impacts could include the following:

- Grading or excavation activities could uncover contamination, thus allowing direct exposure to workers or public.
- Grading or excavation activities could generate contaminated soil that would need treatment and proper disposal.
- Contamination could spread as the result of construction activities, such as dewatering, which might mobilize contamination.
- Dewatering during construction could generate contaminated groundwater that would need treatment and proper disposal.
- Construction activities could discover contamination that was otherwise unknown.
- Construction activities could encounter underground or above-ground storage tanks containing hazardous materials that would require special disposal.
- Construction activities could encounter pole-mounted electrical transformers, which might contain polychlorinated biphenyl-contaminated transformer oil and require special disposal.
- Demolishing, removing, and disposing of existing structures could release hazardous materials, such as asbestos or lead. Asbestos is commonly used in building construction and is most dangerous when crushed, broken, or otherwise disturbed. Lead is often found in lead pipes or in lead-based paint.
- Construction activities could encounter materials that require special disposal, such as creosote- or arsenic-treated wood, railroad ties, telephone poles, and marine or building piles.
- Construction activities could result in a spill or accidental releases of hazardous materials, such as lubricants or fuels from heavy equipment.

Sound Transit would minimize construction impacts by avoiding contaminated sites or portions of sites when possible. However, the study area might have other constraints, such as physical, environmental, or topographic impacts, that would make avoidance infeasible. Sound Transit would perform environmental due diligence for properties along the project corridor before acquisition or construction to avoid or minimize impacts from contaminated sites. Environmental due diligence would include the completion of a Phase I Environmental Site Assessment for



properties that would be acquired or that represent a substantial risk to the project during construction activities. A subsequent Phase II Environmental Site Assessment might be necessary for sites where contamination has been identified or is suspected.

As part of the project, Sound Transit would adhere to local, state, and federal regulations and implement applicable best management practices, which include construction stormwater pollution prevention plans, spill control and prevention plans, contaminated media management plans, and health and safety plans. These plans establish protocols for handling hazardous materials to ensure compliance with state and federal standards while minimizing impacts to the project.

High-risk site locations are mapped on Figures 4.3.12-1 through 4.3.12-4.

4.3.12.4.2 SODO Segment

In some cases, the West Seattle Link Extension and the Ballard Link Extension would use the same areas in SODO for construction or operation. Impacts at high-risk sites in these areas are accounted for in the West Seattle Link Extension only, because it is planned to be constructed first. These high-risk sites are shown in Table 4.2.12-5 in Section 4.2.12.4.2, SODO Segment, for West Seattle Link Extension.

4.3.12.4.3 Chinatown-International District Segment

Table 4.3.12-6 identifies the high-risk site within the Chinatown-International District Segment study area by alternative. This site is shown on Figure 4.3.12-1.

The Chinatown-International District Segment Build Alternatives could also have impacts to soil and groundwater from artificial fill sources and past and current industrial and transportation uses in this segment area.

Table 4.3.12-6. Potential High-Risk Sites Affected by Alternative – Chinatown-International District Segment

Site Name (Map I.D.)	Potential Impact	4th Avenue Shallow Alternative (CID-1a)*	4th Avenue Deep Station Option (CID-1b)*	5th Avenue Shallow Alternative (CID-2a)	5th Avenue Deep Station Option (CID-2b)
Union Station (#532)	Encounter soil and groundwater contaminated with polycyclic aromatic hydrocarbons and metals.	Affected	Affected	Affected	Affected
Total Sites Affected	Not Applicable	1	1	1	1

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Note: All high-risk sites have documented releases. The potential for each alternative to affect high-risk sites is based on direct construction impacts. If a high-risk site falls within the construction area, it could be affected, which could result in associated impacts.

4.3.12.4.4 Downtown Segment

Table 4.3.12-7 identifies the high-risk sites within the Downtown Segment study area by alternative. These sites are shown on Figure 4.3.12-2.





Source: City of Seattle, King County (2019, 2020, 2021), U.S. Environmental Protection Agency (2015), Environmental Data Resources Inc. (2018), Ecology (2019).

Alternatives

- Preferred Alternative
- Preferred Alternative with Third-party Funding
- Other Alternatives

Alternative Profile

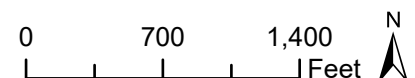
- Elevated
- Tunnel
- At-Grade
- Retained Cut

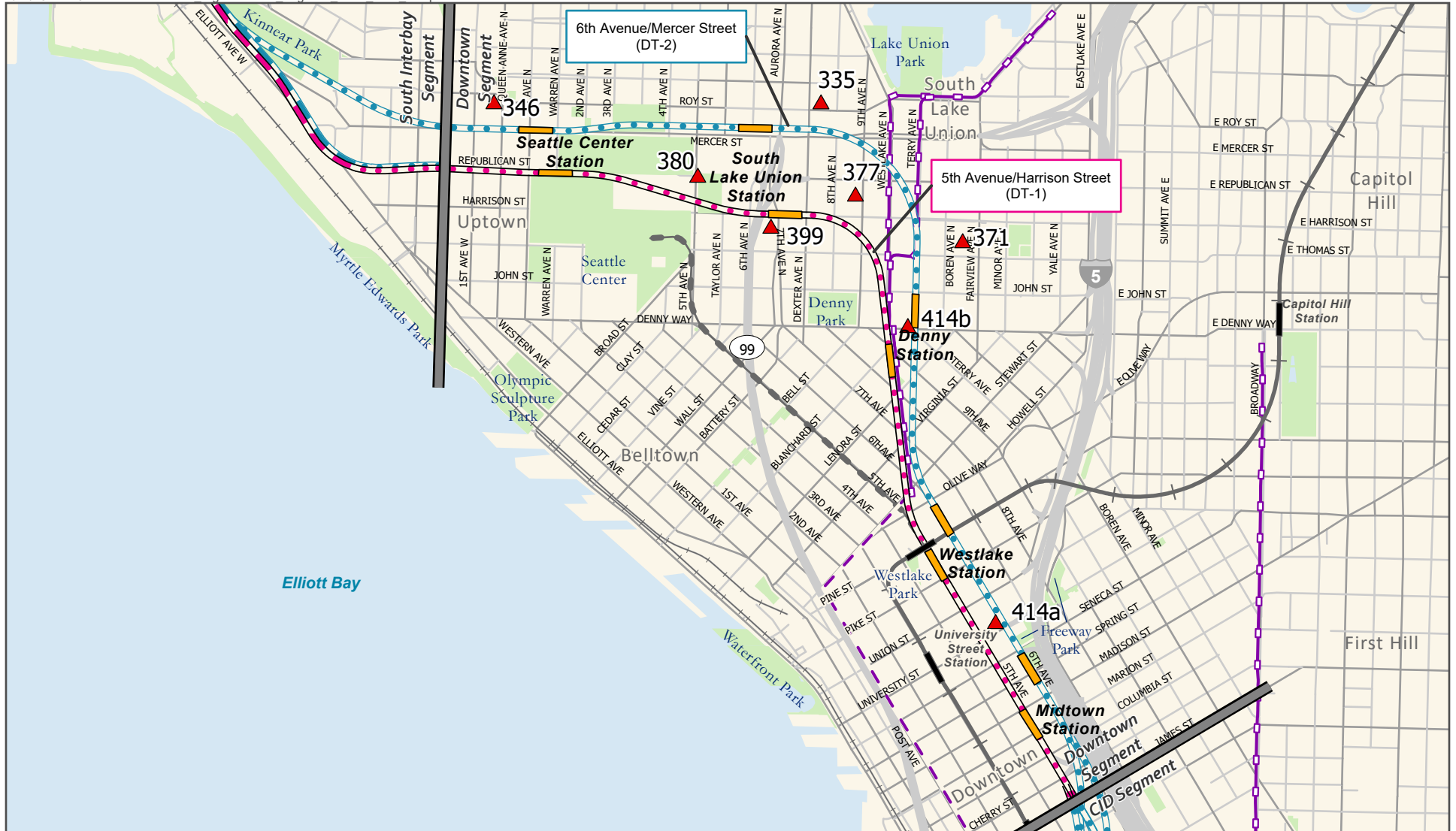
Station

- New
- Existing

- Segment Line
- Existing Link Light Rail
- East Link Light Rail (Under Construction)
- Existing Streetcar
- Center City Connector Streetcar (Construction Paused)
- Railroad
- SODO Busway
- Proposed Overpass
- Park
- ▲ High-Risk Hazardous Material Site
- Harbor Island Superfund Site

FIGURE 4.3.12-1
High-Risk
Hazardous Material Sites
 Ballard Link Extension -
 Chinatown-International
 District Segment
 West Seattle and
 Ballard Link Extensions





Source: City of Seattle, King County (2019, 2020, 2021), U.S. Environmental Protection Agency (2015), Environmental Data Resources Inc. (2018), Ecology (2019).

Alternatives

- Preferred Alternative
- Preferred Alternative with Third-party Funding
- Other Alternatives

Alternative Profile

- Elevated
- At-Grade
- Retained Cut

Station

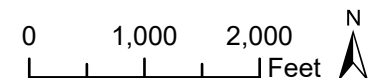
- New
- Existing

- Segment Line
- Existing Link Light Rail
- Monorail
- Existing Streetcar
- Center City
- Connector Streetcar (Construction Paused)
- Railroad
- Park

- ▲ High-Risk Hazardous Material Site

FIGURE 4.3.12-2
High-Risk Hazardous Material Sites
Ballard Link Extension -
Downtown Segment

West Seattle and
Ballard Link Extensions





Source: City of Seattle, King County (2019, 2020, 2021), U.S. Environmental Protection Agency (2015), Environmental Data Resources Inc. (2018), Ecology (2019).

Alternatives

- Preferred Alternative
- Preferred Alternative with Third-party Funding
- Other Alternatives

Alternative Profile

- Elevated — Tunnel
- At-Grade — Retained Cut

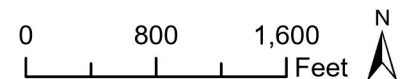
Station

- New

- Segment Line
- Railroad
- Park

- ▲ High-Risk Hazardous Material Site
- Abandoned Landfill

FIGURE 4.3.12-3
High-Risk
Hazardous Material Sites
 Ballard Link Extension -
 South Interbay Segment
 West Seattle and
 Ballard Link Extensions



Alternatives

- Preferred Alternative
- Preferred Alternative with Third-party Funding
- Other Alternatives

Alternative Profile

- Elevated
- At-Grade
- Tunnel
- Retained Cut

Station

- New

Legend

- Segment Line
- Railroad
- Stream
- Park
- High-Risk Hazardous Material Site

0 800 1,600 Feet

Table 4.3.12-7. Potential High-Risk Sites by Affected Alternative – Downtown Segment

Site Name (Map I.D.)	Potential Impact	Preferred 5th Avenue/Harrison Street Alternative (DT-1)	6th Avenue/Mercer Street Alternative (DT-2)
Seattle Hilton Hotel Parking Garage (#414a)	Encounter soil and groundwater contaminated by petroleum.	Not Affected	Affected
Iris Holding LLC (#380)	Encounter soil contaminated with gasoline and Stoddard solvent.	Affected	Affected
Nash Holland Denny Investors (#414b)	Encounter soil and groundwater contaminated by petroleum and 1,2- dichloropropane. Remediation system within the right-of-way may be impacted and may require replacement.	Not Affected	Affected
Seattle Vagabond Inn (#399)	Encounter soil and groundwater contaminated by tetrachloroethylene.	Affected	Not Affected
Ivey Imaging LLC (#377)	Encounter groundwater contaminated by tetrachloroethylene and trichloroethylene.	Not Affected	Affected
American Linen Supply Co Dexter Ave (#335)	Encounter soil and groundwater contaminated by tetrachloroethylene and trichloroethylene.	Not Affected	Affected
Troy Laundry Seattle (#371)	Encounter groundwater contaminated by trichloroethylene.	Not Affected	Affected
Texaco Downstream 211577 (#346)	Encounter groundwater or vapors contaminated by petroleum products.	Not Affected	Affected
Total Sites Affected	Not Applicable	2	7

Note: All high-risk sites have documented releases. The potential for each alternative to affect high-risk sites is based on direct construction impacts. If a high-risk site falls within the construction area, it could be affected, which could result in associated impacts.

4.3.12.4.5 South Interbay Segment

Table 4.3.12-8 identifies the high-risk sites within the South Interbay Segment study area by alternative. These sites are shown on Figure 4.3.12-3.

In addition to specific high-risk sites, the South Interbay Segment study area was originally tidelands that have been filled with unknown fill material. The South Interbay Segment is characterized by historical and current industrial use, including railyard operations along the entire segment. This segment has a high risk of impacts from unknown fill and industrial use, with a high likelihood of encountering metals and polycyclic aromatic hydrocarbons in shallow soil and groundwater. Penetrations of the landfill, such as drilled shafts, would be constructed to prevent long-term surface water infiltration and leachate migration.



Table 4.3.12-8. Potential High-Risk Sites Affected by Alternative – South Interbay Segment

Site Name (Map I.D.)	Potential Impact	Preferred Galer Street Station/Central Interbay Alternative (SIB-1)	Prospect Street Station/15th Avenue Alternative (SIB-2)	Prospect Street Station/Central Interbay Alternative (SIB-3)
Former Bay Station Site/Elliott Ave MGP (#273)	Encounter coal tar and soil contaminated with polycyclic aromatic hydrocarbons.	Affected	Affected	Affected
Leather Care Inc (#324)	Encounter soil and groundwater contaminated with tetrachloroethylene and trichloroethylene.	Affected	Affected	Not Affected
Former Interbay Landfill (#207)	Accumulation of methane gas in enclosed spaces during construction.	Affected	Affected	Affected
Blackstock Lumber (#372)	Encounter soil and groundwater contaminated with petroleum.	Affected	Affected	Not Affected
Seattle Port Terminal 91 (#241)	Encounter soil and groundwater contaminated with petroleum, metals, and volatile organic compounds.	Affected	Not Affected	Not Affected
Total Sites Affected	Not Applicable	5	4	2

Note: All high-risk sites have documented releases. The potential for each alternative to affect high-risk sites is based on direct construction impacts. If a high-risk site falls within the construction area, it could be affected, which could result in associated impacts.

4.3.12.4.6 Interbay/Ballard Segment

Table 4.3.12-9 identifies the high-risk sites within the Interbay/Ballard Segment study area by alternative. These sites are shown on Figure 4.3.12-4.

Table 4.3.12-9. Potential High-Risk Sites Affected by Alternative – Interbay/Ballard Segment

Site Name (Map I.D.)	Potential Impact	Preferred Elevated 14th Avenue Alternative (IBB-1a)	Elevated 14th Avenue Alignment Option (from Prospect Street Station/15th Avenue) (IBB-1b)	Preferred Tunnel 14th Avenue Alternative (IBB-2a)*	Preferred Tunnel 15th Avenue Station Option (IBB-2b)*	Elevated 15th Avenue Alternative (IBB-3)
Champion International (#98)	Encounter sediments impacted by metals.	Affected	Affected	Affected	Affected	Not Affected
Interbay BNR (#143)	Encounter soil and groundwater contaminated by petroleum.	Affected	Not Affected	Affected	Affected	Not Affected



Site Name (Map I.D.)	Potential Impact	Preferred Elevated 14th Avenue Alternative (IBB-1a)	Elevated 14th Avenue Alignment Option (from Prospect Street Station/15th Avenue) (IBB-1b)	Preferred Tunnel 14th Avenue Alternative (IBB-2a)*	Preferred Tunnel 15th Avenue Station Option (IBB-2b)*	Elevated 15th Avenue Alternative (IBB-3)
SCL Interbay Property (#154)	Encounter soil and groundwater contaminated by trichloroethylene.	Affected	Not Affected	Affected	Affected	Not Affected
Mamco Mfg Bldgs/Mars Hill Properties 50th LLC (#63)	Encounter soil and groundwater contaminated by trichloroethylene.	Affected	Affected	Affected	Affected	Not Affected
The Tux Shop/Unocal 5479 (#33)	Encounter soil and groundwater contaminated with petroleum and chlorinated solvents.	Not Affected	Not Affected	Not Affected	Affected	Affected
Ernst Ballard Parcel B (#54)	Encounter soil contaminated with petroleum and carcinogenic polycyclic aromatic hydrocarbons.	Affected	Affected	Affected	Not Affected	Not Affected
Seattle Maritime Academy (#75)	Encounter fill material or soil and groundwater contaminated with metals, polycyclic aromatic hydrocarbons, and petroleum	Affected	Affected	Affected	Affected	Not Affected
Port of Seattle Fishermen's Terminal (#106)	Encounter sediments contaminated with metals, polychlorinated biphenyls, tributyltin, and polycyclic aromatic hydrocarbons.	Not Affected	Not Affected	Not Affected	Not Affected	Affected
Broadstone Ballard (#39a)	Encounter groundwater contaminated by trichloroethylene.	Affected	Affected	Affected	Not Affected	Not Affected
Firestone Stores of Ballard Inc 3187 (#39b)	Encounter groundwater contaminated by trichloroethylene.	Affected	Affected	Affected	Not Affected	Not Affected



Site Name (Map I.D.)	Potential Impact	Preferred Elevated 14th Avenue Alternative (IBB-1a)	Elevated 14th Avenue Alignment Option (from Prospect Street Station/15th Avenue) (IBB-1b)	Preferred Tunnel 14th Avenue Alternative (IBB-2a)*	Preferred Tunnel 15th Avenue Station Option (IBB-2b)*	Elevated 15th Avenue Alternative (IBB-3)
7 Eleven Food Store (#156)	Encounter soil and groundwater contaminated by petroleum, and groundwater impacted by tetrachloroethylene and trichloroethylene.	Not Affected	Affected	Affected	Affected	Affected
Vaupell (#43)	Encounter groundwater contaminated by trichloroethylene.	Affected	Affected	Affected	Not Affected	Not Affected
Total Sites Affected	Not Applicable	9	8	10	7	3

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Note: All high-risk sites have documented releases. The potential for each alternative to affect high-risk sites is based on direct construction impacts. If a high-risk site falls within the construction area, it could be affected, which could result in associated impacts.

In addition to the high-risk sites listed in Table 4.3.12-9, construction activities in the Ballard industrial area have a high likelihood of encountering impacted soil and groundwater, especially metals or polycyclic aromatic hydrocarbons due to the current and historical industrial and manufacturing uses.

4.3.12.5 Indirect Impacts of the Build Alternatives

The construction of the Ballard Link Extension would support redevelopment of properties around station areas where local zoning allows. Redevelopment of properties in the study area might result in cleanup of contamination earlier than might otherwise occur, which would be an indirect benefit of the project.

4.3.12.6 Mitigation Measures

With inclusion of the best practices described under Section 4.3.12.4.1, Impacts Common to All Alternatives, and adherence to regulatory requirements as part of the project, there are no anticipated impacts and no mitigation is needed.



4.3.13 Electromagnetic Fields

4.3.13.1 Affected Environment

Sound Transit reviewed existing and planned property uses along the Ballard Link Extension corridor where potential electromagnetic fields from light rail trains and facilities could interfere with normal operation and function of sensitive equipment. The study area extends 300 feet from the Build Alternatives track alignments, including stations. No potentially sensitive equipment was identified in the SODO, Chinatown-International District, and Interbay/Ballard segments. The following properties have sensitive equipment within the study area for the Downtown and South Interbay segments.

Downtown Segment:

- Allen Institute, 615 Westlake Avenue North
- Institute for Systems Biology, 401 Terry Avenue North
- Just Biotherapeutics, 401 Terry Avenue North
- Kineta, 219 Terry Avenue North
- UW Medicine South Lake Union Campus, 850 Republican Street
- Juno Therapeutics, 400 Dexter Avenue North

South Interbay Segment:

- Luminex, 645 Elliott Avenue West

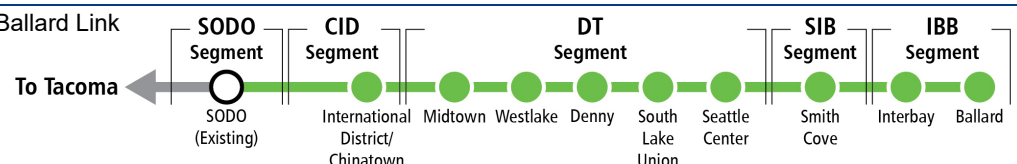
For the properties listed above, sensitive equipment can generally tolerate magnetic field fluctuations in the range of 0.001 to 0.003 gauss. The existing equipment already functions in dense urban areas where there are many electromagnetic field sources, as shown in Table 4.3.13-1. Existing static and 60-hertz magnetic field disturbances in Table 4.3.13-1 are above tolerable levels for the sensitive equipment identified in the study area. Therefore, the project assumes that the owners of the sensitive equipment shielded and protected the equipment from nearby electromagnetic field sources when it was installed, to prevent environmental disturbances.

Table 4.3.13-1. Existing Sources of Electromagnetic Fields in the Study Area

Existing Sources of Electromagnetic Fields in Study Area	Electromagnetic Field Strength (approximate)
Earth's magnetic field	0.53 gauss (at sea level)
60-hertz electric power distribution and use	0.087 gauss (for 500-kilovolt overhead lines, directly below edge of overhead lines)
Moving cars, buses, trucks, and trains	0.18 gauss (for heavy steel-laden flatbed truck, at a distance of approximately 16 feet)
Industrial, commercial, and consumer equipment that uses electricity	0.3 gauss (for microwave oven, at 6 inches)
Radio emitters such as broadcast antennas, wireless internet routers, and cellular phones	Wi-Fi router at 1 meter: 3 volts/meter 50 kilowatt AM station at 100 meters: 40 volts/meter Cell phone at head: 50 volts/meter

Sources: National Institute of Environmental Health Sciences 2002; World Health Organization 2020a; World Health Organization 2020b; United States Environmental Protection Agency 1991.

Note: Magnetic fields are measured in units of gauss (g). Radio frequency signal strength is measured in units of volts/meter.



4.3.13.2 Environmental Impacts of the No Build Alternative

The existing electromagnetic field environment would not change if the project is not built.

4.3.13.3 Environmental Impacts of the Build Alternatives during Operations

4.3.13.3.1 Impacts Common to All Alternatives

To evaluate the potential for localized electromagnetic field effects to sensitive equipment from the project, Sound Transit evaluated the potential for electromagnetic interference at properties with sensitive equipment, as well as areas along the alternatives where electromagnetic fields generated from operating the project are expected to be greater, such as at traction power substations and where trains must accelerate or ascend an incline.

Electromagnetic Field Impacts to Sensitive Equipment and Human Health

Electromagnetic fields from the project operation would be generated from direct-current electricity flowing from the traction power substation through overhead catenary wires to the light rail trains, from movement of the large metal trains, and from radio frequency fields from wireless systems such as communications, data transmission, and monitoring systems on the light rail vehicles and along the corridor. The strongest electromagnetic field source would be the slowly varying magnetic fields from direct current flowing from the traction power substations through overhead catenary wires to the light rail trains. These slowly varying electromagnetic fields would diminish in level with lateral distance from the rail line.

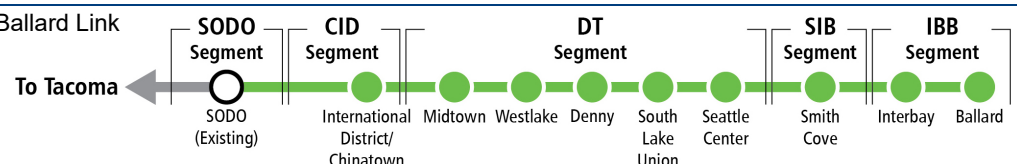
The direct current from the traction power substations carried by the catenary wires to the light rail trains would slowly vary in amplitude depending on train acceleration. The direct current also includes low levels of low-frequency alternating currents. These low-frequency alternating currents also generate electromagnetic fields, which could interfere with low-frequency radio waves from other sources such as AM radios. Such interference might annoy the listener, but does not damage the radio equipment. Additional detail on traction power substations can be found in Chapter 2, Alternatives Considered.

The magnetic field from light rail operation would not exceed 10 gauss, which is less than 1/100th of the exposure considered safe for human health by the Institute of Electrical and Electronics Engineers (2019). The light rail system would not be a notable source of static magnetic fields for human exposure. Example sources of electromagnetic fields are listed in Section 4.1.13, Electromagnetic Fields.

No potentially sensitive equipment was identified in the SODO, Chinatown-International District, and Interbay/Ballard segments; therefore, these segments are not discussed further.

Key Electricity Terms

A **volt** is the base unit of electric potential between two points. An **amp** is the base unit of electric current that flows between two points in an electric circuit. Electric fields are measured in units of **volts per meter** and magnetic fields are measured in units of **gauss**. Electromagnetic wave frequency is measured in units of **hertz**, or cycles per second. **Direct-current power** refers to current that flows in one direction (from higher to lower potential), so its frequency of reversal is 0 hertz. Electric power is measured in units of **watts**. Electric work or energy is measured in units of **kilowatt-hours** (1 kilowatt of power expended for one hour).



Impacts from Stray Currents

Without control measures, a portion of the electrical current flowing from the traction power substations to the light rail trains may produce stray currents, where the current flows in alternative conducting paths, such as metal structures, water, or the earth. The stray currents can corrode adjacent metal structures if they are not sufficiently controlled and if the metal structures are not sufficiently protected. Sound Transit would minimize or avoid alternative conducting paths such as metal structures, water, or the earth. The stray currents can corrode adjacent metal structures if they are not sufficiently controlled and if the metal structures are not sufficiently protected. Sound Transit would minimize or avoid the effect of stray currents on neighboring facilities by incorporating best management practices appropriate for the project. The best management practices may include:

- Installing cathodic protections systems in nearby utility lines to protect them from corrosion
- Installing insulating unions to break the electrical conductivity of nearby utility pipes and force the stray current to take another path
- Isolating the electrical rails from the ground
- Installing stray-current-control track-fastening systems where appropriate

4.3.13.3.2 Downtown Segment

For alternatives in the Downtown Segment, no long-term impacts are expected for potentially sensitive equipment. To evaluate the potential impact of the magnetic field disturbance caused by light rail operation, Sound Transit modeled the maximum electromagnetic field disturbance to magnetic fields using the following scenario:

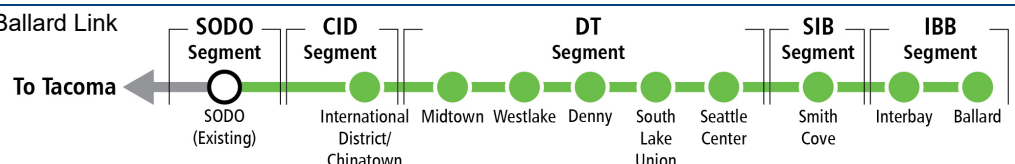
- Two trains, one in each direction, at the same location.
- Accelerating trains, drawing a maximum current of 1,500 amps for each train. Each train has four light rail vehicles; each vehicle has four 140-kilowatt motors.
- In a partial traction power supply failure condition, with one traction power substation supplying the full load for both trains.

During most times and in most places, the magnetic field disturbance caused by the Ballard Link Extension would be much lower than in this scenario.

As shown in Figure L4.13A-1 in Appendix L4.13A, Electromagnetic Field Potentially Sensitive Equipment, measurements made of the existing Sound Transit light rail system confirmed the accuracy of the magnetic field calculations. Figure L4.13B-1 in Appendix L4.13B, Electromagnetic Field Graphs, shows the magnetic field caused by operation of the two light rail vehicle trains, versus the lateral distance from the track centerline. For example, the magnetic field caused by the trains would be about 0.06 gauss at 60 feet lateral distance from the track centerline and at the same vertical elevation as the track.

Figure L4.13B-2 in Appendix L4.13B shows the static magnetic field disturbance caused by the operation of the two trains, versus the vertical distance from the top of the rails on which the trains would run. The magnetic field would be about 0.12 gauss at a vertical offset of 60 feet above the top of the rails.

Both Build Alternatives would have tunnels at an average depth of 60 feet below building foundations, with a minimum depth of about 40 feet below building foundations. As shown on Figure L4.13B-2 in Appendix L4.13B, the static magnetic field disturbance decreases as distance increases and would likely be below acceptable levels at these distances.



The potential for the slowly varying magnetic field to interfere with operation of sensitive equipment depends on the sensitive equipment location within each building, and any shielding around sensitive equipment to protect it from existing electromagnetic field sources. For most locations, the magnetic fields caused by light rail trains are expected to be below acceptable thresholds because of the tunnel depth as well as the strong shielding effect of steel building foundations and steel tunnel components.

The maximum predicted static magnetic field disturbances caused by the project for the potentially sensitive equipment closest to the Ballard Link line would range from 0.0004 to 0.014 gauss (see Appendix L4.13A, Table L4.13A-1). Existing static and 60-hertz magnetic field disturbances presented in Table 4.3.13-1 are greater than disturbances expected from the project. Therefore, the project assumes that the owners of the sensitive equipment shielded and protected the equipment from nearby electromagnetic field sources when it was installed to prevent environmental disturbances.

4.3.13.3 South Interbay Segment

For alternatives in the South Interbay Segment, no long-term impacts are anticipated for potentially sensitive equipment.

For Preferred Alternative SIB-1 and Alternative SIB-2 with above-ground guideway, disturbances from slowly varying magnetic fields would be less than the disturbances caused by nearby motor vehicle movements and by the fields caused by 60-hertz power usage. As described for the Downtown Segment as well as in Appendix L4.13B, the static magnetic field disturbance would be low enough at the sensitive equipment location that it is not expected to impact use of the equipment. The project also assumes that the owners of the sensitive equipment shielded and protected the equipment from nearby electromagnetic field sources when it was installed, to prevent environmental disturbances. The existing shielding would be adequate to protect the operation of potentially sensitive equipment from the slowly varying magnetic field disturbances that would be caused by light rail operation. There are no known properties with sensitive equipment within the study area for Alternative SIB-3.

4.3.13.4 Environmental Impacts of the Build Alternatives during Construction

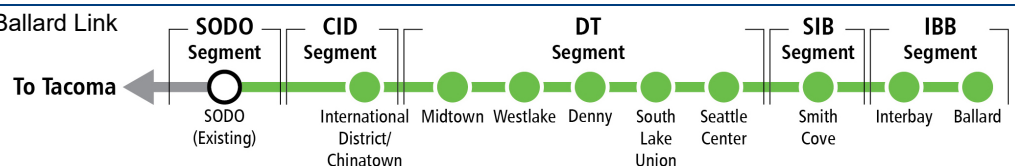
Existing shielding for sensitive equipment provides adequate protection, and no electromagnetic field impacts are expected from construction equipment or construction activities associated with the Ballard Link Extension.

4.3.13.5 Indirect Impacts of the Build Alternatives

No indirect electromagnetic field impacts are expected from the Ballard Link Extension because of the shielding already present for the sensitive equipment.

4.3.13.6 Mitigation Measures

No mitigation measures are needed for the Ballard Link Extension because electromagnetic fields caused by the project near facilities with sensitive equipment would be lower than existing electromagnetic fields and disturbances caused by motor vehicle movements and 60-hertz power usage.



4.3.14 Public Services, Safety, and Security

4.3.14.1 Affected Environment

The study area for public services is 0.5 mile from the edge of the Ballard Link Extension project limits for operations and construction. The project limits include permanent project improvements and areas needed for project construction. Table 4.3.14-1 identifies the public service providers that have facilities in the study area. Information on public transit facilities can be found in Section 3.12, Ballard Link Extension Affected Environment and Impacts During Operation – Transit, and Section 3.19, Ballard Link Extension Construction Impacts. Facility locations are shown on Figures 4.3.14-1 through 4.3.14-5.

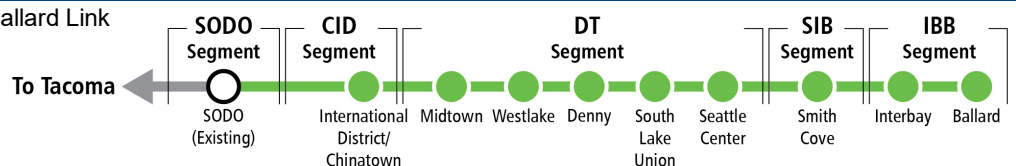
Table 4.3.14-1. Public Service Providers in Ballard Link Extension Study Area

Type	Service Provider	Locations
Police	Seattle Police Department	<ul style="list-style-type: none"> Seattle Police Support Facility, 730 South Stacy Street and 2203 Airport Way South Seattle Police Department West Precinct, 810 Virginia Street Seattle Police Headquarters, 610 5th Avenue
	Metro Police; King County Sheriff	<ul style="list-style-type: none"> King County Sheriff, 516 3rd Avenue
Fire/Emergency Medical, Local	Multiple	<ul style="list-style-type: none"> Harborview Medical Center, 325 9th Avenue Kindred Hospital Seattle - First Hill, 1334 Terry Avenue King County Emergency Medical Services, 401 5th Avenue, Suite 1200 Medic One Program, 325 9th Avenue Seattle Fire Department Fire Station 2, 2320 4th Avenue Seattle Fire Department Fire Station 3, 1735 West Thurman Street Seattle Fire Department Fire Station 5, 925 Alaskan Way Seattle Fire Department Fire Station 10, 105 5th Avenue South Seattle Fire Department Fire Station 18, 1521 Northwest Market Street Seattle Fire Department Fire Station 20, 2800 15th Avenue West Seattle Fire Department Headquarters, 301 2nd Avenue South Seattle Office of Emergency Management, 105 5th Avenue South Swedish Medical Center - Ballard, 5300 Tallman Avenue Northwest Swedish Medical Center - First Hill, 747 Minor Avenue Virginia Mason Hospital, 1100 Seneca Street
Solid Waste, Private	Waste Management; Cleanscapes	Not Applicable



4.3.14 Public Services, Safety and Security

Type	Service Provider	Locations
Public Schools (K-12) and facilities	Seattle Public Schools	<ul style="list-style-type: none"> Ballard High School, 1418 Northwest 65th Street Frantz Coe Elementary School, 2424 7th Avenue West Memorial Stadium, 401 5th Avenue North Salmon Bay K-8 School, 1810 Northwest 65th Street Seattle Public Schools John Stanford Center for Educational Excellence (Administrative Building), 2445 3rd Avenue South Summit Public School - Sierra, 1025 South King Street The Center School, 305 Harrison Street Youth Education Program, 810 3rd Avenue
Private Schools (K-12)	Multiple	<ul style="list-style-type: none"> Morningside Academy, 901 Lenora Street, Suite 2714 O'Dea High School, 802 Terry Avenue Puget Sound Community School, 660 South Dearborn Street Saint Alphonsus School, 5816 15th Avenue Northwest Saint Anne School, 101 West Lee Spruce Street School, 914 Virginia Street The Downtown School, 160 John Street The Northwest School, 1415 Summit Avenue YouthCare's Orion Center, 1828 Yale Avenue
Colleges	Multiple	<ul style="list-style-type: none"> Academy of Interactive Entertainment, 305 Harrison Street City University of Seattle, 521 Wall Street Suite 100 Cornish College of the Arts, 1000 Lenora Street Seattle Maritime Academy, 4455 Shilshole Avenue Northwest Seattle Pacific University, 3307 3rd Avenue West University of Washington Medicine Research Facility in South Lake Union, 850 Republican Street
Other Government Facilities	Federal	<ul style="list-style-type: none"> Federal Office Building, 909 1st Avenue Jackson Federal Building, 915 2nd Avenue United States Coast Guard, Pier 36, 1519 Alaskan Way South United States District Courthouse, 700 Stewart Street United States Immigration Review Court, 1000 2nd Avenue, Suite 2500 William Kenzo Nakamura United States Court House, 1051 6th Avenue
	State	<ul style="list-style-type: none"> Seattle Armory and United States Army National Guard Recruiting Office, 1601 West Armory Way
	County	<ul style="list-style-type: none"> King County Administration Building, 500 4th Avenue King County Chinook Building, 401 5th Avenue King County Correctional Facility, 500 5th Avenue King County District Courthouse and King County Sheriff's Office, 516 3rd Avenue King County Department of Public Defense, 710 2nd Avenue, Suite 200 King County Graybar Building, 416 Occidental Avenue South King County King Street Center, 201 South Jackson Street King County 9th & Jefferson Building, 908 Jefferson Street King County Yesler Building, 400 Yesler Way



4.3.14 Public Services, Safety and Security

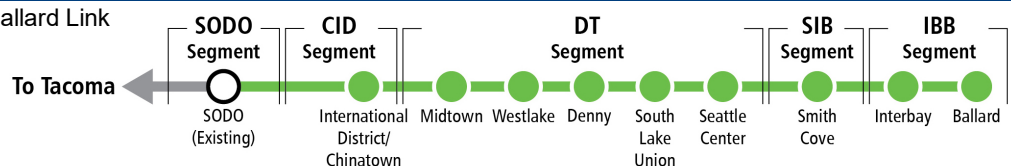
Type	Service Provider	Locations
	City	<ul style="list-style-type: none"> Seattle City Hall, 600 4th Avenue Seattle Municipal Court, 600 5th Avenue Seattle Municipal Tower, 700 5th Avenue Seattle Parks and Recreation Department West Central Maintenance Warehouse, 1403 West Howe Street
	Public Libraries	<ul style="list-style-type: none"> King County Law Library, 516 3rd Avenue The Seattle Public Library - Ballard Library, 5614 22nd Avenue Northwest The Seattle Public Library - Central Library, 1000 4th Avenue The Seattle Public Library - International District/Chinatown Library, 713 8th Avenue South Washington Talking Book and Braille Library, 2021 9th Avenue
	United States Postal Service	<ul style="list-style-type: none"> Ballard, 5706 17th Avenue Northwest Ballard Post Office and Carrier Annex, 4501 9th Avenue Northwest Federal, 909 1st Avenue Suite 100 Interbay Post Office and Carrier Annex, 2010 15th Ave West International, 409 Maynard Avenue South Suite 109 Midtown, 301 Union Street Pioneer Square, 217 1st Avenue South Queen Anne, 415 1st Avenue North Seafirst, 1001 4th Avenue Suite 25 United States Postal Service Carrier Annex and Distribution Center/Terminal Post Office, 2460 4th Avenue South
	Other	<ul style="list-style-type: none"> Columbia Center (multiple federal, county, and city offices), 701 5th Avenue

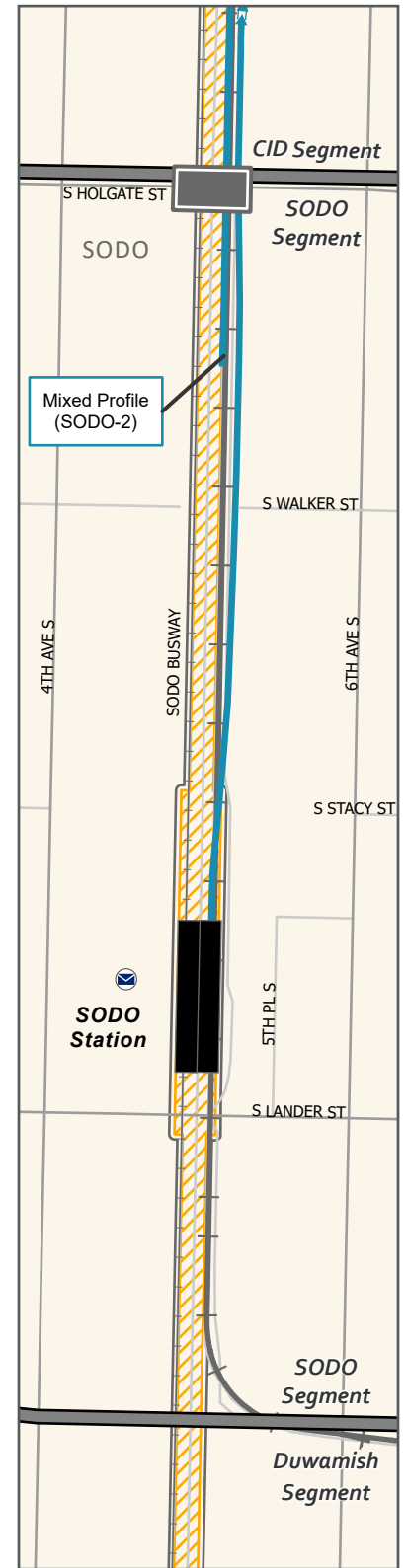
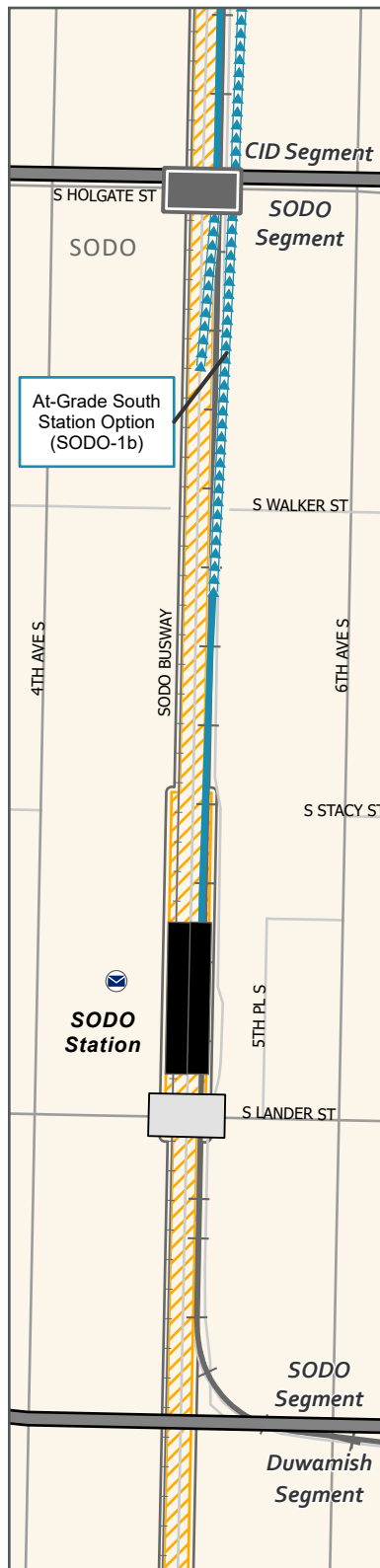
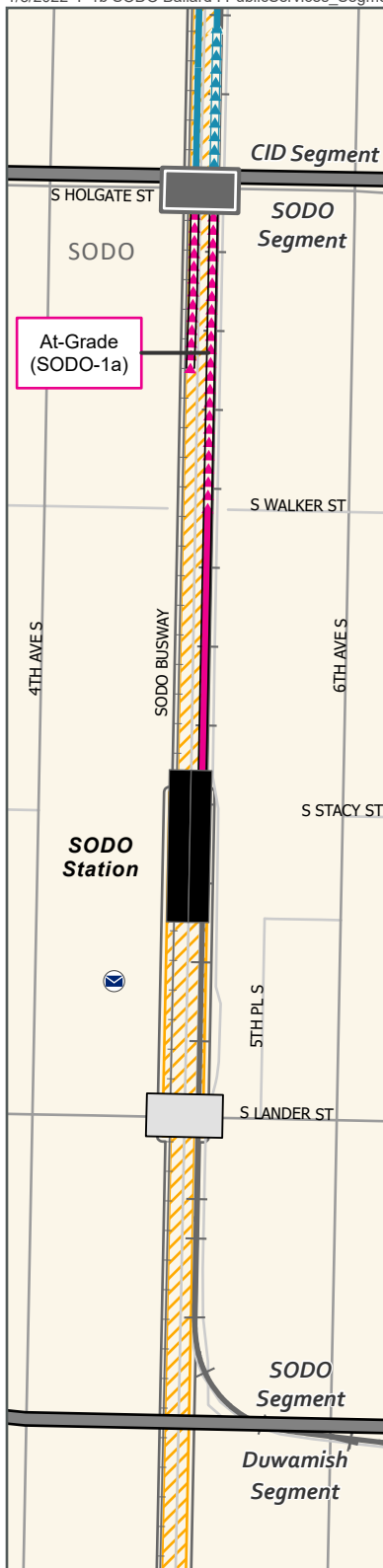
Sources: City of Seattle 2020, King County 2020, King County 2019.

4.3.14.1.1 Fire and Emergency Medical Services

The Seattle Fire Department provides fire and emergency medical services in the study area. In 2020, the Seattle Fire Department's average response time from dispatch to arrival was as follows (City of Seattle 2021):

- 78 percent of the time arrived within 4 minutes for the first-arriving engine for fires and hazardous materials responses (standard is 90 percent)
- 92 percent of the time arrived within 8 minutes for full alarm assignment (15 firefighters) for fires and hazardous materials responses (standard is 90 percent)
- 73 percent of the time arrived within 4 minutes for basic life support services (standard is 90 percent)
- 81 percent of the time arrived within 8 minutes for advanced life support services (standard is 90 percent)





Source: City of Seattle, King County (2019, 2020, 2021).

Alternatives

- Preferred Alternative
- Preferred Alternative with Third-party Funding
- Other Alternatives

Alternative Profile

- Elevated
- At-Grade
- Retained Cut

Station

- Existing

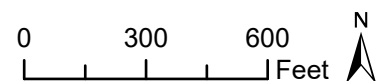
- Segment Line
- Existing Link
- Light Rail
- Railroad
- SODO Busway
- Existing Overpass
- Proposed Overpass

Post Office

Note: Seattle Public Schools John Stanford Center for Educational Excellence and Seattle Police Support Facility are located within the Ballard - SODO Segment but outside of the map extent.

FIGURE 4.3.14-1
Public Services
Ballard Link Extension -
SODO Segment

West Seattle and
Ballard Link Extensions





Source: City of Seattle, King County (2019, 2020, 2021).

Alternatives

- Preferred Alternative
- Preferred Alternative with Third-party Funding
- Other Alternatives

Alternative Profile

- Elevated
- At-Grade
- Tunnel
- Retained Cut

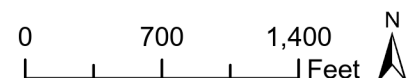
Station

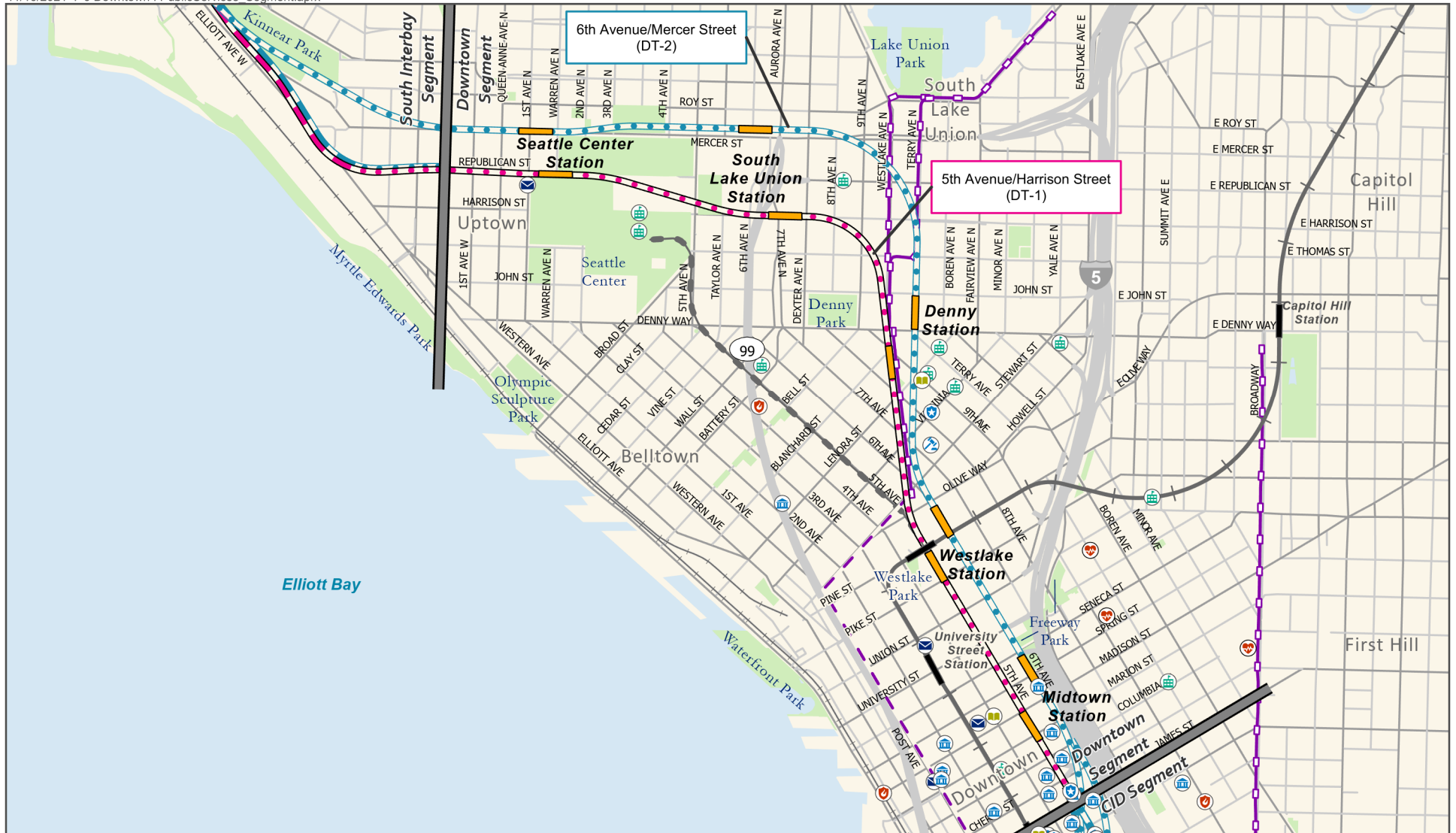
- New
- Existing

- Segment Line
- Existing Link Light Rail
- East Link Light Rail (Under Construction)
- Existing Streetcar
- Center City
- Connector Streetcar (Construction Paused)
- Railroad
- SODO Busway
- Proposed Overpass
- Park

- Fire Station
- Government Facility
- Hospital/Medical Facility
- Library
- Police Station
- Post Office
- School and Facilities

FIGURE 4.3.14-2
Public Services
 Ballard Link Extension -
 Chinatown-International
 District Segment
*West Seattle and
 Ballard Link Extensions*





Source: City of Seattle, King County (2019, 2020, 2021).

Alternatives

- Preferred Alternative
- Preferred Alternative with Third-party Funding
- Other Alternatives

Alternative Profile

- Elevated
- At-Grade
- Retained Cut

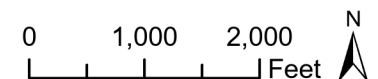
Station

- New
- Existing

- Segment Line
- Existing Link Light Rail
- Monorail
- Existing Streetcar
- Center City
- Connector Streetcar (Construction Paused)
- Railroad
- Park

- Ⓜ Courthouse
- Ⓜ Fire Station
- Ⓜ Government Facility
- Ⓜ Hospital/Medical Facility
- Ⓜ Library
- Ⓜ Police Station
- Ⓜ Post Office
- Ⓜ School and Facilities

FIGURE 4.3.14-3
Public Services
 Ballard Link Extension -
 Downtown Segment
*West Seattle and
 Ballard Link Extensions*



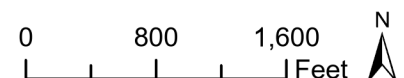


Source: City of Seattle, King County (2019, 2020, 2021).

- Alternatives**
- Preferred Alternative
 - Preferred Alternative with Third-party Funding
 - Other Alternatives
- Alternative Profile**
- Elevated
 - Tunnel
 - At-Grade
 - Retained Cut
- Station**
- New
- Legend**
- Segment Line
 - Railroad
 - Park
 - Fire Station
 - Government Facility
 - Post Office
 - School and Facilities

FIGURE 4.3.14-4
Public Services
Ballard Link Extension -
South Interbay Segment

West Seattle and
Ballard Link Extensions





Source: City of Seattle, King County (2019, 2020, 2021).

Alternatives

- Preferred Alternative
- Preferred Alternative with Third-party Funding
- Other Alternatives

Alternative Profile

- Elevated
- At-Grade
- Tunnel
- Retained Cut

Station

- New

Segment Line

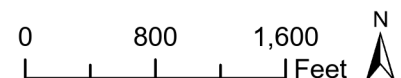
- Railroad
- Stream
- Park

- Fire Station
- Hospital/Medical Facility
- Library
- Post Office
- School and Facilities

Note: Ballard Elementary School is located within the Interbay/Ballard segment but outside of the map extent.

FIGURE 4.3.14-5
Public Services
Ballard Link Extension -
Interbay/Ballard Segment

West Seattle and
Ballard Link Extensions



In addition to the emergency medical units provided by the fire department, several hospitals are in the study area and provide emergency medical services. Harborview Medical Center includes the Seattle Fire Department/King County Medic One Program, which provides advanced life-support services. It is also part of the Northwest Healthcare Response Network. Fire Station 10 in the Chinatown-International District houses the department's hazardous materials team, Fire Alarm Center, and Office of Emergency Management. Fire Station 3 at Fishermen's Terminal houses fireboats that respond to calls east of the Ballard Locks, but is not staffed full time. All other fire stations serve their surrounding areas.

4.3.14.1.2 Police Services

The Ballard Link Extension is within the North and West Seattle Police Department precincts. Appendix L4.14, Public Services, Safety, and Security, contains information on crime rates in the city of Seattle, the state of Washington, and the areas near existing Link light rail stations. Seattle Police Harbor Patrol is located on the north shore of Lake Union. While the headquarters and boat docks are outside the study area, Harbor Patrol operates in waterways within the study area, including Salmon Bay and Elliott Bay, and provides marine law enforcement, rescue, fire response, and assistance.

4.3.14.1.3 Solid Waste Services

Waste Management and Cleanscapes are currently contracted to provide solid waste, yard waste, and recycling collection within the study area. Nonhazardous solid waste collected in the study area is taken to the South Transfer Station and then to a landfill outside of King County. Collection vehicles travel throughout the roadways in the study area.

4.3.14.1.4 Schools

The study area is served by Seattle Public Schools. There are also a number of private schools and colleges in the study area (see Table 4.3.14-1). Collectively, the public schools in the Ballard Link Extension study area served approximately 3,400 students in the 2019 to 2020 school year. Many students attending private and public schools use school bus transportation. Middle school and high school students also use Metro buses and Link light rail through an ORCA card program. Seattle Public Schools provide school walking and bicycling routes, with designated school crosswalks. Memorial Stadium, an outdoor stadium for concerts and athletics owned by Seattle Public Schools, is in the study area.

4.3.14.1.5 Other Government Facilities

Other government facilities in the study area include post offices, courts, administrative offices, libraries, maintenance facilities, and the Washington National Guard (see Table 4.3.14-1).

4.3.14.2 Environmental Impacts of the No Build Alternative

The No Build Alternative would have no direct impacts on public services in the area. However, continued population and employment growth within the study area would not only increase public service demands but may also increase traffic congestion and emergency services' response times (see Chapter 3).



4.3.14.3 Environmental Impacts of the Build Alternatives during Operation

4.3.14.3.1 Impacts Common to All Build Alternatives

Fire and Emergency Medical Services

Sound Transit's safety design criteria are used to avoid conflicts with vehicular, bicycle, and pedestrian traffic. Sound Transit would prepare a safety and security management plan for the WSBLP Project. The management plan would establish the safety and security measures required throughout the project lifecycle (design, construction, and operation).

The Ballard Link Extension would operate within its own exclusive grade-separated right-of-way, and light rail operations would not directly affect fire and emergency medical services routes or response times on public roadways. Increased congestion at station areas, particularly those that are close to fire stations, could affect response times but traffic impacts would be mitigated. Chapter 3 identifies locations where traffic congestion could occur and potential mitigation to improve traffic conditions.

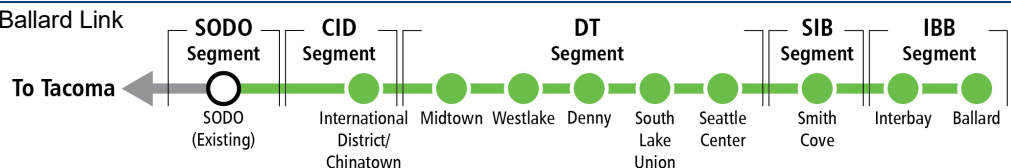
In accordance with the City of Seattle's fire code, Sound Transit would maintain access to fire hydrants, fire lanes, and fire response access points adjacent to the Ballard Link Extension where possible. Where it is not possible, Sound Transit would coordinate with the Seattle Fire Department to redesign access. Design for elevated and tunnel emergency access and evaluation would conform with state and local fire codes and with National Fire Protection Association 130, Standard for Fixed Guideway Transit and Passenger Rail Systems (2020). Access to trains could generally be provided by trains on the adjacent track. When a second train is not practical, Sound Transit would follow the local and state fire codes and National Fire Protection Association 130. Emergency access to tunnels would be maintained for prompt response times and for the safety of passengers and emergency service providers. Tunnel stations would include several safety design features to address fire prevention, ventilation and fire protection, and evacuation, such as automatic fire suppression equipment; emergency ventilation shafts, fans, and dampers; and emergency lighting, communications equipment, and exit signage. Emergency services providers and Sound Transit personnel would be trained to respond to emergencies on elevated guideways, tunnels, and in retained cut profiles. Provisions for emergency access would be included at the stations.

Sound Transit's Fire/Life Safety Committee would review safety requirements and develop solutions regarding access to the light rail system, emergency routes, water and fire hydrant needs, training, costs, and other design features; specific emergency procedures and necessary equipment would be determined during final design.

Police

Police vehicles are not anticipated to experience increased response times. Police could have difficulty responding to calls at elevated or tunneled sections of guideway or at stations not easily accessible from the existing roadway network. Sound Transit would coordinate with local emergency service providers to provide additional planning for these situations; however, trains would generally proceed to the nearest station for a police response. Sound Transit would also coordinate with emergency responders to have a plan for unanticipated emergencies.

All Build Alternatives would require additional police and security staff to monitor stations, entryways, and adjacent areas to protect people and property. Sound Transit's transit police



would remain at some stations throughout the day and would patrol other facilities and respond to incidents in coordination with local law enforcement.

Previous studies have shown that crime at transit stations generally mirrors crime levels in the surrounding area (Moudon et al. 2018, Billings et al. 2011, City of Seattle 1999). Over 90 percent of crimes in transit facilities relate to quality of life crimes (e.g., vandalism, drunkenness, and panhandling) and property crimes. An increase in the number of people in the area from light rail and implementation of security measures could deter crime along the project corridor.

Design of access points and the location of facilities could influence crime if stations provide places where crimes can go unseen by others. The *Sound Transit Agency Safety Plan* (Sound Transit 2020) requires a threat and vulnerability assessment for all new transit facilities during the preliminary design phase. For this assessment, Sound Transit would review existing crime data in new station locations and interview law enforcement to identify possible security threats and risks. Stations would be designed using the principles of Crime Prevention Through Environmental Design to include numerous features such as abundant light, open access, and visibility to address security issues. Crime Prevention Through Environmental Design measures would also minimize impacts by controlling passenger movements with specific traffic flow patterns and installing closed-circuit television cameras, emergency telephones, controlled exits, and sealed fare boxes. Sound Transit would continue consultation with police and public safety services throughout the design process to minimize risk.

Sound Transit would build upon existing safety and security management plans from other Link projects and apply lessons learned from these projects to meet the latest Federal Transit Administration guidelines on safety and security. Sound Transit would work with the United States Department of Homeland Security, Federal Transit Administration, emergency service providers, and local law-enforcement agencies to create a project-specific safety and security management plan that would meet all federal, state, and local requirements and develop strategies to prevent and respond to potential threats to public safety.

Solid Waste

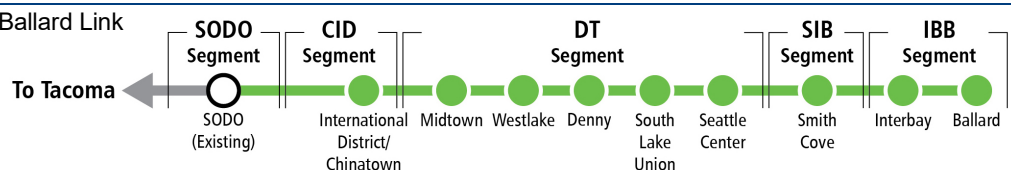
Operation of the Ballard Link Extension would not impact solid waste collection and disposal within the study area. Sound Transit would not acquire any property currently used by recycling, composting, and solid waste facilities or operating bases. No collection routes would be negatively affected or experience delay or altered services due to minor changes in existing roadways. In addition, the project would not increase demand for waste services.

Schools

Because the Ballard Link Extension would be entirely grade separated, the project would not affect school bus/van travel through residential neighborhoods. In areas where new stations are within walking distance to schools, students and staff could experience improved travel times. For information on overall travel times, see Chapter 3.

Other Government Facilities

Sound Transit would coordinate with United States Postal Service officials to ensure that changes in existing roadways resulting from project operations would not negatively affect postal routes or create delivery delays. Because the Ballard Link Extension would be entirely grade separate, conflicts with United States Postal Service routes are not anticipated.



4.3.14.3.2 SODO Segment

All SODO Segment alternatives include an overpass on South Holgate Street, which would remove the existing Central Link at-grade crossing. This would benefit emergency response and travel times within the area because they would no longer experience a delay at this crossing when trains pass.

The Ballard Link Extension-only M.O.S. would have the impacts to public services discussed here for the Ballard Link Extension, and have the impacts discussed for the SODO Segment for the West Seattle Link Extension (see Section 4.2.14.3.2). The Ballard Link Extension-only M.O.S. would also include improvements in the Duwamish Segment to connect to the existing Operations and Maintenance Facility Central. This would cause a moderate noise impact on Seattle Fire Department Fire Station 14, which could be mitigated with a sound wall (see Section 4.3.7.3 Environmental Impacts of the Build Alternatives during Operation and Appendix N.3, Noise and Vibration Technical Report, for potential mitigation). If it is built to connect with Alternative DUW-2 in the West Seattle Link Extension, the Ballard Link Extension-only M.O.S. would acquire part of the Fire Station 14 property on 4th Avenue South. This acquisition is not expected to require relocation of the station and no long-term effects are expected. If the Ballard Link Extension-only M.O.S. is constructed, Fire Station 14 would not have additional affect with the West Seattle Link Extension when it is built.

4.3.14.3.3 Chinatown-International District Segment

Operation of Alternative CID-1a*, Option CID-1b*, Alternative CID-2a, and Option CID-2b would not have additional impacts to public services other than those discussed above under Section 4.3.14.3.1, Impacts Common to All Build Alternatives, for the Ballard Link Extension.

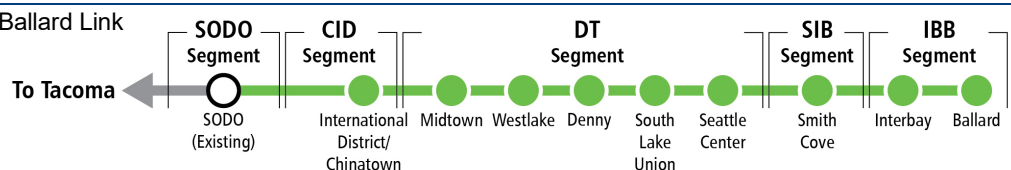
4.3.14.3.4 Downtown Segment

There would be no direct impacts to public services with either Downtown Segment alternative. Both alternatives would provide improved access to multiple federal, state, and local offices and services with the Midtown Station. Access to some public and private schools and colleges along the alternatives, such as the Center School and Cornish College of the Arts, would be improved by both alternatives. Access to Memorial Stadium would also be improved by both alternatives.

4.3.14.3.5 South Interbay Segment

Preferred Alternative SIB-1 would be elevated across the Seattle Armory property, where the Washington Army National Guard is located. The alternative would require guideway columns in paved areas in the southwestern portion of the property used for military vehicle storage and would require relocation of a few small equipment storage buildings. This would not impact their use of the property because there are other areas within the property that can be used for these purposes. Guideway columns along the northwestern edge of the property would require reconfiguration of the internal roadway to the northeastern side of the property. Access to the property from West Armory Way would be maintained and emergency response times would not be affected. The Washington National Guard is considering relocating outside of Seattle, and the property may be redeveloped with other uses.

Alternative SIB-2 would be elevated within the 15th Avenue West right-of-way adjacent to the United States Postal Service Interbay Post Office and Carrier Annex (Interbay Carrier Annex). This alternative would permanently displace some parking spaces at the United States Postal



Service Interbay Carrier Annex property. Sound Transit would provide replacement parking adjacent to the property and there would not be an impact to operations or access to the facility. This alternative would also be elevated next to Fire Station 20 on 15th Avenue West but is not expected to impact fire station operations.

Alternative SIB-3 would displace the United States Post Office Interbay Carrier Annex and require relocation. Sound Transit would coordinate with the United States Postal Service to find a suitable relocation site within the surrounding area. In addition, Sound Transit would work closely with the agency to minimize delays in mail service or operation during the relocation process. The Seattle Parks and Recreation Department West Central Maintenance Warehouse would also be displaced by Alternative SIB-3 and require relocation within the surrounding area. Sound Transit would coordinate with the Seattle Parks and Recreation Department to find a suitable relocation site within the surrounding area. The Alternative SIB-2 guideway columns would eliminate some parking on this property but would not displace the facility. Sound Transit would provide replacement parking adjacent to the property, and there would not be an impact to operations or access to the facility.

4.3.14.3.6 Interbay/Ballard Segment

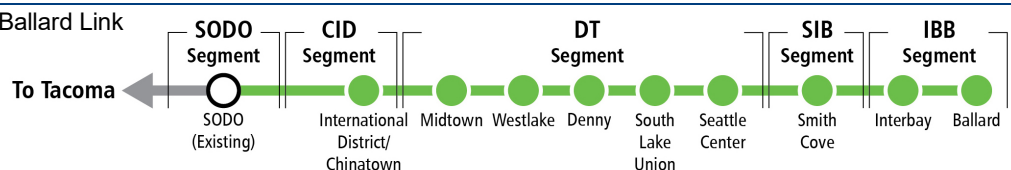
Operation of Preferred Alternative IBB-1a and Option IBB-1b would not have additional impacts to public services other than those discussed above under Section 4.3.14.3.1, Impacts Common to All Build Alternatives, for the Ballard Link Extension. Preferred Alternative IBB-1a and Option IBB-1b would be just to the east of the Seattle Maritime Academy but would not impact long-term operations. Preferred Alternative IBB-2a* and Preferred Option IBB-2b* would have a groundborne noise impact at the academy, but it could be mitigated. Preferred Option IBB-2b* and Alternative IBB-3 would have station entrances next to Fire Station 18 on Northwest Market Street; however, the project would not impact long-term fire station operations.

Alternative IBB-3 would cross Salmon Bay adjacent to Fire Station 3 in Fishermen's Terminal. The bridge would be designed to allow for boat passage; however, the guideway columns would introduce new constraints on inbound access between the navigation channel and the fire station. This alternative would also introduce access constraints between the navigation channel and Fishermen's Terminal (refer to Section 3.17, Ballard Link Extension Affected Environment and Impacts During Operation – Navigation, in Chapter 3 for additional information). However, it is not anticipated that fire station operations or emergency response by either the Seattle Fire Department or Seattle Police Harbor Patrol would be impacted.

4.3.14.4 Environmental Impacts of the Build Alternatives during Construction

4.3.14.4.1 Impacts Common to All Build Alternatives

Construction of any Ballard Link Extension alternative would require temporary lane and roadway closures, shifts in roadway alignments, and detours associated with the project, which could result in increased congestion along adjacent roadways. Prior to construction, Sound Transit would coordinate with public service providers to establish alternate routes and ensure required access during established time periods. Traffic control plans would be reviewed and approved by affected agencies before being implemented to minimize increases in travel and response times and to avoid interference with emergency response, collection of solid waste and recyclables, or transportation of students. Through continued coordination and communication with local agencies, Sound Transit anticipates that there would be no impact to public services, safety, and security during construction.



Fire and Emergency Medical Services

Temporary closures could affect access and response times for fire and emergency medical vehicles. Throughout the construction period, Sound Transit would maintain access and egress for fire and emergency medical vehicles to minimize impacts on response and travel times within project segments. Sound Transit would also develop contingency plans with emergency service providers to reduce response and travel times and ensure access to hydrants and water lines during construction of the project. City of Seattle fire and emergency medical providers would respond to potential emergencies at the construction sites.

Police

Temporary closures could affect access and response times for police vehicles. Additional police may be required to direct traffic in areas where project construction requires alterations to existing roadways, especially in areas where road closures would occur. Sound Transit would coordinate with the City of Seattle and Washington State Patrol to provide adequate police services. Traffic congestion and new traffic patterns resulting from construction could temporarily increase the number of traffic incidents and therefore increase demand on existing police resources. New traffic patterns and circulation changes would be coordinated with local police and emergency service providers prior to their establishment. Seattle Police Department would respond to potential emergencies at the construction sites.

Solid Waste

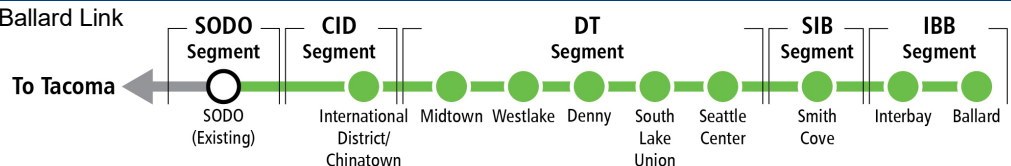
As with other public service providers, waste and recycling vehicles could experience delays along collection routes close to the project. Sound Transit would maintain access and egress for solid waste and recycling collection vehicles to minimize impacts on collection. Sound Transit would work with collection companies to identify if any access points are required to be closed and develop alternative access points, collection locations, or other needed measures. Project construction would likely increase the amount of debris and refuse; however, there are several waste facilities in the region that could accept this waste with no impacts to solid waste operations.

Schools

The Ballard Link Extension Build Alternatives are not in close proximity to schools and therefore are unlikely to result in any construction-related impacts, such as noise and dust, on students or school staff. Full and partial road closures during construction could result in the temporary rerouting of school and/or transit buses, which could affect student and staff travel times. However, Sound Transit would work with local school bus operators and other transit authorities to identify relocated bus stops near those temporarily closed stops. See Chapter 3 for further discussion of impacts to buses during construction.

Other Government Facilities

United States Postal Service vehicles could experience delays during construction; however, Sound Transit would ensure that access and egress for such vehicles would be maintained and closure of an access point would be remedied by an alternate access developed in coordination with local post offices.



4.3.14.4.2 SODO Segment

All SODO Segment alternatives would construct a South Holgate Street overpass, which would require a road closure along this street, as well as lane closures on 4th Avenue South and 6th Avenue South. This could increase emergency response and travel times for vehicles that typically use this road, especially at the nearby Seattle Police Support Facility, but detours would be coordinated with service providers.

All of the alternatives would also close the SODO Busway during construction. While Sound Transit would work with Metro and the Seattle Department of Transportation to find alternate bus routes, impacts to the busway could create slightly longer travel times for staff and students at schools served by these routes who rely on Metro bus services to commute. After construction, service would be restored on the SODO Busway for Alternative SODO-2.

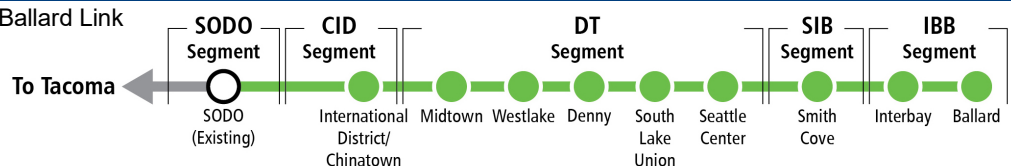
The Ballard Link Extension-only M.O.S. would have the impacts to public services discussed here for the Ballard Link Extension, and have the impacts discussed for the SODO Segment for the West Seattle Link Extension (see Section 4.2.14.4.2). The Ballard Link Extension-only M.O.S. would include improvements to the Duwamish Segment to connect to the existing Operations and Maintenance Facility Central. When built to connect to Alternative DUW-2, it would require temporary relocation of some uses at Fire Station 14, including parking for electric fleet vehicles and training functions that currently use the eastern portion of this fire station property. If these relocations were necessary, Sound Transit would work closely with fire station officials to identify a suitable property within the surrounding area and ensure operations continue with minimal impacts during relocation. Contingency response routes would be developed to identify alternate response pathways, as necessary. If the Ballard Link Extension-only M.O.S. is constructed, Fire Station 14 would no longer be affected by the West Seattle Link Extension when it is built.

4.3.14.4.3 Chinatown-International District Segment

Construction associated with Alternative CID-1a* and Option CID-1b* would require partial and full closures of 4th Avenue South and some cross streets that could affect emergency response times in this area. Construction associated with Alternative CID-2a and Option CID-2b would require partial and full road closures of 5th Avenue South and some cross streets that could affect emergency response times in this area. Fire Station 10 is on 5th Avenue South, north of South Washington Street, and response from this location could be affected by alternatives on either street. Although no road closures are anticipated adjacent to the fire station, closures in the area could lead to increased congestion around the station, which could potentially result in increased emergency response times.

4.3.14.4.4 Downtown Segment

Construction-related road closures along 4th Avenue, 5th Avenue, and other cross streets with Preferred Alternative DT-1 could affect access to multiple public facilities and services in the downtown commercial core, including the Seattle Public Library - Central Library, King County and City of Seattle administration buildings, and federal and county courthouses. The loading dock for the Seattle Public Library - Central Library may be inaccessible for up to 8 weeks as a result of closure of Madison Street for Preferred Alternative DT-1. Sound Transit would work with the library to refine the construction approach to minimize loading dock access disruptions. Construction noise from excavation on Madison Street could affect use of parts of the library. Appendix N.3 discusses potential mitigation for these impacts. Construction-related road closures on 4th Avenue, 5th Avenue, and other cross streets could also affect emergency response times, but alternate routes would be identified. Construction-related road closures



along Westlake Avenue and 8th Avenue for cut-and-cover construction of the Denny Station for Preferred Alternative DT-1 could affect emergency response times for the Seattle Police Department's West Precinct. Road closures for cut-and-cover construction of the Seattle Center Station for the same alternative would not affect access to the United States Postal Service facility on 1st Avenue North, although some reconfiguration of access may be needed. Sound Transit would work closely with Seattle Police Department and United States Postal Service officials to minimize construction impacts to operations and maintain access.

4.3.14.4.5 South Interbay Segment

Construction of the Preferred Alternative SIB-1 guideway across and alongside Elliott Avenue West could impact emergency response times from Fire Station 20 to calls for assistance to the south on Elliott Avenue West. Guideway construction on the southwestern portion of the Seattle Armory property used for military vehicle parking and equipment storage may require temporary relocation of some vehicles. This would not impact their use of the property because there are other areas within the property that can be used for these purposes. Sound Transit would work closely with Washington National Guard officials to minimize construction impacts to the Seattle Armory property and operations. Access to the property would be maintained during construction. Sound Transit would work with emergency service providers to minimize impacts on response times. Contingency response routes would be developed to identify alternative response pathways, as necessary.

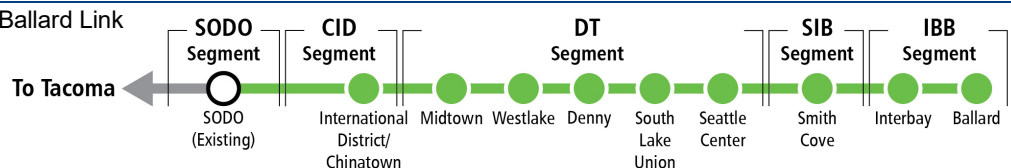
Elevated guideway construction along 15th Avenue West for Alternative SIB-2 would be next to both the United States Postal Service Interbay Carrier Annex and Fire Station 20. Straddle-bent construction on the United States Postal Service Interbay Carrier Annex property would result in the temporary loss of several parking spaces which could affect their operations. However, Sound Transit would provide replacement parking adjacent to the United States Postal Service Interbay Carrier Annex. Construction adjacent to Fire Station 20 and partial closures of 15th Avenue West and Elliott Avenue West could affect response times to calls for assistance to the south and the north of the station. Access to and from the fire station would need to be maintained at all times. Construction of Alternative SIB-3 would require small sections of partial closures of 15th Avenue West and also partial closures of Elliott Avenue West on nights and weekends. These closures could impact emergency response times from Fire Station 20 to calls for assistance to the south on these streets.

Sound Transit would coordinate with both the United States Postal Service and Seattle Fire Department to maintain service and identify temporary operation facilities or response/delivery routes, if necessary.

4.3.14.4.6 Interbay/Ballard Segment

Construction of Preferred Alternative IBB-1a and Option IBB-1b would be just to the east of the Seattle Maritime Academy. Construction of the guideway would require closure of 14th Avenue Northwest from Northwest 45th Street to Northwest 51st Street as well as some cross streets for 3 years. However, Northwest 45th Street and Shilshole Avenue Northwest would remain open and access to the academy would be maintained.

Construction of all the alternatives would be within a block of Fire Station 18. Road and lane closures on 14th Avenue Northwest, 15th Avenue Northwest, and the 15th Avenue Northwest/Northwest Market Street intersection could affect response times from this station, but access to and from the station would be maintained at all times.



Construction of the Preferred Alternative IBB-1a, Option IBB-1b, and Alternative IBB-3 bridge across Salmon Bay could impact response times from and access to Fire Station 3 at Fishermen's Terminal. Response times of Seattle Police Harbor Patrol to Salmon Bay and waterways west of these alternatives could also be impacted by construction during temporary closures of the navigation channel and from increased waterway congestion (refer to Section 3.19.6.6, Navigation, in Chapter 3 for additional information). Sound Transit would coordinate with Seattle Police Harbor Patrol prior to and throughout construction at key milestones or phases where navigation conditions could change.

4.3.14.5 Indirect Impacts of the Build Alternatives

The project would not lead to unplanned or induced increase in the population of Seattle or King County and would be unlikely to cause an increased demand for public services beyond those already planned. There could be a redistribution of some populations and employment growth to areas adjacent to new stations, which is consistent with City and regional plans. For more information on changes to populations and areas surrounding stations, see Section 4.3.2, Land Use.

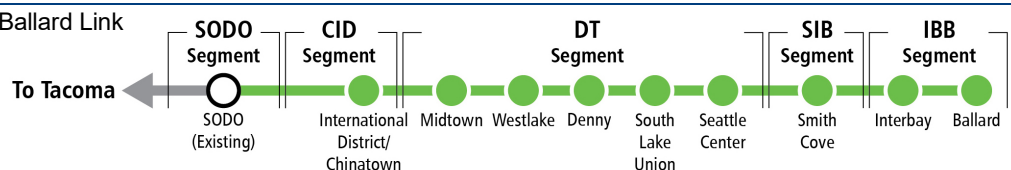
4.3.14.6 Mitigation Measures

If an alternative would require relocation of the United States Postal Service Interbay Post Office and Carrier Annex, Sound Transit would identify a replacement property in coordination with the United States Postal Service. The replacement facility would meet the geographic, size, parking, access, and loading dock requirements that would be identified by the United States Postal Service. Sound Transit would be responsible for environmental review, design, and construction of a replacement facility acceptable to the United States Postal Service. Postal operations would be relocated to the replacement facility prior to the project impacting the existing facility. The property would be relocated in accordance with the Uniform Relocation Assistance and Real Property Acquisitions Policies Act of 1970 and the Sound Transit Real Estate Property Acquisition and Relocation Policy, Procedures and Guidelines, as described in Section 4.3.1, Acquisitions, Displacements, and Relocations.

Sound Transit would coordinate with public service providers before and during construction to maintain reliable emergency access and alternative plans or routes to minimize delays in response times. This would include coordination with Seattle Police Harbor Patrol prior to and throughout construction at key milestones or phases where navigation conditions could change. Sound Transit would also coordinate with solid waste and recycling companies and schools should rerouting of collection or school bus routes need to occur. Sound Transit would work with the Seattle Public Library to refine the construction approach to minimize loading dock access disruptions.

No other mitigation would be needed, given the project commitments to the following:

- Provide mitigation measures as identified in Chapter 3 for long-term and construction impacts on traffic.
- Design the project in accordance with Link light rail's design standards that fully address emergency, safety, and security.
- Operate the light rail in accordance with Link light rail's existing approaches to ensure safety and security throughout the system.
- Develop emergency response and safety and security plans and programs in cooperation with affected agencies.



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4.3.15 Utilities

4.3.15.1 Affected Environment

The Ballard Link Extension study area is the area within 100 feet of the track alignment, stations, and associated facilities (construction and operation). Utilities considered in this analysis include water, sanitary sewer, storm sewer, electrical power, natural gas, telephone and communications infrastructure, and petroleum product pipelines. Table 4.3.15-1 summarizes the utility providers in the study area.

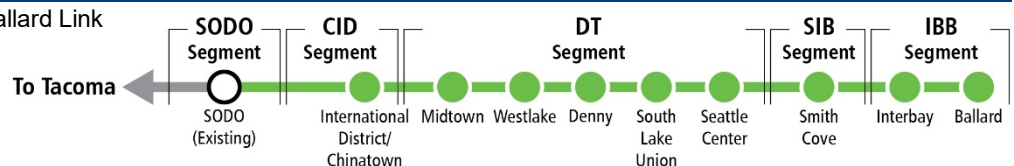
Table 4.3.15-1. Summary of Existing Utility Providers in the Ballard Link Extension Study Area

Utility	Provider
Electricity	<ul style="list-style-type: none"> Seattle City Light
Natural gas	<ul style="list-style-type: none"> Puget Sound Energy
Water	<ul style="list-style-type: none"> Seattle Public Utilities
Stormwater Management	<ul style="list-style-type: none"> King County Wastewater Treatment Division Port of Seattle Seattle Public Utilities Washington State Department of Transportation
Wastewater Management	<ul style="list-style-type: none"> King County Wastewater Treatment Division Seattle Public Utilities
Petroleum	<ul style="list-style-type: none"> Olympic Pipeline
Communications and cable providers	<ul style="list-style-type: none"> CenturyLink, Inc. (and Level 3) Seattle Information Technology Mobilite (Sound Transit systems) Verizon Communications Inc. Comcast Corporation Sprint WaveDivision Holdings LLC T-Mobile Atlas Networks Earthlink AT&T Inc. Crown Castle Fiber Zayo Group
Steam	<ul style="list-style-type: none"> Enwave

Sources: Federal Communications Commission 2018, City of Seattle 2019.

Water and high-pressure gas lines are typically 3 to 6 feet underground, while sewer lines are usually 6 or more feet underground. Some smaller utilities, such as fiber optic cables and telephone lines, are buried less than 3 feet underground. Water, sewer, and storm drain pipelines typically run parallel beneath streets, while fiber optic cables, telephone lines, and power lines often run below sidewalks.

Pigeon Alley in the Chinatown-International District is a utility corridor partially under 5th Avenue South (from South Jackson Street to South Lane Street) housing over 20 utilities, including water, communications, stormwater, electricity, and the Sound Transit fiber optic backbone for Eastlink and Central Link operations. This backbone has 12 systems conduits, 8 of which are



communications, which run from South Jackson Street to the Operations and Maintenance Facility Central. Seattle Center, located in the Downtown Segment, has a central utility plant that manages utilities including sewer, water, and steam lines. Information on major utility upgrades or expansions in the study area was gathered from the City of Seattle Capital Improvement Program (City of Seattle 2018) and Regional Wastewater Services Plan (King County 2018). Sound Transit would continue to coordinate with King County, Seattle Public Utilities, Seattle City Light, Puget Sound Energy, and appropriate City of Seattle departments through final design regarding how the Ballard Link Extension could affect planned utility upgrades, which are summarized in Appendix L4.15.

4.3.15.2 Environmental Impacts of the No Build Alternative

The No Build Alternative would not impact utilities in the Ballard Link Extension study area.

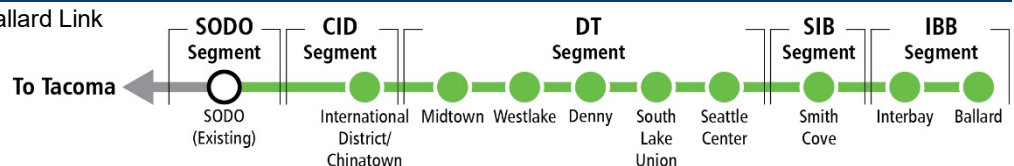
4.3.15.3 Environmental Impacts of the Build Alternatives during Operation

The Ballard Link Extension would increase electricity usage in the study area through the operation of light rail trains using direct-current power taken from 26-kilovolt electric distribution facilities, as well as through lighting installed at stations and safety lighting along the alignment and other light rail facilities. Seattle City Light would provide the electricity to operate the project's light rail vehicles, stations, and facilities. Section 4.3.10, Energy Impacts, describes the Build Alternatives' energy consumption and identifies energy-related impacts. Seattle City Light has the capacity to supply the electricity needed for the light rail extension, and Sound Transit will continue to coordinate with Seattle City Light to determine if improvements to Seattle City Light infrastructure would be necessary.

Traction power substations placed at or near light rail stations would provide power to the overhead catenary system that would power the light rail vehicles. The substations would be powered by 26-kilovolt electric lines connecting to the nearest power pole. In some cases, additional distribution lines might be needed to serve individual substations. Stray electrical current from a light rail system's traction power electrical system can cause damage and corrosion to nearby underground utilities if not properly controlled. Section 4.3.13, Electromagnetic Fields, provides additional discussion of potential stray current effects on utilities.

Major service disruptions to utility customers during light rail repair and maintenance operations are unlikely. Sound Transit would design the light rail to maintain access to utilities for maintenance and repair. In some cases, that would require Sound Transit to relocate sewer maintenance holes, pipes, vaults, or other access points. Sound Transit would work with utility providers to maintain required access to these utilities and relocated sewer maintenance holes and vaults, utility mains, fire hydrants, and other features.

Sound Transit would integrate efficient operating practices at existing and new facilities and use equipment to reduce energy and water demand and to recycle water. Sound Transit's sustainability requirements are described further in Section 4.3.10, Energy Impacts. Implementing these and other sustainable practices would reduce consumption and demand on utilities.



4.3.15.4 Environmental Impacts of the Build Alternatives during Construction

4.3.15.4.1 Impacts Common to All Alternatives

Sound Transit inventoried major utilities in the study area to identify potential conflicts that might require utility relocation and to understand the degree of utility impacts. Major utilities were defined as follows:

- Water mains that are 16 inches in diameter or greater
- Sanitary sewer force mains and gravity sewers that are 24 inches in diameter or greater
- Stormwater drains that are 36 inches in diameter or greater and drainage ponds
- Electrical transmission lines that are 115-kilovolt or greater
- High-pressure gas mains
- Intermediate-pressure gas lines that are 8 inches in diameter or greater
- Telephone and fiber optic duct banks with three or more conduits
- Petroleum product pipelines
- Steam pipelines that are 12 inches in diameter (carrier pipe diameter) or greater

Sound Transit did not evaluate or inventory impacts to minor utilities but will evaluate and inventory them as the project design progresses from preliminary to final design.

The purpose of identifying these conflicts is to plan for relocating the utilities during construction to remove possible conflicts, prevent disturbing the route during future maintenance of overhead or underground utilities, ensure that the light rail infrastructure is separated from the utility by the minimum distance required, and account for relocation costs.

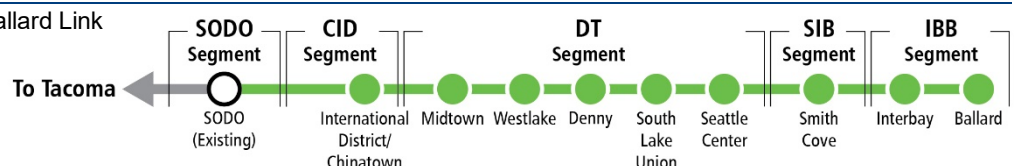
Potential impacts during construction may require the following:

- Relocating utility poles supporting overhead lines
- Raising overhead power lines to heights that do not interfere with guideway or catenary system
- Constructing new distribution lines to provide power to substations
- Relocating underground utilities
- Inspecting, repairing, and casing underground utilities at guideway track crossings
- Service disruptions

There also may be potential settling of ground around utilities, as described in Section 4.3.11, Geology and Soils.

Construction could affect access to underground utility providers, and in some cases, utilities would need to be relocated in consultation with the utility provider and the City of Seattle.

Construction could lead to impacts such as displacement, relocation, or interrupted service to utilities. The degree of impact would depend on depth, material composition, excavation limits, construction methods, project alignment, and other factors. Within the study area, most underground utilities are within about 6 feet of the surface and within 35 feet of the centerline of each alternative. To allow for excavation and to minimize load impacts from the weight of light rail vehicles, underground utilities would be relocated or cased for protection. Utilities within public road rights-of-way would generally be moved to a different location within the right-of-



way. In some cases, utilities may need to be relocated to adjacent rights-of-way and/or require additional easements from affected private properties.

Where feasible, columns for elevated guideways would avoid impacts on underground utilities. Elevated guideways might also require that existing power lines be relocated or elevated over the overhead catenary system. Bored tunnel profiles would generally avoid utility lines, except at stations, where Sound Transit would use cut-and-cover construction. Potential settlement of utilities is described in Section 4.3.11, Geology and Soils.

Temporary connections to utility customers would typically be established before relocations to minimize service disruptions. However, inadvertent damage to underground utilities could occur if utility locations are uncertain or misidentified. Sound Transit would work with utility companies to identify damaged utility lines or connections and restore service as soon as possible. Efforts to minimize impacts would also include potholing and pre-construction surveys to identify utility locations as well as outreach to inform customers of potential service disruptions.

The following subsections summarize the notable utility conflicts in each segment. Appendix L4.15 summarizes all major conflicts with each Ballard Link Extension Build Alternative. Where major utilities would be directly under or above the project limits, the approximate length of the relocation is provided (rounded to the nearest hundred). Where major utilities would intersect with an alternative, the number of crossings is identified because the length of the relocation has not yet been determined. Sound Transit would determine relocation lengths during final design.

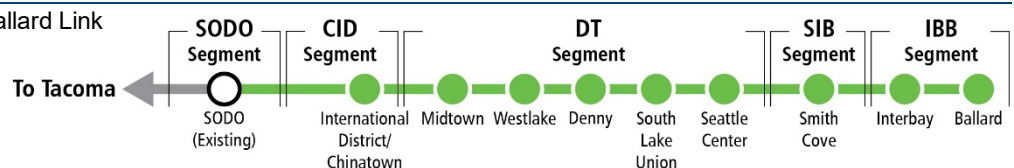
4.3.15.4.2 SODO Segment

All Build Alternatives in the SODO Segment would require replacement of a water line under South Holgate Street, between 4th Avenue South and 6th Avenue South. It would be cased to accommodate light rail weight and replaced at the same location. All Build Alternatives would include relocation of the Sound Transit fiber optic backbone within the SODO Busway.

The Ballard Link Extension-only M.O.S. would result in utility conflicts identified in this section (for the Ballard Link Extension in the SODO Segment), utility conflicts identified in the SODO Segment for the West Seattle Link Extension (see Section 4.2.15.4.2), and in the Duwamish Segment to connect to the existing Operations and Maintenance Facility Central. The utility conflicts in the Duwamish Segment include a high-pressure gas line that would be protected in place and an overhead 230-kilovolt power line that would be relocated from 5th Avenue South to 6th Avenue South. If the Ballard Link Extension-only M.O.S. is constructed, these utilities would no longer be affected by the West Seattle Link Extension when it is built.

4.3.15.4.3 Chinatown-International District Segment

Alternatives CID-1a* and CID-2a would have more utility conflicts related to cut-and-cover construction, while Option CID-1b* and Option CID-2b would have less. All Build Alternatives in the Chinatown-International District Segment may conflict with a pile-supported sewer line at South Royal Brougham Way, which could be temporarily relocated adjacent to the existing line or a portion of it would be replaced. Alternative CID-1a* and Option CID-1b* would affect a 48-inch-diameter combined sewer line along 4th Avenue South from South Jackson Street to South Royal Brougham Way. This relocation could affect the hydraulic system for the King County combined sewer in this area and would require coordination with both Seattle Public Utilities and King County Wastewater. Alternatives CID-1a* and CID-2a would also affect gas lines that would require relocation.



Alternative CID-1a*, Alternative CID-2a, and Option CID-2b would conflict with water lines at 5th Avenue South, 6th Avenue South, and Main Street. Due to the age and condition of the pipes, ground improvement disruptions may require replacement of sections of the water lines. For cut-and-cover construction, the water lines would be protected in place.

Construction of any of the Chinatown-International District Segment Build Alternatives would conflict with Sound Transit's fiber optic backbone for East Link and Central Link operation in the area of the tunnel portal and Pigeon Alley. With Alternative CID-2a and Option CID-2b, the portion of the fiber optic backbone between South Jackson Street and Seattle Boulevard South within Pigeon Alley would need to be relocated adjacent to the 4th Avenue South parking garage structure. For all Build Alternatives, south of Seattle Boulevard South, the Sound Transit fiber optic backbone would be relocated within the SODO Busway.

Alternative CID-2a and Option CID-2b would also require relocation of other utilities within Pigeon Alley, with Alternative CID-2a having the most relocations. Alternative CID-2a would also require relocation of a 16-inch-diameter water line and 12-inch-diameter high pressure gas line from 5th Avenue South to 6th Avenue South.

The diagonal station configuration for Alternative CID-2a would have fewer relocations compared to the Alternative CID-2a station and be similar to Option CID-2b, but would require relocation of some utilities in Pigeon Alley for the pedestrian undercrossing connection adjacent to the existing northbound International District/Chinatown Station platform. These relocations could be within the 5th Avenue South right-of-way.

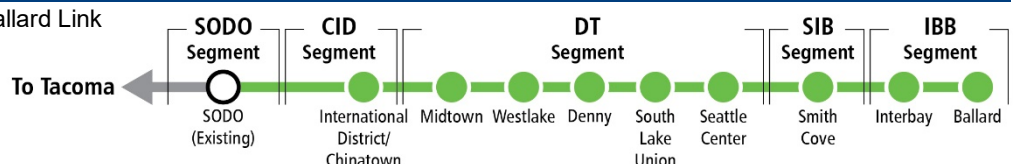
Alternative CID-2a (including the diagonal station configuration) and Option CID-2b would require relocation of a portion of the 230-kilovolt transmission line that is proposed by the Seattle City Light's Denny Substation Project, which would build a transmission line from the new Denny Substation to the existing Massachusetts Substation.

4.3.15.4.4 Downtown Segment

Preferred Alternative DT-1 would require relocation of combined sewers and gas lines under Westlake Avenue for construction of the Denny Station. Both of the Build Alternatives in the Downtown Segment would require relocation of fiber optic telecommunications lines. Sound Transit would work with Seattle City Light to minimize impacts on the planned duct bank and overhead power line expansion planned for the Denny Substation. Sound Transit would work with Puget Sound Energy to avoid potential impacts to the gas line along 5th Avenue with either Downtown Segment Build Alternative. Both alternatives would conflict with major steam lines for tunnel construction. All steam lines would be protected in place. Preferred Alternative DT-1 would not conflict with utilities at the Seattle Center central utility plant, and access to the plant would be maintained during construction.

4.3.15.4.5 South Interbay Segment

Alternative SIB-3 would be close to the King County Wastewater Pump Station on West Garfield Street but would avoid direct impacts on the pump station. Alternative SIB-2 would conflict with gas lines on West Mercer Place and Elliott Avenue West. Both Preferred Alternative SIB-1 and Alternative SIB-3 would also require relocation of a fiber optic telecommunications line on West Dravus Street. Preferred Alternative SIB-1 would also conflict with a fiber optic line on West Garfield Street and Alternative SIB-3 would conflict with an additional fiber optic line on West Armory Way. Both Preferred Alternative SIB-1 and Alternative SIB-2 would be close to the King County Wastewater Mercer/Elliott West combined sewer overflow facility on Elliott Avenue West but would avoid direct impacts to the facility. There may be impacts associated with the future expansion of this facility to the south. Sound Transit would coordinate with King County on any



potential upgrades to this facility to minimize impacts. Alternative SIB-3 would relocate a 96-inch sewer line because of conflicts with guideway columns. Both Preferred Alternative SIB-1 and Alternative SIB-3 would be close to the King County Wastewater Interbay force main and odor control facility upgrade but would not directly impact the planned upgrade to this facility.

4.3.15.4.6 Interbay/Ballard Segment

Preferred Alternative IBB-1a would relocate a gas line and stormwater drainage systems under 14th Avenue Northwest. Preferred Alternative IBB-1a and Option IBB-1b would have the most conflicts with fiber optic telecommunications lines on 14th Avenue Northwest. Preferred Alternative IBB-1a and Option IBB-1b would also require relocation of a 96-inch-diameter storm drain under 14th Avenue Northwest, including relocation of its outfall in Salmon Bay. Utility relocations for the project would not conflict with the proposed King County sewer work within the same area.

Preferred Alternative IBB-2a* would conflict with sewer, gas, fiber optic, and storm drain lines under 14th Avenue Northwest, but most could be protected in place. Preferred Option IBB-2b* would have fewer conflicts due to the difference in station location. Alternative IBB-3 would conflict with sewer and fiber optic lines, but most could be protected in place. All Build Alternatives would avoid the Ship Canal Water Quality Project that is currently under construction.

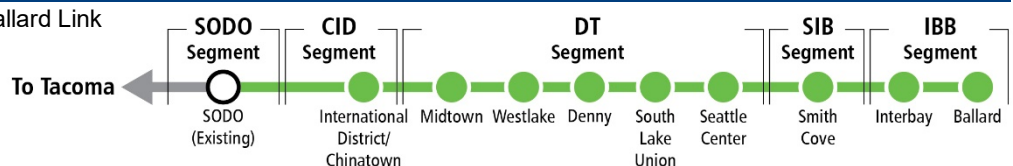
Preferred Alternative IBB-1a (connecting to Alternative SIB-3), Preferred Alternative IBB-2a*, and Preferred Option IBB-2b* would require coordination with Seattle City Light regarding design of the planned Interbay Substation at 17th Avenue West and West Bertona Street that is expected to be operational by 2025. If it is determined that an alternate location for the substation would be needed, Sound Transit would work with Seattle City Light to identify an alternate location. Alternative IBB-3 would relocate a storm drain outfall on the south side of Salmon Bay.

4.3.15.5 Indirect Impacts of the Build Alternatives

For the Ballard Link Extension, indirect impacts would be the same for all Build Alternatives. The improved transit access would support planned transit-oriented development or redevelopment near the Ballard Link Extension stations. This increase in population and development would also likely increase demand for utility services in some areas surrounding stations. The project corridor is entirely within Seattle's urban growth boundary, and development near the project would not be denser than allowed within the adopted land use plan. Increased development and associated utility demands within these areas are addressed by City plans. Section 4.3.2, Land Use, provides more details on adopted land use plans and potential project impacts.

4.3.15.6 Mitigation Measures

Through pre-construction measures and coordination with utility providers, no impacts on major utilities are expected during construction of the Ballard Link Extension and no mitigation would be needed.



4.3.16 Historic and Archaeological Resources

4.3.16.1 Affected Environment

Appendix N.5, Historic and Archaeological Resources Technical Report, includes a history of the Ballard Link Extension study area; additional information about federal, state, and local regulations affecting cultural resources; and further detail regarding the National Register-eligible resources described in the following sections. It also includes information on each of the parcels inventoried as part of the built environment survey.

The area of potential effects for each alternative extends from elements of the project limits (e.g., guideway, stations, and construction staging areas) to the nearest tax parcel or a maximum of 200 feet where large tax parcels are adjacent to project elements. One parcel is a standard area of potential effects extent for linear transportation projects, because potential direct and indirect effects to historic properties typically do not extend beyond one parcel. The area of potential effects is larger in the following areas to account for potential visual effects:

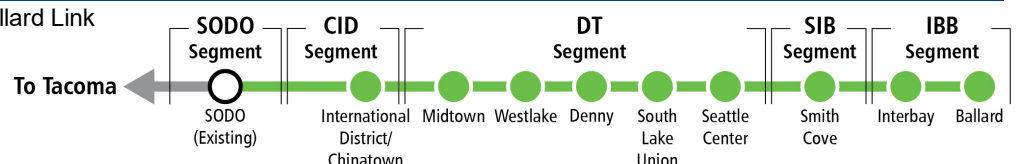
Area of Potential Effects

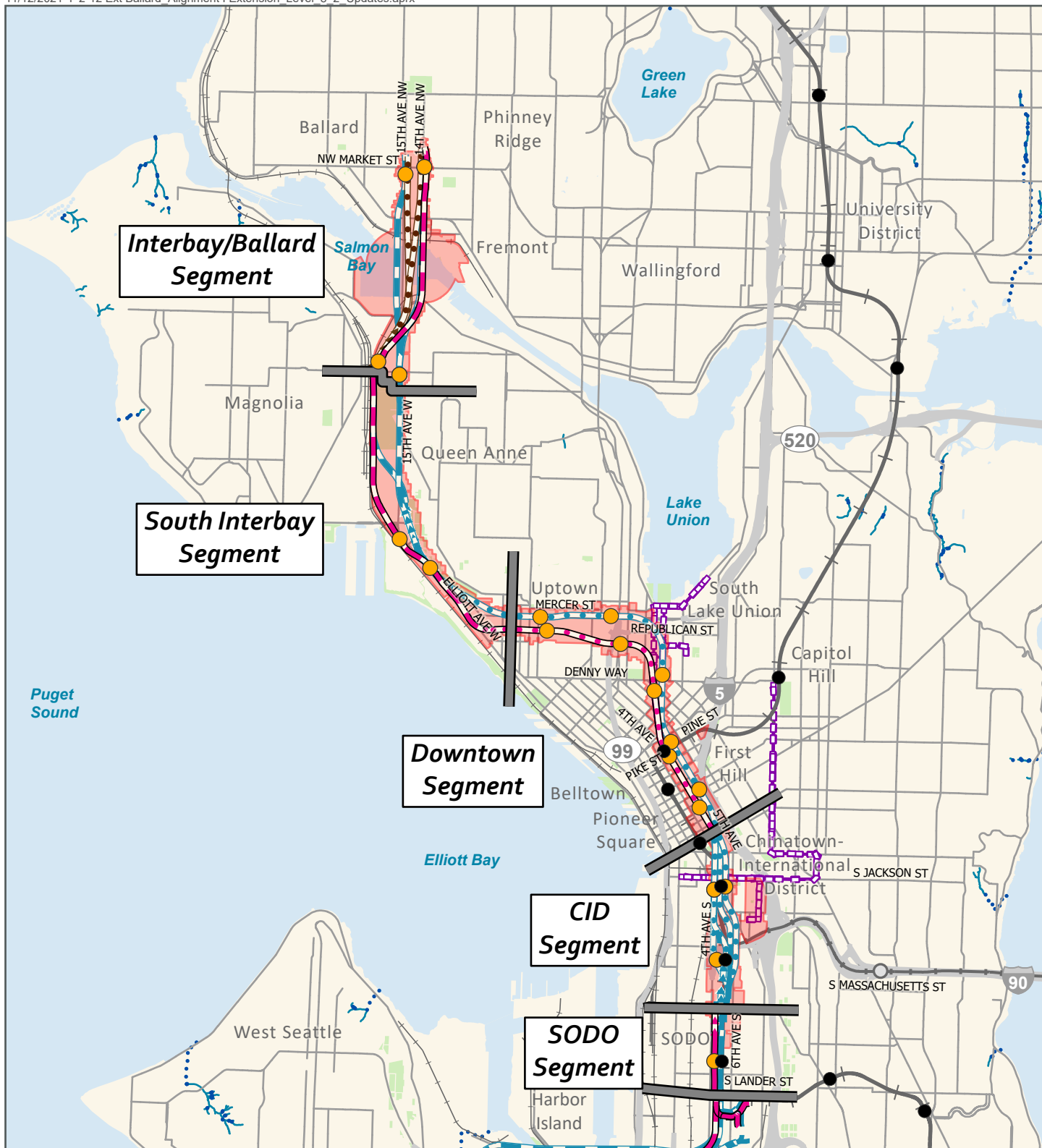
In accordance with Section 106 of National Historic Preservation Act, the area of potential effects includes all areas where one or more alternatives or project elements has the potential to adversely affect historic and/or archaeological resources. FTA, in consultation with the State Historic Preservation Officer, Tribes, and other consulting parties, determines the Section 106 area of potential effects for historic and archaeological resources.

- **SODO Segment.** Area of potential effects extended one additional parcel from the guideway where project alternatives would reconstruct South Holgate Street to cross over the existing and new light rail alignments.
- **Interbay/Ballard Segment.** Where some alternatives include a high-level fixed bridge, the area of potential effects extends 0.25 mile from the center of the new high-level bridges at 14th Avenue Northwest and 15th Avenue Northwest. It also extends to parcels on the southwest side of the Ballard Bridge (between 21st Avenue West and the shoreline, north of West Nickerson Street) and includes all of Fishermen's Terminal.

The State Historic Preservation Officer concurred with FTA's area of potential effects in February 2020. On March 25, 2021, FTA, in cooperation with Sound Transit, defined a revised area of potential effects that includes proposed station locations, staging areas, and other project elements that had not previously been identified; the State Historic Preservation Officer concurred with the revised area of potential effects on March 26, 2021. Since then, Sound Transit identified new construction elements that required additional revisions to the area of potential effects. On September 7, 2021, FTA, in consultation with the State Historic Preservation Officer, defined the area of potential effects based on these additional revisions. On October 5, 2021, the State Historic Preservation Officer conditionally concurred with FTA's revised area of potential effects. Subsequently, the State Historic Preservation Officer, FTA, and Sound Transit met on November 18, 2021, to discuss conditional concurrence and area of potential effects concerns voiced by consulting parties and the State Historic Preservation Officer. As the project advances, FTA and Sound Transit will continue to consult with the State Historic Preservation Officer and other consulting parties on the area of potential effects to address specific concerns regarding historic districts and individual resources.

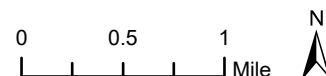
The area of potential effects for the Ballard Link Extension is depicted on Figure 4.3.16-1.





Source: City of Seattle, King County (2019, 2020, 2021).

FIGURE 4.3.16-1
Area of Potential Effects
 Ballard Link Extension
 West Seattle and
 Ballard Link Extensions



To better understand the potential to encounter archaeological resources within the area of potential effects, known sites within an additional 0.25-mile area were studied. Additional information on methods for the review of archaeological resources within the study area and area of potential effects is in Appendix N.5.

4.3.16.1.1 Historic Built Environment Resources

Historic built environment resources within the area of potential effects that were built in or before 1980 were surveyed and inventoried. Table 4.3.16-1 summarizes the National Register-listed and eligible historic properties (either previously identified or determined as part of this evaluation) and designated Seattle landmarks within each segment within the area of potential effects. These resources are also listed by segment in Section 4.3.16.3, Environmental Impacts of the Build Alternatives during Operation.

Table 4.3.16-1. Historic Built Environment Resources within the Ballard Link Extension Area of Potential Effects

Segment	National Register Resources		Designated Seattle Landmarks
	Listed	Determined Eligible ^a	
SODO	0	2	0
Chinatown-International District	37	16	4
Downtown	20	83	29
South Interbay	0	43	8
Interbay/Ballard	1	57	0
Linear Resources Spanning Multiple Segments	0	2	0
Total	58	204	41

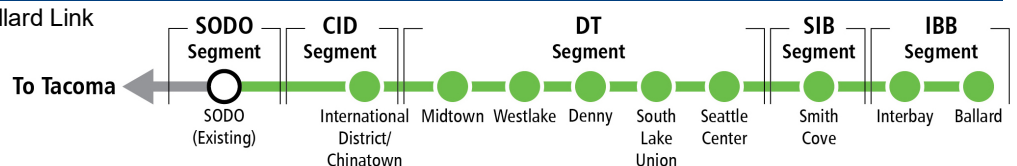
^a FTA continues to consult with the State Historic Preservation Officer about National Register eligibility of historic-age resources within the area of potential effects; therefore, this information is subject to change.

Some of the buildings within the Chinatown-International District and Downtown segments contain areaways, which are belowground spaces within street rights-of-way, enclosed by the sidewalks above and by building foundations and street supports on either side. Areaways located in a National Register-listed historic district or attached to a National Register-listed building are considered historic properties, even though they are actually part of the right-of-way. All areaways that retain integrity and are connected to a historic property or within a historic district are assumed to be historic for the purposes of this project.

Prior to publication of the Final EIS, historic areaways within the area of potential effects for the Preferred Alternative will be identified, documented, and evaluated for potential National Register eligibility.

4.3.16.1.2 Archaeological Resources

No archaeological field investigation has occurred in the area of potential effects because access has not been secured. Archaeological monitoring of the geotechnical borings currently being conducted in support of design has provided some insight into the archaeological potential of the project corridor. Desktop research included examination of the history of the area of potential effects, the presence of previously identified archaeological resources, the archaeological predictive model (developed by the Washington State Department of Archaeology and Historic Preservation), ethnographic information, and archival resources. U.S.



Meander lines were also used in the analysis to help determine probability for archaeological resources near modern day or historically documented shorelines.

A total of 25 archaeological resources were identified within 0.25 mile of the area of potential effects for the five segments of the Ballard Link Extension using the WISAARD system. Of the 25 resources identified, only 9 fall within the area of potential effects for the project and are within the Chinatown-International District or the Downtown segments. The South Interbay and the Interbay/Ballard segments have no known archaeological sites within the area of potential effects.

Table 4.3.16-2 identifies the number of archaeological resources associated with the Ballard Link Extension by segment. The area of potential effects is shown on Figure 4.3.16-1.

Table 4.3.16-2. Archaeological Resources within 0.25 Miles of the Ballard Link Extension Area of Potential Effects

Segment	Archaeological Resources within 0.25 mile of Area of Potential Effects	National Register-Eligible Archaeological Resources in Area of Potential Effects	Non-National Register-Eligible Archaeological Resources in Area of Potential Effects	Unevaluated or Undetermined Eligibility Archaeological Resources in Area of Potential Effects
SODO	0	0	0	0
Chinatown-International District	10	0	3	0
Downtown	14	0	3	3
South Interbay	1	0	0	0
Interbay/Ballard	0	0	0	0
Total	25	0	6	3

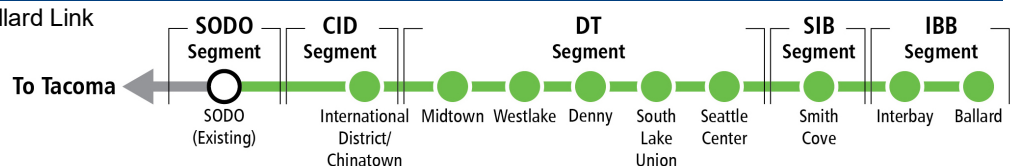
Geotechnical borings to support the Draft Environmental Impact Statement began in 2018 and concluded in 2021. Of the 131 boreholes completed, 28 were archaeologically monitored within the Ballard Link Extension following the recommendations developed within the *Geotechnical Investigation, Cultural Resources Assessment and Inadvertent Discovery Plan* (Bumback et al. 2019) for the project. Historical-period refuse associated with the Interbay Landfill was identified in four boreholes (IB2034, IB2036, IB2037, and IB2038) along the western edge of what is now the Interbay Golf Course. No archaeological features or artifacts were identified in any of the remaining boreholes.

4.3.16.2 Environmental Impacts of the No Build Alternative

Archaeological resources may be identified through other construction activities as the area continues to expand and develop. Similarly, the number of historic built environment resources could decrease with increased development or through neglect.

4.3.16.3 Environmental Impacts of the Build Alternatives during Operation and Construction

This section discusses potential impacts during operations (long-term impacts) and construction (short-term impacts) of the Ballard Link Extension on historic resources. In cases where historic resources or districts exceed the one-parcel or 200-foot boundary, effects to historic properties are still considered on the entire resource or district.



Under federal regulations (National Historic Preservation Act, 36 Code of Federal Regulations, part 800.5), a project would have an adverse effect if it would alter, directly or indirectly, any of the characteristics of a historic property that qualify it for inclusion in the National Register in a manner that would diminish the property's integrity of location, design, setting, materials, workmanship, feeling, or association. All qualifying characteristics of a historic property shall be considered, including those that may have been identified after the original evaluation of the property's National Register eligibility.

The following sections discuss the potential direct impacts of project construction and operation on archaeological sites and historic built environment resources.

To determine the effects on historic properties with the Ballard Link Extension area of potential effects, the following information was used:

- The location of project elements and proximity to historic properties
- Potential partial or complete acquisition and/or demolition of historic properties
- Construction methods and location
- Potential for vibration (short- or long-term) that could damage historic properties
- Potential for settlement that could damage historic properties
- Potential changes to the visual setting that adversely affect the historic setting
- Traffic detours related to roadway closures

What are Adverse Effects on Historic Properties?

- Physical destruction of or damage to all or part of the property.
- Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, and provision of handicapped access, that is not consistent with the Secretary of the Interior's Standards for the Treatment of Historic Properties (36 Code of Federal Regulations 68) and applicable guidelines.
- Removal of the property from its historic location.
- Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance.
- Introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features.
- Neglect of a property that causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an indigenous Tribe or Native Hawaiian organization.
- Transfer, lease, or sale of property out of federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance.

4.3.16.3.1 Historic Built Environment Resources

For this project, property-specific adverse effects are characterized as follows:

- **Property demolition.** Property would be acquired and demolished.
- **Partial property acquisition.** Part of the property would be acquired for the project but would not necessitate demolition of the historic built environment resource. An adverse effect would occur if the acquisition diminished one or more aspects of the property's integrity. Not all partial property acquisitions would result in an adverse effect.
- **Permanent proximity effects.** Proximity to the project and/or visual intrusion would cause permanent diminishment of setting, feeling, and/or other aspects of integrity.
- **Construction disruption.** A property in direct proximity (typically within one parcel) would be affected by reduced access, extensive noise, and/or vibration over an extended duration,



diminishing one or more aspect of integrity. Construction in proximity of a historic property would not necessarily diminish integrity or result in an adverse effect.

Operation-related impacts are defined in this section as long-term, permanent impacts when revenue service begins. These on-going impacts are typically associated with the introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features.

Construction-related impacts to historic built environment resources can be caused by several factors, including, but not limited to, restricted access, increased truck traffic along haul routes, glare, noise, vibration, and temporary changes to setting. Together, these factors can lead to reduced commercial activity, and reduced investment in historic properties. Typically, these effects would not be considered adverse unless they would diminish characteristics that contribute to a historic property's National Register eligibility.

Construction-related vibration would potentially affect built environment historic properties. As described in Appendix N.3, Noise and Vibration Technical Report, the primary concern from vibration as a result of construction activities is the potential for damage to buildings, particularly historic properties, including those within historic districts. Because the details of the construction means and methods for this project are not available at this time and there are several Build Alternatives, the construction vibration analysis focused on determining the distance beyond which the damage risk criteria and annoyance criteria would not be exceeded. A construction vibration control plan would be developed to address locations where there are historic properties that would have the potential to be affected. Properties in all segments that would experience construction-related impacts are noted in Tables 4.3.16-3 through 4.3.16-7.

Designated Seattle landmarks and districts that would be directly modified would be subject to review and issuance of certificate of approval from the Landmarks Board and/or District Review Boards.

4.3.16.3.2 Archaeological Resources

Based on the archaeological predictive model, there is a very high potential that unknown archaeological sites exist in areas where ground disturbance would occur for the project and could be impacted by construction of any of the Ballard Link Extension alternatives.

4.3.16.3.3 Linear Resources Spanning Multiple Segments

The Ballard Link Extension contains two linear resources that span one or more segments. They are the Seattle and Montana Railway/Great Northern Railway Seattle to Everett Mainline Milepost 0 to 4.9, and the Seattle and Walla Walla Railroad/Puget Sound Shore Railroad Company/Seattle, Lake Shore and Eastern Railroad/Northern Pacific Railway Black River Junction to the Lake Washington Ship Canal. However, they would be avoided and would not be adversely affected, directly or indirectly, by any Build Alternatives. No aspect of their integrity would be altered or diminished by the project.

4.3.16.3.4 SODO Segment

Historic Built Environment Resources

As summarized in Table 4.3.16-3, all three alternatives would adversely affect one historic property in this segment, except when connecting to Alternative CID-1a* in the Chinatown-International District Segment.



Table 4.3.16-3. Effects to Built Environment Historic Properties: Ballard Link Extension Area of Potential Effects – SODO Segment

Survey Number	WISAARD Property Number	Property Name	Address	Built Date	National Register Eligibility Status ^a	Preferred At-Grade Alternative (SODO-1a) ^b	At-Grade South Station Option (SODO-1b) ^b	Mixed Profile Alternative (SODO-2) ^c
1028	342325	Lincoln Moving & Storage, Alaska Orient Van Lines Building	1924 4th Avenue South	1966	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
1030	720609	Graybar Electric Company Building ^d	1919 6th Avenue South	1960	Eligible (Criterion C)	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition
Total Number of Adversely Affected Properties	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	1	1	1

Notes:

Assessments of effects to individual historic properties are preliminary and have not been formally determined by FTA. Final effects determinations are pending additional consultation with the State Historic Preservation Officer, Tribes, and other consulting parties.

Property names correspond with the resource names documented on the Historic Property Inventory forms prepared for the Department of Archaeology and Historic Preservation. Property names typically reflect historic names of businesses or individuals that occupied the building in the past.

^a Unless noted as “pending consultation,” the State Historic Preservation Officer has concurred with determinations of National Register eligibility.

^b The Ballard Link Extension-only M.O.S. would adversely affect the Alaskan Copper Company Employment Office and Auto Repair Garage at 2958 6th Avenue South (3322a and 3322b) resources in the Duwamish Segment to connect to the existing Operations and Maintenance Facility Central. If the Ballard Link Extension-only M.O.S. is constructed, these properties would no longer be affected by the West Seattle Link Extension when it is built.

^c The Ballard Link Extension-only M.O.S. would adversely affect the Auto Repair Garage at 2958 6th Avenue South (3322a) resource in the Duwamish Segment to connect to the existing Operations and Maintenance Facility Central. If the Ballard Link Extension-only M.O.S. is constructed, these properties would no longer be affected by the West Seattle Link Extension when it is built.

^d For all alternatives, property demolition would only occur when connecting to Option CID-1b*, Alternative CID-2a, and Option CID-2b. When connecting to Alternative CID-1a*, part of the property would be acquired, but no aspect of integrity would be diminished, and the effect would not be adverse.

The Ballard Link Extension-only M.O.S. would adversely affect one to two resources in the Duwamish Segment of the West Seattle Link Extension in order to connect to the existing Operations and Maintenance Facility Central. If the Ballard Link Extension-only M.O.S. is constructed, these properties would no longer be affected by the West Seattle Link Extension when it is built.

Archaeological Resources

All of the SODO Segment falls within a zone defined by the archaeological predictive model as “survey highly advised: very high risk” for archaeological resources, indicating that there is a very high risk of impacting previously unidentified archaeological resources in this area across



most of the segment. There are no recorded archaeological sites within the area of potential effects or within 0.25 mile of the area of potential effects for this segment.

4.3.16.3.5 Chinatown-International District Segment

Historic Built Environment Resources

As summarized in Table 4.3.16-4, all of the alternatives would adversely affect known historic properties in the Chinatown-International District Segment.

There are two previously identified National Register-eligible historic districts in this segment: the National Register-listed Seattle Chinatown Historic District and the Pioneer Square-Skid Road National Historic District. All alternatives would adversely affect Seattle Chinatown Historic District, and Alternative CID-1a* and Option CID-1b* would adversely affect the Pioneer Square-Skid Road National Historic District. These districts (with different boundaries) are also designated City of Seattle historic districts; any work within the local district boundaries would require a certificate of approval from the oversight boards.

Archaeological Resources

All of the Chinatown-International District Segment alternatives fall within a zone defined by the archaeological predictive model as “survey highly advised: very high risk” for archaeological resources.

There are three recorded archaeological sites within the Chinatown-International District Segment (45KI765, 45KI1027, and 45KI1223). Because all three archaeological resources have been determined not eligible (with 45KI1027 and 45KI1223 having been completely removed), there are no recorded National Register eligible archaeological sites that would be affected by the alternatives in this segment.

4.3.16.3.6 Downtown Segment

Historic Built Environment Resources

As summarized in Table 4.3.16-5, Alternative DT-2 would adversely affect about three times as many built environment historic properties as the other alternative in the Downtown Segment. Because both of these alternatives are tunnels, effects are concentrated in the station areas.

Archaeological Resources

Both Downtown Segment alternatives fall within a zone defined by the archaeological predictive model as “survey highly advised: very high risk” for archaeological resources. There are portions of the Downtown Segment, most along the northern boundary paralleling Mercer Street, where the archaeological predictive model is downgraded slightly to “survey highly advised: high risk.”

Fourteen archaeological sites were identified within 0.25 mile of the area of potential effects for the Downtown Segment, with six sites falling in the area of potential effects. Three of these recorded sites (45KI958, 45KI1146, and 45KI1451), were determined to be not eligible for listing in the National Register.

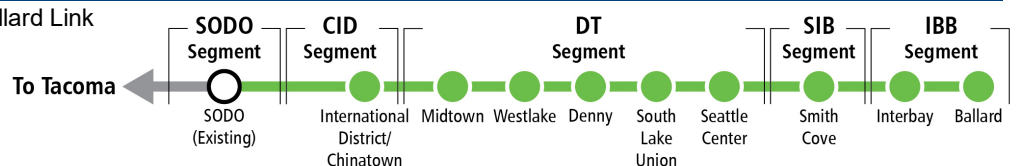


Table 4.3.16-4. Effects to Built Environment Historic Properties: Chinatown-International District Segment

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	4th Avenue Shallow Alternative (CID-1a)*	4th Avenue Deep Station Option (CID-1b)*	5th Avenue Shallow Alternative (CID-2a)	5th Avenue Deep Station Option (CID-2b)
Not Applicable	Not Applicable	Seattle Chinatown Historic District	Multiple	Multiple dates	National Register-listed historic district	Adversely Affected: <i>Construction Disruption</i>	Adversely Affected: <i>Construction Disruption</i>	Adversely Affected: <i>Property Demolition and Construction Disruption</i>	Adversely Affected: <i>Property Demolition and Construction Disruption</i>
Not Applicable	Not Applicable	Pioneer Square-Skid Road National Historic District	Multiple	Multiple dates	National Register-listed historic district	Adversely Affected: <i>Construction Disruption and Partial Property Acquisition</i>	Adversely Affected: <i>Construction Disruption and Partial Property Acquisition</i>	Not Adversely Affected	Not Adversely Affected
66	14941	King County Administration Building	500 4th Avenue	1970	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
69	39470	420 4th Avenue	420 4th Avenue	1924	Contributes to the Pioneer Square-Skid Road National Historic District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
72	45032	Hotel Reynolds	410 4th Avenue (406 to 410 4th Avenue)	1905	Contributes to the Pioneer Square-Skid Road National Historic District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
73	39473	Macrae Parking Garage	400 4th Avenue	1927	Contributes to the Pioneer Square-Skid Road National Historic District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected



4.3.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	4th Avenue Shallow Alternative (CID-1a)*	4th Avenue Deep Station Option (CID-1b)*	5th Avenue Shallow Alternative (CID-2a)	5th Avenue Deep Station Option (CID-2b)
74	39474	Old Public Safety Building - Seattle	400 Yesler Way	1909	National Register listed; Contributes to the Pioneer Square-Skid Road National Historic District; within the Pioneer Square Preservation District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
840	39475	Prefontaine Building	110 Prefontaine Place South	1909	Contributes to the Pioneer Square-Skid Road National Historic District; within the Pioneer Square Preservation District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
841	671365	Great Northern Railway Tunnel	201 4th Avenue South	1904	Contributes to the Pioneer Square-Skid Road National Historic District; within the Pioneer Square Preservation District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected



4.3.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	4th Avenue Shallow Alternative (CID-1a)*	4th Avenue Deep Station Option (CID-1b)*	5th Avenue Shallow Alternative (CID-2a)	5th Avenue Deep Station Option (CID-2b)
842	720500	Opening in Tunnel Above Great Northern/ Northern Pacific Train Tracks	4th Avenue South	1929	Contributes to the Pioneer Square-Skid Road National Historic District; within the Pioneer Square Preservation District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
843	720502	Opening in Tunnel Above Great Northern/ Northern Pacific Train Tracks	4th Avenue South	1929	Contributes to the Pioneer Square-Skid Road National Historic District; within the Pioneer Square Preservation District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
851	344099	Buty Building	501 South Jackson Street	1901	Contributes to the Seattle Chinatown Historic District; within the International Special Review District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected



4.3.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	4th Avenue Shallow Alternative (CID-1a)*	4th Avenue Deep Station Option (CID-1b)*	5th Avenue Shallow Alternative (CID-2a)	5th Avenue Deep Station Option (CID-2b)
853	45108	Retail Stores	418 5th Avenue South	1926	Contributes to the Seattle Chinatown Historic District; within the International Special Review District	Not Adversely Affected	Not Adversely Affected	Adversely Affected: <i>Property Demolition</i>	Adversely Affected: <i>Property Demolition</i>
854	56066	Publix Hotel	504 5th Avenue South	1928	Contributes to the Seattle Chinatown Historic District; within the International Special Review District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
1133	54050	United States Immigrant Station and Assay Office – Seattle	815 Seattle Boulevard South (815 Airport Way South)	1931	National Register-listed; within the International Special Review District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected



4.3.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	4th Avenue Shallow Alternative (CID-1a)*	4th Avenue Deep Station Option (CID-1b)*	5th Avenue Shallow Alternative (CID-2a)	5th Avenue Deep Station Option (CID-2b)
1203	39496	Union Station - Seattle	401 South Jackson Street	1911	National Register listed; Contributes to the Pioneer Square-Skid Road National Historic District; Within the Pioneer Square Preservation and the International Special Review Districts	Adversely Affected: <i>Construction Disruption and Partial Property Acquisition</i>	Adversely Affected: <i>Construction Disruption and Partial Property Acquisition</i>	Not Adversely Affected	Not Adversely Affected
1303	39466	Dilling Park/City Hall Park	City Hall Park (450 3rd Avenue)	1911	Contributes to the Pioneer Square-Skid Road National Historic District; Within the Pioneer Square Preservation District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
1817	53391	New Richmond Hotel	308 4th Avenue South	1910	National Register-listed; within the International Special Review District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected



4.3.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	4th Avenue Shallow Alternative (CID-1a)*	4th Avenue Deep Station Option (CID-1b)*	5th Avenue Shallow Alternative (CID-2a)	5th Avenue Deep Station Option (CID-2b)
1823	344539	American Hotel	520 South King Street	1925	Contributes to the Seattle Chinatown Historic District; within the International Special Review District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
1824	676079	Seattle First National Bank - International District Branch	525 South Jackson Street	1959	Eligible (Criterion C); Non-contributing to the Seattle Chinatown Historic District; within the International Special Review District	Not Adversely Affected	Not Adversely Affected	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition
1897	342768	Nepage McKenney Company	804 6th Avenue South	1924	Eligible (Criteria A and C); within the International Special Review District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
1899	342236	Holgate Terminals Incorporated	1762 6th Avenue South	1960	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
1910	720568	Disston, Inc. Plant	1701 4th Avenue South	1975	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
2080	720512	Pacific National Bank of Washington	1763 4th Avenue South	1975	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected



4.3.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	4th Avenue Shallow Alternative (CID-1a)*	4th Avenue Deep Station Option (CID-1b)*	5th Avenue Shallow Alternative (CID-2a)	5th Avenue Deep Station Option (CID-2b)
3236	723195	United Savings and Loan Bank	601 South Jackson Street	1973	Eligible (Criteria A and C); Non-contributing to the Seattle Chinatown Historic District; within the International Special Review District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
3237	343170	Hing Hay Park	414 6th Avenue South	1973	Eligible (Criteria A and C); Non-contributing to the Seattle Chinatown Historic District; within the International Special Review District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
4106	39493	Metropolitan Building	222 2nd Avenue Extension South	1906	Contributes to the Pioneer Square-Skid Road National Historic District; within the Pioneer Square Preservation District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected



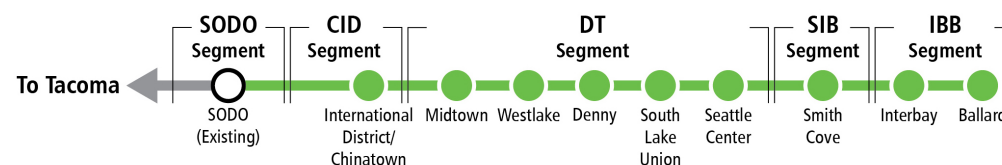
4.3.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	4th Avenue Shallow Alternative (CID-1a)*	4th Avenue Deep Station Option (CID-1b)*	5th Avenue Shallow Alternative (CID-2a)	5th Avenue Deep Station Option (CID-2b)
4107	39494	Seattle Lighting Fixture Company Annex	210 2nd Avenue Extension South	1946	Eligible (Criteria A and C); Non-contributing to the Pioneer Square-Skid Road National Historic District; Within the Pioneer Square Preservation District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
4116	342521	Governor Apartments	514 South Jackson Street	1926	Contributes to the Seattle Chinatown Historic District; Within the International Special Review District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
4117	45138	Old Main School	307 6th Avenue South	1873	Contributes to the Seattle Chinatown Historic District; Within the International Special Review District; Designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected



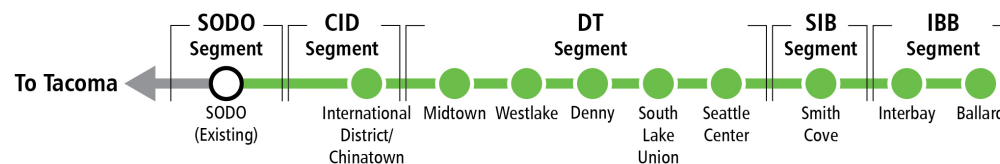
4.3.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	4th Avenue Shallow Alternative (CID-1a)*	4th Avenue Deep Station Option (CID-1b)*	5th Avenue Shallow Alternative (CID-2a)	5th Avenue Deep Station Option (CID-2b)
4118	723097	H.T. Kubota Building	513 South Main Street	1924	Contributes to the Seattle Chinatown Historic District; within the International Special Review District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
5100	341559	Goon Dip Building	664 South King Street	1911	Contributes to the Seattle Chinatown Historic District; within the International Special Review District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
5101	725873	China Garage (T.C. Garage)	413 7th Avenue South	1915	Contributes to the Seattle Chinatown Historic District; within the International Special Review District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
5102	725876	T&C Building	671 South Jackson Street	1915	Contributes to the Seattle Chinatown Historic District; within the International Special Review District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected



4.3.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	4th Avenue Shallow Alternative (CID-1a)*	4th Avenue Deep Station Option (CID-1b)*	5th Avenue Shallow Alternative (CID-2a)	5th Avenue Deep Station Option (CID-2b)
5103	343780	Eclipse Hotel	670 South Weller Street	1908	Contributes to the Seattle Chinatown Historic District; within the International Special Review District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
5104	340883	Gee How Oak Tin Hotel	519 7th Avenue South	1907	Contributes to the Seattle Chinatown Historic District; within the International Special Review District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
5105	86879	Hudson Hotel/Louisa Hotel	669 South King Street	1909	Contributes to the Seattle Chinatown Historic District; within the International Special Review District; the Chinese Community Bulletin Board (on the building) is a designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected



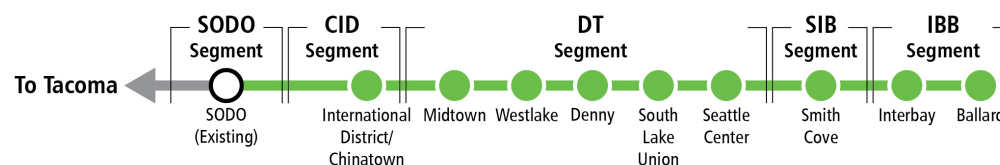
4.3.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	4th Avenue Shallow Alternative (CID-1a)*	4th Avenue Deep Station Option (CID-1b)*	5th Avenue Shallow Alternative (CID-2a)	5th Avenue Deep Station Option (CID-2b)
5106	725897	Sun Ya Restaurant	605 7th Avenue South	1975	Eligible (Criteria A and C) (pending consultation); within the International Special Review District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
5107	725898	Rainier Bank - International District Branch	666 South Dearborn Street	1979	Eligible (Criterion C) (pending consultation); within the International Special Review District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
5113	725913	The Dragon	700 South Lane Street	1978	Eligible (Criterion C) (pending consultation); within the International Special Review District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
5115	719719	Eng, William Residence	611 8th Avenue South	1937	Eligible (Criterion A); within the International Special Review District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected



4.3.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	4th Avenue Shallow Alternative (CID-1a)*	4th Avenue Deep Station Option (CID-1b)*	5th Avenue Shallow Alternative (CID-2a)	5th Avenue Deep Station Option (CID-2b)
5117	343383	Kong Yick Apartments	705 1/2 South King Street	1910	Contributes to the Seattle Chinatown Historic District; within the International Special Review District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
5118	344395	Chinese Opera House/Chinese Garden Restaurant	516 7th Avenue South	1924	Contributes to the Seattle Chinatown Historic District; within the International Special Review District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
5119	715351	Chong Wa Benevolent Association	522 7th Avenue South	1929	Contributes to the Seattle Chinatown Historic District; within the International Special Review District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
5120	342599	East Kong Yick Building/Freeman Hotel	719 South King Street	1910	Contributes to the Seattle Chinatown Historic District; within the International Special Review District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected



4.3.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	4th Avenue Shallow Alternative (CID-1a)*	4th Avenue Deep Station Option (CID-1b)*	5th Avenue Shallow Alternative (CID-2a)	5th Avenue Deep Station Option (CID-2b)
5121b	725918	Jackson Service Station	701 South Jackson Street	1927	Contributes to the Seattle Chinatown Historic District; within the International Special Review District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
5122	343162	Republic Hotel	412 7th Avenue South	1920	Contributes to the Seattle Chinatown Historic District; within the International Special Review District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
5123	343168	Bing Kung Association Apartments	420 7th Avenue South	1916	Contributes to the Seattle Chinatown Historic District; within the International Special Review District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
5126	344438	Don Hee Apartments	410 8th Avenue South	1910	Contributes to the Seattle Chinatown Historic District; within the International Special Review District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected



4.3.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	4th Avenue Shallow Alternative (CID-1a)*	4th Avenue Deep Station Option (CID-1b)*	5th Avenue Shallow Alternative (CID-2a)	5th Avenue Deep Station Option (CID-2b)
5127	343163	Hip Sing Association Building/Chinn Apartments	420 8th Avenue South	1910	Contributes to the Seattle Chinatown Historic District; within the International Special Review District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
5128	337189	Commercial Building	805 South King Street	1925	Contributes to the Seattle Chinatown Historic District; within the International Special Review District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
5129a	To be determined	To be determined	801 South Dearborn Street	1950	Not yet evaluated; pending right of entry	Not Applicable	Not Applicable	Not Applicable	Not Applicable
5129b	To be determined	To be determined	801 South Dearborn Street	1967	Not yet evaluated; pending right of entry	Not Applicable	Not Applicable	Not Applicable	Not Applicable
5129c	To be determined	To be determined	801 South Dearborn Street	1975	Not yet evaluated; pending right of entry	Not Applicable	Not Applicable	Not Applicable	Not Applicable
5129d	To be determined	To be determined	801 South Dearborn Street	1954	Not yet evaluated; pending right of entry	Not Applicable	Not Applicable	Not Applicable	Not Applicable



4.3.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	4th Avenue Shallow Alternative (CID-1a)*	4th Avenue Deep Station Option (CID-1b)*	5th Avenue Shallow Alternative (CID-2a)	5th Avenue Deep Station Option (CID-2b)
5129e	To be determined	To be determined	801 South Dearborn Street	1967	Not yet evaluated; pending right of entry	Not Applicable	Not Applicable	Not Applicable	Not Applicable
5130	725924	Frye Investment Company Office Building	707 South Plummer Street	1951	Eligible (Criterion C) (pending consultation)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
5132	725925	Seattle Engineering Department Office Building	714 South Charles Street	1973	Eligible (Criterion C) (pending consultation)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
Total Number of Adversely Affected Properties	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	3	3	3	3

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement, some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Notes:

Assessments of effects to individual historic properties are preliminary and have not been formally determined by FTA. Final effects determinations are pending additional consultation with the State Historic Preservation Officer, Tribes, and other consulting parties.

Property names correspond with the resource names documented on the Historic Property Inventory forms prepared for the Department of Archaeology and Historic Preservation. Property names typically reflect historic names of businesses or individuals that occupied the building in the past.

^a Unless noted as “pending consultation,” the State Historic Preservation Officer has concurred with determinations of National Register eligibility.

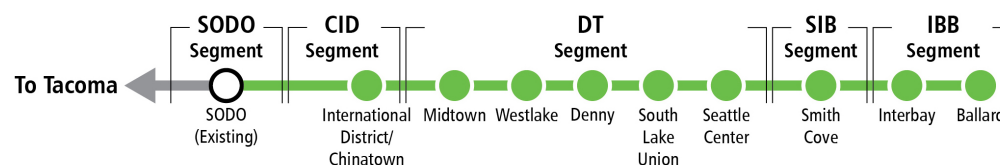
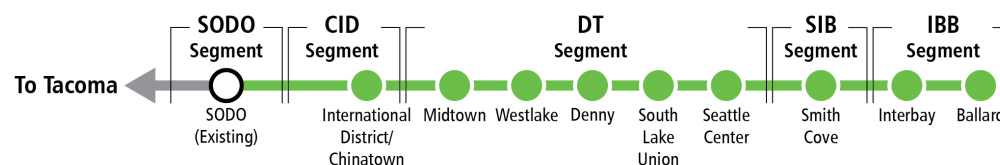


Table 4.3.16-5. Effects to Built Environment Historic Properties: Downtown Segment

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	Preferred 5th Avenue/ Harrison Street Alternative (DT-1)	6th Avenue/ Mercer Street Alternative (DT-2)
12	676617	Frederick and Nelson Building	500 (512) Pine Street	1918	Eligible, designated Seattle Landmark	Not Adversely Affected	Adversely Affected: <i>Construction Disruption and Partial Property Acquisition</i>
13	41200	Medical Dental Building – Seattle	507 (509) Olive Way	1925	National Register-listed	Not Adversely Affected	Not Adversely Affected
16	344618	Lloyd Building	601 Stewart Street	1926	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected
19	676106	Washington Plaza Hotel	1900 5th Avenue	1969	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected
21	676105	Plaza 600 Building	600 Stewart Street	1969	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected
22	720303	McDonald's Restaurant	1950 6th Avenue	1979	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected
27	41211	Western Auto Supply	700 Virginia Street (2004 Westlake Avenue)	1923	Eligible (Criterion A)	Not Adversely Affected	Not Adversely Affected
28	41149	Westlake Hotel	2008 Westlake Avenue	1907	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected
30	41152	Larned Apartments	2030 7th Avenue	1909	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected
39	41155	Retail Stores	2120 Westlake Avenue	1909	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected
45	86490	Volker, William, Building	1000 Lenora Street	1928	National Register-listed (Criterion C)	Not Adversely Affected	Not Adversely Affected



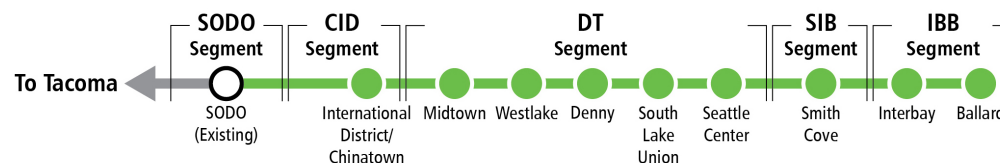
4.3.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	Preferred 5th Avenue/ Harrison Street Alternative (DT-1)	6th Avenue/ Mercer Street Alternative (DT-2)
46	344660	Olympic Hotel Parking Garage and Airline Terminal Building	415 Seneca Street	1964	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected
47	717705	Park Hilton Hotel	1113 6th Avenue	1980	Eligible (Criterion C) (pending consultation)	Not Adversely Affected	Not Adversely Affected
48	53453	Women's University Club of Seattle	1105 6th Avenue	1922	National Register-listed (Criteria A and C), designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected
49	708771	Spring Apartment Hotel	1100 5th Avenue	1922; 1959	Eligible (Criterion C)	Not Adversely Affected	Adversely Affected: <i>Partial Property Acquisition</i>
50	45105	United States Courthouse – Seattle	1010 5th Avenue	1940	National Register-listed (Criteria A and C)	Not Adversely Affected	Not Adversely Affected
52	16900	Bank of California Building	901 5th Avenue	1973	Eligible (Criterion C)	Adversely Affected: <i>Property Demolition</i>	Not Adversely Affected
56	45126	The Dover Apartments	901 6th Avenue	1907	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected
58	343568	First Methodist Episcopal Church – Seattle	809 (801) 5th Avenue	1908	National Register-listed (Criteria A and C), designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected
277	48470	Plymouth Congregational Church	1217 6th Avenue	1967	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected
278	45128	Washington Athletic Club	1325 6th Avenue	1929	National Register-listed (Criteria A and C), designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected



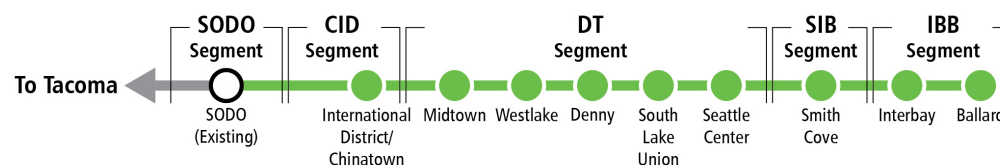
4.3.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	Preferred 5th Avenue/ Harrison Street Alternative (DT-1)	6th Avenue/ Mercer Street Alternative (DT-2)
280	28320	Logan Building	1400 5th Avenue (500 Union Street)	1958	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected
281	44189	O'Shea Building	501 Pine Street	1914	Eligible (Criteria A and C)	Not Adversely Affected	Adversely Affected: <i>Partial Property Acquisition</i>
282	44194	Shafer Building	523 Pine Street	1923	National Register listed (Criterion C), designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected
283	45166	Decatur Building	1521 6th Avenue	1922	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected
285	45101	Coliseum Building	1506 5th Avenue (5th Avenue and Pike Street)	1915	National Register-listed (Criterion C), designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected
292	720636	The People's National Bank	1415 5th Avenue	1973	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected
299	720637	One Union Square	600 University Street	1980	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected
300	45127	Park Place Building	1200 6th Avenue	1971	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected
323	676107	Durant Motor Company	333 Westlake Avenue North	1923	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected
344	41179	Kelly Goodwin Hardwood	310 Terry Avenue North	1915	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected



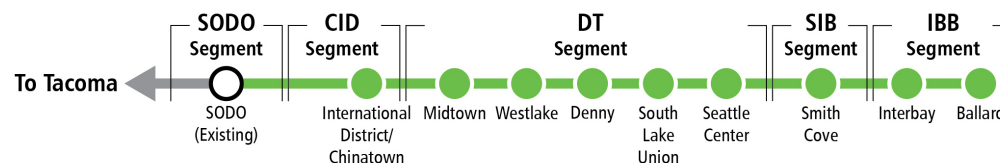
4.3.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	Preferred 5th Avenue/ Harrison Street Alternative (DT-1)	6th Avenue/ Mercer Street Alternative (DT-2)
348	716634	Dick's Drive In	500 Queen Anne Avenue North	1974	Eligible (Criterion A)	Not Adversely Affected	Not Adversely Affected
351	38452	Wedgewood Apartments	505 1st Avenue North	1930	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected
352	87224	Queen Anne Post Office and Regional Headquarters	415 1st Avenue North	1964	National Register listed (Criteria A and C)	Not Adversely Affected	Not Adversely Affected
354	343298	Thurmond's Central Realty	123 Mercer Street	1955	Eligible (Criteria A and C)	Not Adversely Affected	Adversely Affected: Property Demolition
356	335621	Maxine Apartments	105 Mercer Street	1929	Eligible (Criterion C)	Not Adversely Affected	Adversely Affected: Property Demolition
359a	43992	Playhouse – Century 21 Exposition	201 Mercer Street	1962	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected
359e	43623	Friendship Bell/Kobe Bell	305 Harrison Street	1968	Eligible (Criteria A and C); designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected
360	38497	Seattle High School – Memorial Stadium	369 Republican Street (401 5th Avenue North)	1947	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected
362	720234	Seattle Public Schools Dept Of Athletics Building	401 5th Avenue North	1965	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected
366	55130	Ancient Order of United Workmen (AOUW), Meeting Hall No. 2	501 Dexter Avenue North	1952	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected



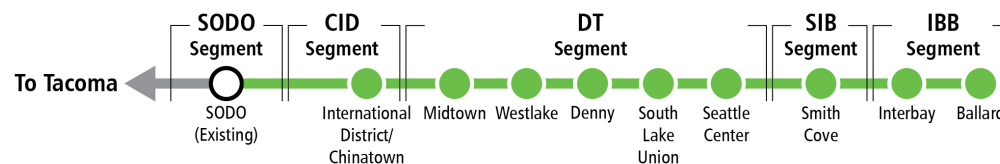
4.3.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	Preferred 5th Avenue/ Harrison Street Alternative (DT-1)	6th Avenue/ Mercer Street Alternative (DT-2)
367	99082	J.T. Hardeman Hat Company	500 Aurora Avenue North	1920	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected
377	344506	Washington Natural Gas Co	850 Republican Street	1964	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected
379	336924	Lexow & Son Custom Cabinet Works	817 Republican Street	1946	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected
388	720008	100 West Harrison Plaza	100 West Harrison Street	1972	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected
411	335636	Grex Apartments	503 1st Avenue West	1930	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected
413	344084	Office Building	506 2nd Avenue West	1958	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected
414	47754	Uptown Theater	511 Queen Anne Avenue North	1926	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected
417a	45130	Broad Street Substation Control Building	319 6th Avenue North	1951	Eligible (Criteria A and C), designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected
417b	45131	Broad Street Substation Crane Tower	319 6th Avenue North	1951	Eligible (Criteria A and C), designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected
436	45102	Y.W.C.A. Building – Seattle	1118 5th Avenue	1914	National Register-listed (Criterion A), designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected



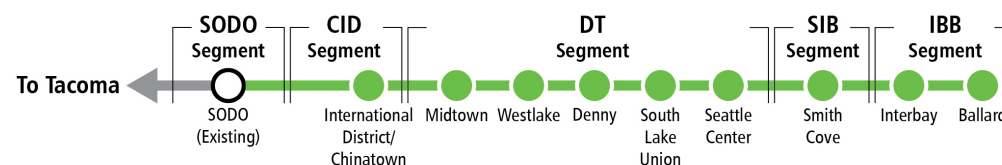
4.3.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	Preferred 5th Avenue/ Harrison Street Alternative (DT-1)	6th Avenue/ Mercer Street Alternative (DT-2)
785	666395	National Bank Of Commerce – Queen Anne Branch	100 West Mercer Street	1955	Eligible (Criterion C)	Not Adversely Affected	Adversely Affected: <i>Property Demolition</i>
859	339796	Seattle Master Builders Association Headquarters	170 Mercer Street	1951	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected
860	342967	Gas Station	600 Warren Avenue North	1954	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected
864	43993	Garage – Century 21 Exposition	300 Mercer Street	1962	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected
869	44000	Office Building	557 Roy Street	1952	Eligible (Criterion C)	Not Adversely Affected	Adversely Affected: <i>Property Demolition</i>
870	45238	S.L. Savidge Inc. Dodge and Plymouth Dealership	2021 9th Avenue	1948	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected
885	44250	Seattle Engineering School	600 Queen Anne Avenue North	1918	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected
1294	720610	Vance Hotel	620 Stewart Street	1926	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected
1298	344521	Stuart G. Thompson-Elwell Company Building	901 Lenora Street	1957	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected



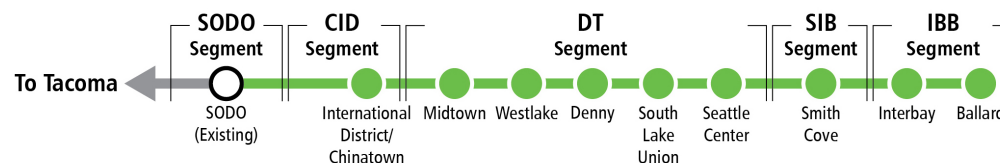
4.3.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	Preferred 5th Avenue/ Harrison Street Alternative (DT-1)	6th Avenue/ Mercer Street Alternative (DT-2)
1299	45036	Rainier Club	411 Columbia Street (810 4th Avenue)	1903	National Register listed (Criterion C), designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected
1391	44599	Freeway Park	700 Seneca Street (Center of Complex Located at about University Street)	1974	National Register-listed (Criteria A and C)	Not Adversely Affected	Adversely Affected: <i>Partial Property Acquisition</i>
1396a	43618	International Commerce and Industry Building	305 Harrison Street	1961	Eligible (Criteria A and C), designated Seattle Landmark	Adversely Affected: <i>Construction Disruption and Permanent Proximity Effects</i>	Not Adversely Affected
1396b	KI1379	Key Arena	305 Harrison Street	1961	National Register-listed (Criterion A), designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected
1396c	715657	International Plaza	305 Harrison Street	1961	Eligible (Criteria A and C), designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected
1396d	43617	Sweden Pavilion	305 Harrison Street	1961	Eligible (Criteria A and C), designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected
1401	43630	Pioneer Sand and Gravel	901 Harrison Street	1927	Eligible (Criteria A and C), designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected
1402	335846	Gordon Apartments	527 1st Avenue North	1929	Eligible (Criterion A)	Not Adversely Affected	Not Adversely Affected



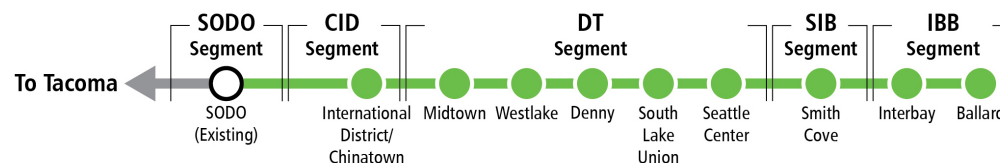
4.3.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	Preferred 5th Avenue/ Harrison Street Alternative (DT-1)	6th Avenue/ Mercer Street Alternative (DT-2)
1407	55131	People's National Bank of Washington	525 Dexter Avenue North	1948	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected
1416	43628	Apartments	800 to 810 Harrison Street	1911	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected
1873	344534	Northern Bank and Trust Building	1500 4th Avenue	1907	National Register-listed (Criterion C)	Not Adversely Affected	Not Adversely Affected
2100	45109	Skinner Building/5th Avenue Theatre	1308 5th Avenue	1926	National Register-listed (Criterion C)	Not Adversely Affected	Not Adversely Affected
2101	15166	Rainier Tower	1301 5th Avenue	1977	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected
2199	338876	Saint Paul's Episcopal Church	15 Roy Street	1962	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected
2201	44370	City Light – Power Control Center	157 Roy Street	1963	Eligible (Criteria A and C), designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected
2300	15165	IBM Building	1200 5th Avenue	1962	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected
2301	45047	Olympic Hotel	411 University Street	1924	National Register-listed (Criterion C)	Not Adversely Affected	Not Adversely Affected
3003	44094	Bergonian Hotel	405 Olive Way	1927	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected
3005	344621	Textile Tower	1807 7th Avenue	1931	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected
3008	45006	Central Building	810 3rd Avenue	1907	Eligible (Criterion C), designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected



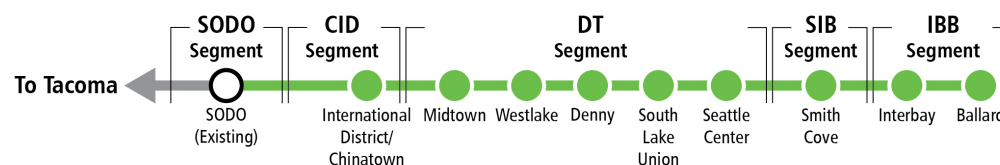
4.3.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	Preferred 5th Avenue/ Harrison Street Alternative (DT-1)	6th Avenue/ Mercer Street Alternative (DT-2)
3009	53374	Leamington Hotel and Apartments	317 Marion Street	1916	National Register-listed (Criterion C), designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected
3011	722422	The Pacific Building	710 3rd Avenue	1969	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected
3012	344659	Grand Central Garage	719 4th Avenue	1919	Eligible (Criteria A and C)	Adversely Affected: Property Demolition	Not Adversely Affected
3013	43011	Arctic Building	306 Cherry Street	1913	National Register-listed (Criterion C), designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected
3059	45052	Liggett Building	1424 4th Avenue	1927	National Register-listed (Criterion C), designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected
3082	47741	Small 20th Century Brick Commercial Building	513 Queen Anne Avenue North	1926	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected
3092	341439	V. Savinoff Furniture Studio	217 9th Avenue North	1946	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected
3223	723100	Alvina Vista Apartments	612 1st Avenue West	1929	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected
3226	723103	Uptown Studios and Apartments	610 2nd Avenue West	1953	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected
3227	343391	G.S. Hamman Building	119 West Roy Street	1924	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected



4.3.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	Preferred 5th Avenue/ Harrison Street Alternative (DT-1)	6th Avenue/ Mercer Street Alternative (DT-2)
3239	47755	Puget Sound News Company	621 2nd Avenue North	1948	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected
3240	47753	Tricoach Corporation	703 6th Avenue North	1928	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected
4000	716633	Floyd A. Naramore Fountain and Plaza	6th Avenue Between Seneca and Spring streets	1967	Eligible (Criterion C)	Not Adversely Affected	Adversely Affected: <i>Partial Property Acquisition</i>
4100	38451	Delmasso Apartments	26 West Harrison Street	1930	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected
4101	43613	Century Building	10 Harrison Street	1965	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected
4102	38450	Strathmore Apartments	7 Harrison Street	1908	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected
4103	723048	Commercial Building	228 Dexter Avenue North	1933	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected
5000	44191	Paramount Theatre	911 Pine Street	1928	National Register-listed (Criterion C)	Not Adversely Affected	Not Adversely Affected
LIN-16	99122	Alweg Monorail – Century 21	5th Avenue	1962	Eligible (Criterion A), designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected
OBJ-1	723414	John H. McGraw Statue	5th and Stewart Streets	1913	Eligible (Criterion C), designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected
OBJ-2	43163	E.J. Towle Company Street Clock	406 Dexter Avenue North	1915	Eligible (Criteria A and C), designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected



4.3.16 Historic and Archaeological Resources

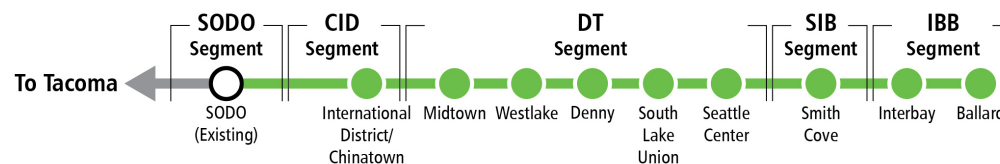
Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	Preferred 5th Avenue/ Harrison Street Alternative (DT-1)	6th Avenue/ Mercer Street Alternative (DT-2)
OBJ-3	45055	Zedick Jewelers Street Clock	1525 (1529) 4th Avenue	1920	Eligible (Criteria A and C), designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected
OBJ-4	53395	Ben Bridge Jewelers Clock	409 Pike Street	1929	Eligible (Criteria A and C), designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected
Total Number of Adversely Affected Properties	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	3	9

Notes:

Assessments of effects to individual historic properties are preliminary and have not been formally determined by FTA. Final effects determinations are pending additional consultation with the State Historic Preservation Officer, Tribes, and other consulting parties.

Property names correspond with the resource names documented on the Historic Property Inventory forms prepared for the Department of Archaeology and Historic Preservation. Property names typically reflect historic names of businesses or individuals that occupied the building in the past.

^a Unless noted as “pending consultation,” the State Historic Preservation Officer has concurred with determinations of National Register eligibility.



Archaeological sites 45KI1434 and 45KI1435 are in the southern portion of the Downtown Segment and designate tunnels (one pedestrian and one utility) that once connected historic buildings. Both sites are to the west of Preferred Alternative DT-1 in an area currently proposed as a construction location that will likely have no impact to any remnants of these resources. While recorded as archaeological sites, neither resource has been evaluated for National Register eligibility. The final archaeological site (45KI1185) with the potential to be directly affected by the project, near the western edge of the segment, identifies a small portion of a historical period transportation resource. While the current site boundary falls between the two alternatives, there is a possibility that this resource will extend across all alternatives. 45KI1185 has not been evaluated for its eligibility for listing in the National Register.

4.3.16.3.7 South Interbay Segment

Historic Built Environment Resources

As summarized in Table 4.3.16-6, all alternatives would adversely affect one or more built environment historic properties in the South Interbay Segment. One National Register-eligible historic district has been identified: the 14th Avenue West Group Historic District. Because each of the five contributing resources are also individually National Register-eligible, they are listed individually in Table 4.3.16-6.

Archaeological Resources

Almost all of the South Interbay Segment alternatives fall within a zone defined by the archaeological predictive model as “survey highly advised: very high risk” for archaeological resources. There is a very small area along West Mercer Street/West Mercer Place between 4th Avenue West and approximately 6th Avenue West where the archaeological predictive model is downgraded to “survey highly advised: high risk.” Although the majority of the area is represented in the archaeological predictive model as “very high risk,” there is only a single recorded archaeological resource within 0.25 mile of the area of potential effects for this segment and it is well separated from the area of potential effects for the Ballard Link Extension.

There is also a known early-to-mid-century historic landfill that is under the Interbay Golf Center that would be directly affected by Preferred Alternative SIB-1 and Alternative SIB-3. Alternative SIB-2 would be directly east of this landfill. This landfill will be surveyed, recorded, and evaluated for eligibility for listing in the National Register after the boundaries and contents can be field-verified. Verification of the archaeological site may be completed through the current archaeological monitoring of geotechnical boring (if sufficient information can be captured) or in the future (following property acquisition or right-of-entry) using geoprobes.

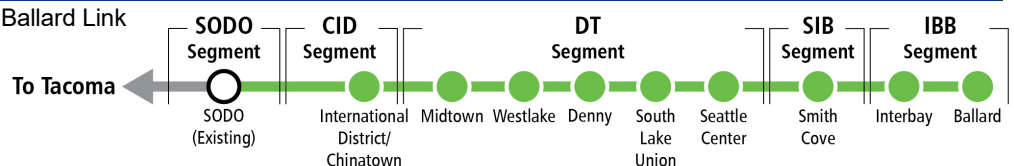


Table 4.3.16-6. Effects to Built Environment Historic Properties: South Interbay Segment

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	Preferred Galer Street Station/Central Interbay Alternative (SIB-1)	Prospect Street Station/15th Avenue Alternative (SIB-2)	Prospect Street Station/Central Interbay Alternative (SIB-3)
383	343966	Waterfront Employers of Washington and The Pacific Maritime Association	301 West Republican Street	1959	Eligible (Criteria A and C)	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Not Adversely Affected
384a	719666	Duplex	317 West Republican Street	1905	Eligible (Criterion C)	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Not Adversely Affected
384b	716635	Duplex	319 West Republican Street	1905	Eligible (Criterion C)	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Not Adversely Affected
384c	720252	Residence	317 1/2 West Republican Street	1905	Eligible (Criterion C)	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Not Adversely Affected
402	338494	Cape Flattery Apartments	320 West Republican Street	1959	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
405	344205	Powers Regulator Co.	511 2nd Avenue West	1955	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
628	335820	Barrett West Apartments	2850 15th Avenue West	1964	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
670	341338	Federal Employees Credit Union	2500 15th Avenue West	1960	Eligible (Criterion C)	Not Adversely Affected	Adversely Affected: Property Demolition	Not Adversely Affected



4.3.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	Preferred Galer Street Station/Central Interbay Alternative (SIB-1)	Prospect Street Station/15th Avenue Alternative (SIB-2)	Prospect Street Station/Central Interbay Alternative (SIB-3)
680	720187	K&D Carpet Installers Building/Alpine Hut	2215 15th Avenue West	1960	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
690	720097	Residence	2250 15th Avenue West	1905	Eligible (Criterion A)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
692	720233	Residence	2246 1/2 15th Avenue West	1909	Eligible (Criterion A) (pending consultation)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
770	338455	Lola Apartments	326 West Mercer Street	1929	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
772	338513	Naomi Apartments	625 4th Avenue West	1930	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
773	338465	Franconia Apartments	400 West Mercer Street	1930	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
774	537709	Apartment Building	412 West Mercer Street	1958	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
777	720029	Iris Apartments	415 West Roy Street	1928	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
778	338609	Westroy Apartments	421 West Roy Street	1931	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
801	43989	Residence	636 West Mercer Place	1907	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected



4.3.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	Preferred Galer Street Station/Central Interbay Alternative (SIB-1)	Prospect Street Station/15th Avenue Alternative (SIB-2)	Prospect Street Station/Central Interbay Alternative (SIB-3)
802a	44101	Kinnear Park Comfort Station/Viewing Platform	899 West Olympic Place	1890	Eligible (Criteria A and C), designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
802b	44106	Kinnear Park	899 West Olympic Place	1890	Eligible (Criteria A and C), designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
805	38483	Sheet Metal Works and Roof Company	942 (934b) Elliott Avenue West	1929	Eligible (Criterion C)	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Not Adversely Affected:
809	38479	Wilson Machine Works	1038 Elliott Avenue West	1925	Eligible	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition
811a	38482, 344088	Gladding, McBean, and Company	945 Elliott Avenue West	1953	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
954	721608	Seattle Armory	1601 West Armory Way	1974	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
955	721609	Seattle Armory Field Maintenance Shop Building	1601 West Armory Way	1974	Eligible (Criterion A)	Adversely Affected: Property Demolition	Not Adversely Affected	Not Adversely Affected
961	87104	King County Metro Pumping Station	1523 West Garfield Street	1967	Eligible (Criterion A)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
976	47791	Western Pacific Chemical Company	1436 (1430 to 1436) Elliott Avenue West	1940	Eligible (Criterion C)	Not Adversely Affected	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition



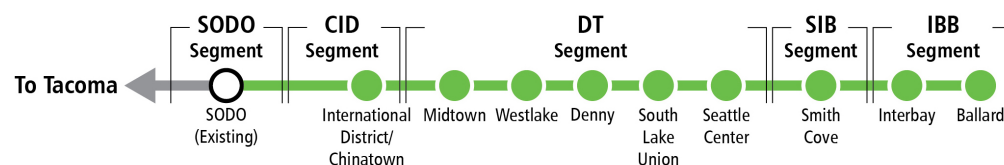
4.3.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	Preferred Galer Street Station/Central Interbay Alternative (SIB-1)	Prospect Street Station/15th Avenue Alternative (SIB-2)	Prospect Street Station/Central Interbay Alternative (SIB-3)
1140	44376	Sea View Apartments	519 West Roy Street	1932	Eligible (Criteria A and C), designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
1417	720190	Office Building	411 West Mercer Street	1973	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
Not Applicable	Not Applicable	14th Avenue West Group Historic District (2000, 2006, 2010, 2014, and 2016 14th Avenue West)	Multiple	1891 to 1906	Eligible, designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
1764	676164	Gilman House	2016 14th Avenue West	1891	Eligible (Criterion C), contributes to the 14th Avenue West Group Historic District, designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
1765	641394	Torbactia House	2014 14th Avenue West	1901	Eligible (Criterion C), contributes to the 14th Avenue West Group Historic District, designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
1766	721037	Residence	2010 14th Avenue West	1900	Eligible (Criterion C), contributes to the 14th Avenue West Group Historic District, designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected



4.3.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	Preferred Galer Street Station/Central Interbay Alternative (SIB-1)	Prospect Street Station/15th Avenue Alternative (SIB-2)	Prospect Street Station/Central Interbay Alternative (SIB-3)
1767	386850	Residence	2006 14th Avenue West	1906	Eligible (Criterion C), contributes to the 14th Avenue West Group Historic District, designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
1768	472425	Residence	2000 14th Avenue West	1903	Eligible (Criterion C), contributes to the 14th Avenue West Group Historic District, designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
1779	720207	The Harbor House	521 5th Avenue West	1964	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
1797	720208	Residence	623 West Mercer Place	1932	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
1829	344536	Mercer West Condominium	415 West Mercer Street	1962	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
3077	335620	Fourth Avenue West Apartments	515 4th Avenue West	1947	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
3096	344505	Metro Headquarters Building	410 4th Avenue West	1962	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
3190	338499	Dor-Rik Apartments	2655 14th Avenue West	1961	Eligible (Criterion C) (pending consultation)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected



4.3.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	Preferred Galer Street Station/Central Interbay Alternative (SIB-1)	Prospect Street Station/15th Avenue Alternative (SIB-2)	Prospect Street Station/Central Interbay Alternative (SIB-3)
3257	354094	Gillespie House	1115 9th Avenue West	1936	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
3265	467559	Residence	1015 West Lee Street	1911	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
Total Number of Adversely Affected Properties	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	7	8	2

Notes:

Assessments of effects to individual historic properties are preliminary and have not been formally determined by FTA. Final effects determinations are pending additional consultation with the State Historic Preservation Officer, Tribes, and other consulting parties.

Property names correspond with the resource names documented on the Historic Property Inventory forms prepared for the Department of Archaeology and Historic Preservation. Property names typically reflect historic names of businesses or individuals that occupied the building in the past.

^a Unless noted as “pending consultation,” the State Historic Preservation Officer has concurred with determinations of National Register eligibility.



4.3.16.3.8 Interbay/Ballard Segment

4.3.16.3.9 Historic Built Environment Resources

As summarized in Table 4.3.16-7, all Interbay/Ballard Segment alternatives would cause adverse effects to one or more built environment historic properties.

One National Register-eligible historic district, Fishermen's Terminal, would be adversely affected by Alternative IBB-3. The district contains three individual National Register-eligible resources that contribute to the district, so they are individually listed in Table 4.3.16-7.

4.3.16.3.10 Archaeological Resources

South of Salmon Bay, all of the Interbay/Ballard Segment alternatives fall within a zone defined by the archaeological predictive model as "survey highly advised: very high risk" for archaeological resources. On the north side of Salmon Bay, the archaeological predictive model recommendation is downgraded to "survey highly advised: high risk."

While the area is represented in the archaeological predictive model as "very high risk," there are no recorded archaeological resources within either the area of potential effects or within 0.25 mile of the area of potential effects for this segment.

4.3.16.4 Indirect Impacts of the Build Alternatives

4.3.16.4.1 Historic Built Environment Resources

Construction of the Ballard Link Extension could encourage population growth and transit-oriented development in the station areas. Potential effects could include demolition or substantial alteration of historic properties for redevelopment. However, future redevelopment in station areas would be consistent with adopted zoning and the City of Seattle's Comprehensive Plan, which currently allows greater density in the station areas than exists today. The City's Landmark ordinance, which would apply to the demolition or substantial alteration of resources that meet the City of Seattle's Landmark criteria would help to reduce loss of historic properties.

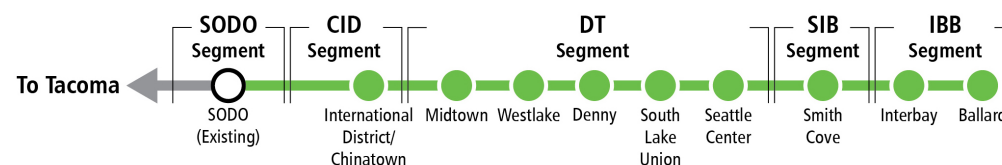
4.3.16.4.2 Archaeological Resources

Archaeological sites are generally only affected by direct impacts. Potential effects from redevelopment in station areas could result in disturbance of archaeological resources in areas not previously disturbed. Future redevelopment in station areas would be subject to review under state and federal regulations that require analysis of potential impacts to archaeological resources. No indirect effects to sites through vibration, restricting access, or land modifications that increase exposure to eligible properties are anticipated.



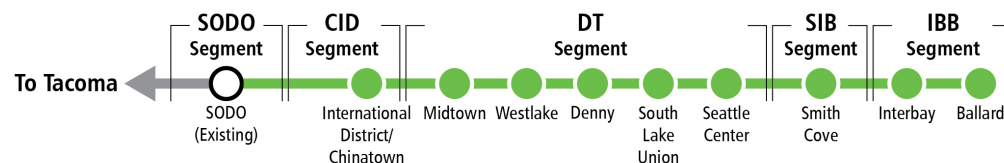
Table 4.3.16-7. Effects to Built Environment Historic Properties: Interbay/Ballard Segment

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	Preferred Elevated 14th Avenue Alternative (IBB-1a)	Elevated 14th Avenue Alignment Option (from Prospect Street Station/15th Avenue) (IBB-1b)	Preferred Tunnel 14th Avenue Alternative (IBB-2a)*	Preferred Tunnel 15th Avenue Station Option (IBB-2b)*	Elevated 15th Avenue Alternative (IBB-3)
5a	723554	Industrial and Commercial Building	1121 Northwest 45th Street	1963	Eligible (Criteria A and C)	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
10a	90524	Lyle Branchflower Company Processing Warehouse	4507 Shilshole Avenue Northwest	1950	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Adversely Affected: Property Demolition
10b	722815	Lyle Branchflower Company Cold Storage Building/North Star Ice Equipment Building	4511 Shilshole Avenue Northwest	1945; 1960	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Adversely Affected: Property Demolition
469	719590	Skipper's Fish, Chip and Chowder House	5305 15th Avenue Northwest	1971	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
476	719335	Nelson Chevrolet Storage Lot Office Building	1510 Northwest 50th Street	1956	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Adversely Affected: Property Demolition
477	719595	Nelson Chevrolet Showroom	1521 Northwest 50th Street	1973	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
482	344402	Restaurant	1510 Northwest Leary Way	1927	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Adversely Affected: Permanent Proximity Effects
496	441302	Residence	5713 14th Avenue Northwest	1905	Eligible (Criterion C)	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected



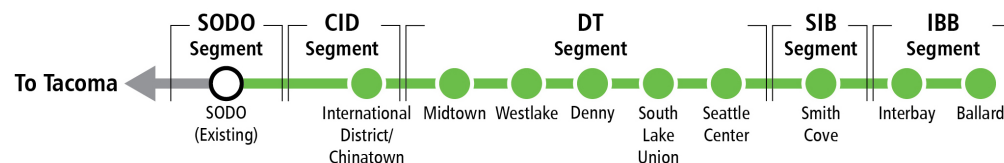
4.3.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	Preferred Elevated 14th Avenue Alternative (IBB-1a)	Elevated 14th Avenue Alignment Option (from Prospect Street Station/15th Avenue) (IBB-1b)	Preferred Tunnel 14th Avenue Alternative (IBB-2a)*	Preferred Tunnel 15th Avenue Station Option (IBB-2b)*	Elevated 15th Avenue Alternative (IBB-3)
504	333632	Apartment Complex	5700 14th Avenue Northwest	1957	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Adversely Affected: Property Demolition	Not Adversely Affected	Not Adversely Affected
529	49120	Bardahl Manufacturing Company Office	1400 Northwest 52nd Street	1952	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
536	342705	Mid-Century Light Industrial Building	5118 14th Avenue Northwest	1963	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
556	719361	Office Building	1148 Northwest Leary Way	1970	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
569	48101	Mike's Tavern and Chili Parlor	1447 Northwest Ballard Way	1940	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
578	719366	HDF Propeller Company Machining and Manufacturing Building	4451 14th Avenue Northwest	1979	Eligible (Criterion A)	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
607	38464	Residence	3440 15th Avenue West	1911	Eligible (Criteria A and C)	Not Adversely Affected	Adversely Affected: Property Demolition	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
608	461681	Residence	3442 15th Avenue West	1911	Eligible (Criteria A and C)	Not Adversely Affected	Adversely Affected: Property Demolition	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
618	357587	Residence	3220 15th Avenue West	1920	Eligible (Criterion C)	Not Adversely Affected	Adversely Affected: Property Demolition	Not Adversely Affected	Not Adversely Affected	Adversely Affected: Property Demolition
647	342781	Superior Concrete Products Co.	3615 15th Avenue West	1945	Eligible (Criterion A)	Adversely Affected: Property Demolition	Not Adversely Affected	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition



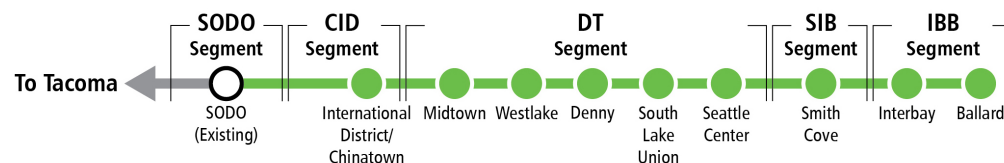
4.3.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	Preferred Elevated 14th Avenue Alternative (IBB-1a)	Elevated 14th Avenue Alignment Option (from Prospect Street Station/15th Avenue) (IBB-1b)	Preferred Tunnel 14th Avenue Alternative (IBB-2a)*	Preferred Tunnel 15th Avenue Station Option (IBB-2b)*	Elevated 15th Avenue Alternative (IBB-3)
648	720084	Elmer & Moody Company Woodwork	3635 Thorndyke Avenue West	1949	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
651	720085	Sweden Freezer Manufacturing Company	3401 Thorndyke Avenue West	1946	Eligible (Criterion A)	Adversely Affected: Property Demolition	Not Adversely Affected	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Not Adversely Affected
659	342170	Keller Supply Co	3205 17th Avenue West	1955	Eligible (Criteria A and C)	Adversely Affected: Property Demolition	Not Adversely Affected	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Not Adversely Affected
Not Applicable	Not Applicable	Fishermen's Terminal Historic District	2000 West Emerson Place (1735 West Thurman Street)	Various	Fishermen's Terminal Historic District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Adversely Affected: Permanent Proximity Effects
951c	709704	Seattle First National Bank - Fishermen's Terminal Branch	2000 West Emerson Place	1964	Eligible (Criterion C), contributes to Fishermen's Terminal Historic District (Criterion A)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
951e	159029	Fishermen's Terminal Fishing Vessel Owners Winch House	2000 West Emerson Place	1916	Eligible (Criteria A and C) contributes to Fishermen's Terminal Historic District	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Adversely Affected: Permanent Proximity Effects
951f	716640	Fishermen's Terminal Fishing Vessel Owners Marine Ways	2000 West Emerson Place (1511 West Thurman Street)	1919	Eligible (Criterion A), contributes to Fishermen's Terminal Historic District (Criterion A)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Adversely Affected: Construction Disruption and Permanent Proximity Effects



4.3.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	Preferred Elevated 14th Avenue Alternative (IBB-1a)	Elevated 14th Avenue Alignment Option (from Prospect Street Station/15th Avenue) (IBB-1b)	Preferred Tunnel 14th Avenue Alternative (IBB-2a)*	Preferred Tunnel 15th Avenue Station Option (IBB-2b)*	Elevated 15th Avenue Alternative (IBB-3)
952d	721259	United States Plywood Corporation Power House	4025 13th Avenue West	1938	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
1537	342178	Seattle City Light - Ballard Substation	1415 Northwest 49th Street	1918	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
1539	43813	Leary Substation	1414 Northwest Leary Way	1954	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
1554	719625	Edith Macefield House	1438 Northwest 46th Street	1900	Eligible (Criterion A)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
1555a	90521	Industrial Building	1130 Northwest 45th Street	1910	Eligible (Criterion A)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
1562	344017	Office Building	3220 17th Avenue West	1955	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
1646	720146	Canal Apartments	1223 West Nickerson Street	1926	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
1875a	43297	Northwest Builders Hardware	1100 West Ewing Street	1957	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
2183	388861	Duplex	1145 Northwest 56th Street	1945	Eligible (Criterion C)	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
3156	344287	Interbay Pharmacy	1613 West Dravus Street	1959	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected



4.3.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	Preferred Elevated 14th Avenue Alternative (IBB-1a)	Elevated 14th Avenue Alignment Option (from Prospect Street Station/15th Avenue) (IBB-1b)	Preferred Tunnel 14th Avenue Alternative (IBB-2a)*	Preferred Tunnel 15th Avenue Station Option (IBB-2b)*	Elevated 15th Avenue Alternative (IBB-3)
3232	723016	Madera on Queen Anne Condominiums	3608 14th Avenue West	1967	Eligible (Criterion C) (pending consultation)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
LIN-1	42541	Ballard Bridge	Spanning Salmon Bay	1919	National Register Listed (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Adversely Affected: Permanent Proximity Effects
LIN-15	88822	Seattle & Montana Railway/Great Northern Railway Main Line/Seattle Lake Shore & Eastern Railroad Ballard Branch Line	Ballard, Seattle	1890	Eligible (Criterion A)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
Total Number of Adversely Affected Properties	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	7	7	4	3	10

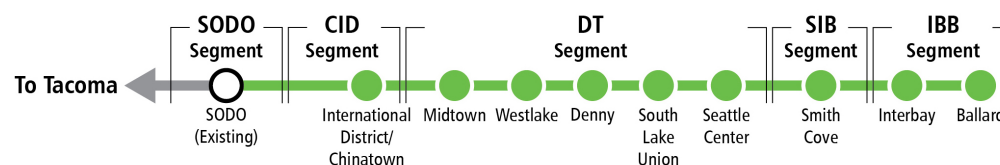
* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement, some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Notes:

Assessments of effects to individual historic properties are preliminary and have not been formally determined by FTA. Final effects determinations are pending additional consultation with the State Historic Preservation Officer, Tribes, and other consulting parties.

Property names correspond with the resource names documented on the Historic Property Inventory forms prepared for the Department of Archaeology and Historic Preservation. Property names typically reflect historic names of businesses or individuals that occupied the building in the past.

^a Unless noted as “pending consultation,” the State Historic Preservation Officer has concurred with determinations of National Register eligibility.



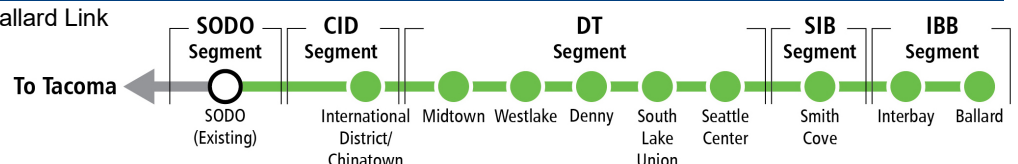
4.3.16.5 Mitigation Measures

Where adverse effects to National Register-eligible or -listed resources cannot be avoided or minimized, FTA and Sound Transit would develop a memorandum of agreement or programmatic agreement in consultation with the State Historic Preservation Officer, Tribes, and other consulting parties under Section 106.

Typical mitigation measures that could be included in a memorandum of agreement or programmatic agreement are listed below.

- Modifying the undertaking through redesign, re-orientation, or other similar changes
- Documenting historic properties or resources that would be impacted
- Installing interpretive/educational signage, or other options that provide a direct public benefit (e.g., exhibits, HistoryLink essays, documentaries, or historic property nominations)
- Implementing data recovery of archaeological or architectural information and materials
- Preparing a National Register nomination for an archaeological site
- Preparing City of Seattle landmark nominations for potentially eligible buildings, structures, objects, and/or sites
- Preparing an ethnographic study, historic essays, documentaries, or formal documentation
- Developing museum exhibits
- Offering lecture series, trainings, or workshops
- Performing additional consultation to ensure compatible replacement buildings or structures
- Supporting preservation non-profit organizations

Sound Transit would develop a detailed monitoring and inadvertent discovery plan for review by the State Historic Preservation Officer and Tribes. The plan would include research questions and outline protocols to ensure the proper treatment of archaeological resources that may be identified during construction.



4.3.17 Parks and Recreational Resources

4.3.17.1 Affected Environment

Parks and recreational resources include designated public parks, recreational sites, public shoreline access areas, open space, greenbelts, recreational trails, playgrounds, golf courses, swimming pools, and school play areas available for public use during non-school hours. The study area for this evaluation includes those resources that are:

- Within 250 feet of the project limits, including areas used for construction.
- Within 0.5 mile (approximately 2,640 feet) from each station structure.

Figure 4.3.17-1 through 4.17-4 shows all parks and recreational resources in the Ballard Link Extension study area, and Table L4.17-3 in Appendix L4.17, Parks and Recreational Resources, contains a list of all resources in the study area. The following subsections summarize by segment the resources within the Ballard Link Extension study area that are close to the project and have the potential to be directly or indirectly impacted.

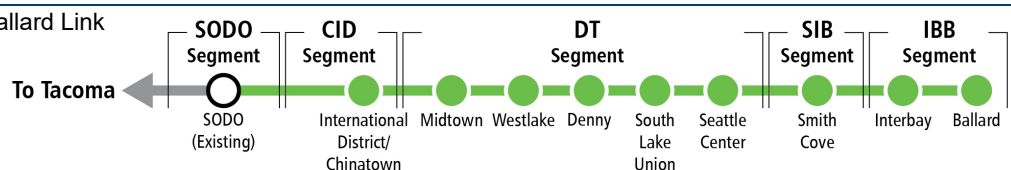
Five trails in the Ballard Link Extension study area are used by both commuters and recreationists. Although these resources are used for recreation, the primary function of these trails is transportation, and therefore they are not analyzed in this section. For a discussion of potential impacts on these trails, refer to Section 3.5.1.4, Non-motorized Facilities, in Chapter 3, Transportation Environment and Consequences.

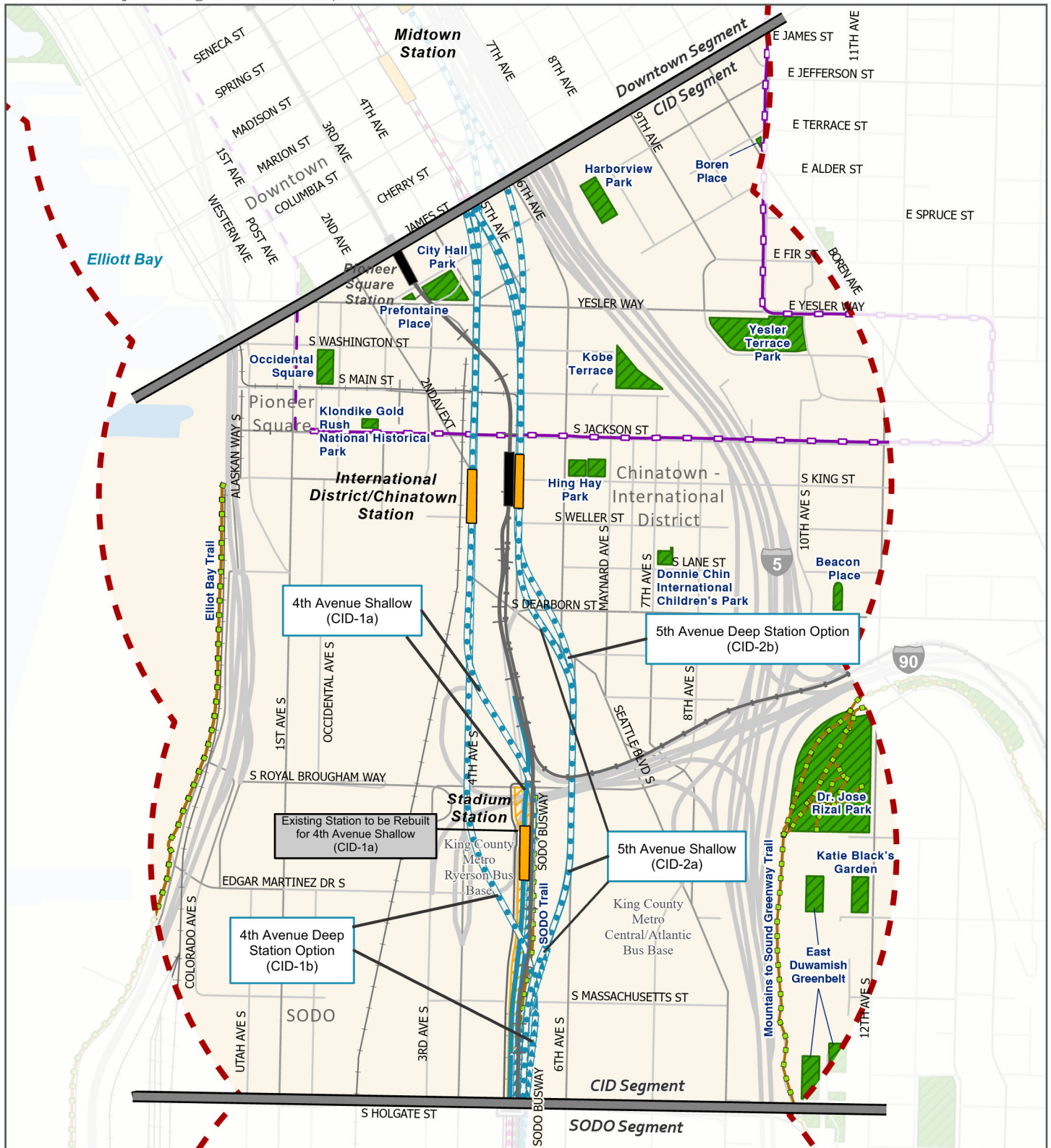
- **SODO Trail** is a 1-mile paved trail east of the existing light rail between South Royal Brougham Way and South Forest Street, in the SODO and Chinatown-International District segments.
- **Elliott Bay Trail** is a 3.4-mile paved trail in the South Interbay Segment that extends from Myrtle Edwards Park to Smith Cove Park.
- **Ship Canal Trail** is a 1.9-mile paved trail in the Interbay/Ballard Segment with end points at Fremont Avenue North just north of Nickerson Street and West Emerson Place near Fishermen's Terminal.
- **Burke-Gilman Trail** is an 18.8-mile paved trail in the Interbay/Ballard Segment that runs from Shilshole Bay to the city of Bothell, where it connects to the Sammamish River Trail. The trail is complete except for a 1.4-mile segment through Ballard, which occurs in the study area. Completing this trail in the study area is part of the Ballard Multimodal Corridor Project that is scheduled for completion by 2021.
- **Magnolia Connector Trail** is a 2.7-mile paved trail and on-street path. The trail connects Commodore Park to the Elliott Bay Trail.

The Mountains to Sound Greenway Trail is within a half mile of the Stadium Station, but is more than a half mile away on the roadway system with Interstate 5 as a barrier between the resource and the station, and therefore is not discussed further in this section.

4.3.17.1.1 SODO Segment

As discussed in Section 4.2.17.1, there are no parks and recreational resources in the SODO Segment study area.





Source: City of Seattle, King County (2019, 2020, 2021).

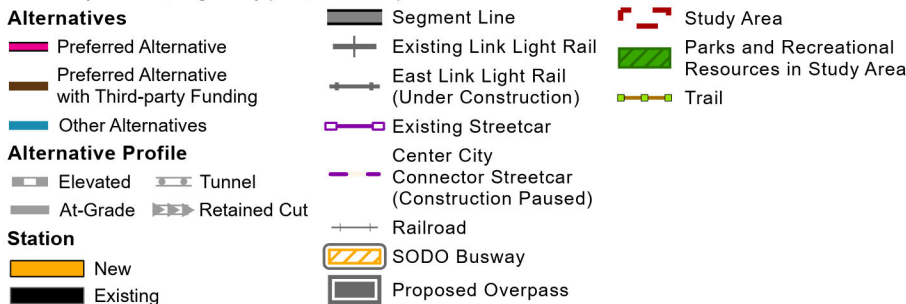
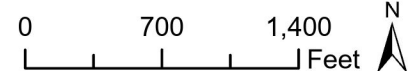
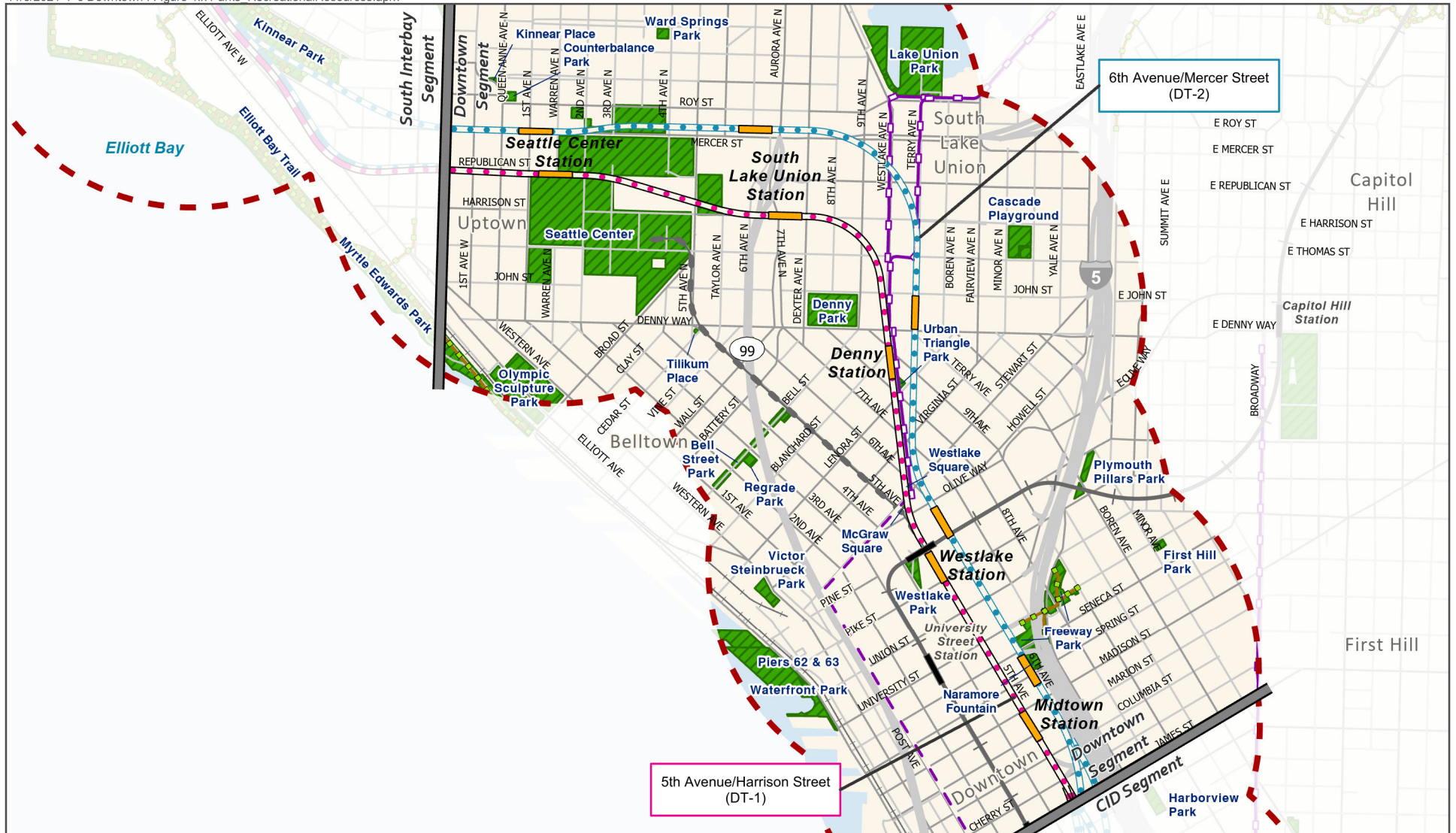


FIGURE 4.3.17-1
Parks and Recreational Resources in the Study Area
 Ballard Link Extension - Chinatown-International District Segment
 West Seattle and Ballard Link Extensions





Source: City of Seattle, King County (2019, 2020, 2021).

Alternatives

- Preferred Alternative
- Preferred Alternative with Third-party Funding
- Other Alternatives

Alternative Profile

- Elevated
- At-Grade
- Tunnel
- Retained Cut

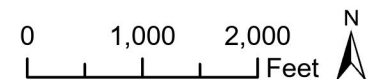
Station

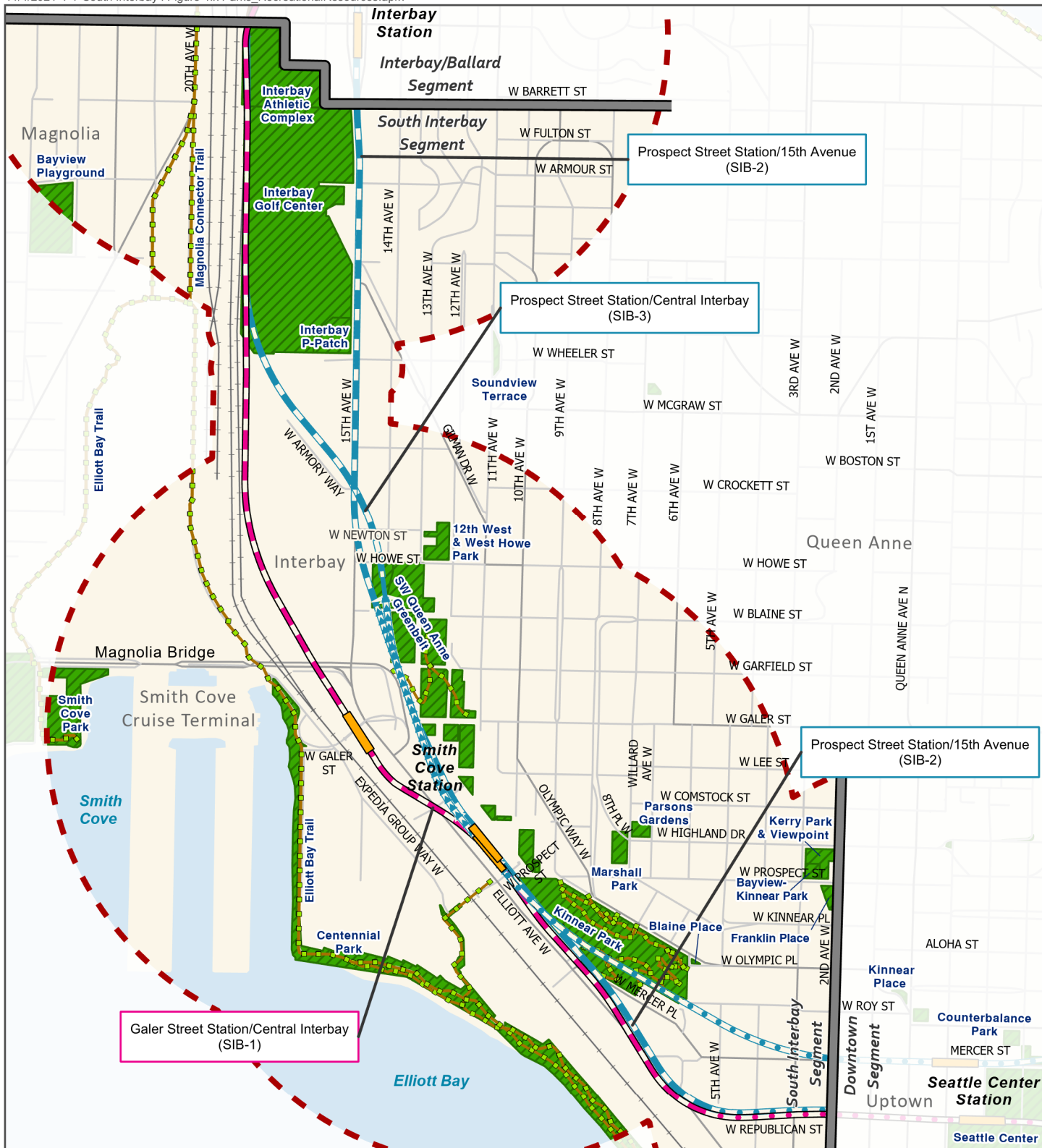
- New
- Existing

- Segment Line
- Existing Link Light Rail
- Monorail
- Existing Streetcar
- Center City
- Connector Streetcar (Construction Paused)
- Railroad

- - - Study Area
- Parks and Recreational Resources in Study Area
- Trail

FIGURE 4.3.17-2
Parks and Recreational Resources in the Study Area
 Ballard Link Extension - Downtown Segment
 West Seattle and Ballard Link Extensions





Source: City of Seattle, King County (2019, 2020, 2021).

Alternatives

- Preferred Alternative
- Preferred Alternative with Third-party Funding
- Other Alternatives

Alternative Profile

- Elevated
- At-Grade
- Tunnel
- Retained Cut

Station

- New

Segment Line

Railroad

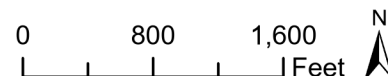
Study Area

Parks and Recreational Resources in Study Area

— Trail

FIGURE 4.3.17-3
Parks and Recreational Resources in the Study Area
 Ballard Link Extension - South Interbay Segment

West Seattle and Ballard Link Extensions





Source: City of Seattle, King County (2019, 2020, 2021).

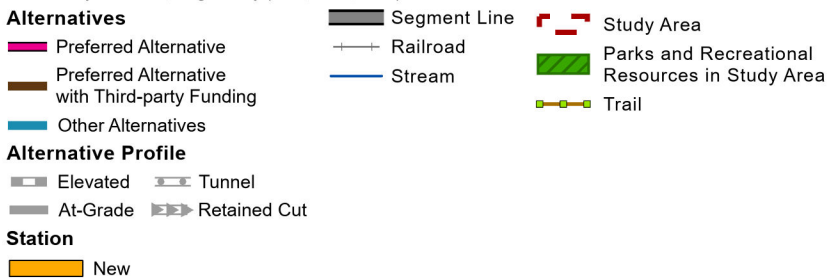
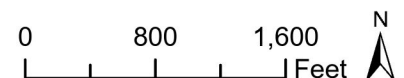


FIGURE 4.3.17-4
Parks and Recreational Resources in the Study Area
 Ballard Link Extension - Interbay/Ballard Segment

West Seattle and Ballard Link Extensions



4.3.17.1.2 Chinatown-International District Segment

There are 14 parks and recreational resources in the Chinatown-International District Segment study area. The following resource would be closest to surface elements of the project (Figure 4.3.17-1):

- **Hing Hay Park** is an 0.3-acre award-winning park that features an iconic gateway, cultural performance space with integrated seating, outdoor fitness equipment, a plaza with flowering trees, café tables, and a decorative staircase. It has both passive and active uses and is used for community festivals.

4.3.17.1.3 Downtown Segment

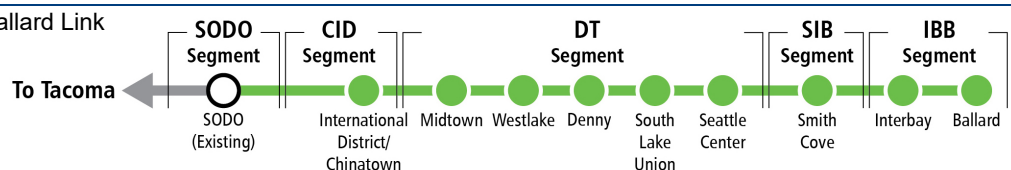
There are 25 parks and recreational resources are within the Downtown Segment study area. The following six resources would be closest to the project where it would have surface elements (Figure 4.3.17-2):

- **Freeway Park** is a 5.2-acre park on the freeway lid over Interstate 5 between Downtown and First Hill. It was constructed in 1976 and has been listed in the National Register of Historic Places (refer to Section 4.3.16, Historic and Archaeological Resources). This urban green space has paved walkways, public art, and a water feature. Plans for this park include restoration of the box gardens and other original features, as well as accessibility improvements, drainage repair, and signage.
- **Narmore Fountain Park** is a 0.1-acre open space bounded by 6th Avenue, Spring Street, and Interstate 5. The plaza features a circular fountain (National Register recommended eligible), concrete planters, and benches.
- **Westlake Park** is a 0.6-acre plaza that is unofficially the City's "town square." It serves as a gathering place and offers public programming. The park has seating, public art, plantings, and a children's play area.
- **Urban Triangle Park (2100 Westlake)** is a 0.2-acre urban park that includes public art, plantings, and a play structure.
- **Denny Park** is a 4.6-acre historic site that was dedicated as a public park in 1883 and was one of the City's first park resources. The park features an off-leash area, a grassy lawn, large trees, and benches.
- **Seattle Center** is a 74-acre active civic, arts, and family gathering place originally built for the 1962 World's Fair. It is operated by the City of Seattle and is part of the Uptown Arts and Cultural District. The center is home to several performance venues including the Climate Pledge Arena museums, tourist attractions, and open spaces, and hosts numerous festivals throughout the year.

4.3.17.1.4 South Interbay Segment

There are 16 parks and recreational resources are in the South Interbay Segment study area. This segment also contains the Seattle Parks Department Maintenance Warehouse, a 14,272-square-foot service building to support grounds maintenance for the Central West parks district. The following four resources would be closest to the project (Figure 4.3.17-3):

- **Kinnear Park** is a 14.7-acre historic two-tiered park (refer to Section 4.3.16, Historic and Archaeological Resources). The upper portion of Kinnear Park features open space, views,



and a nature trail; the lower portion has a paved trail, tennis courts, restrooms, and an off-leash area.

- **Southwest Queen Anne Greenbelt** is a 12.6-acre greenbelt with a forested trail area that can be accessed by parking nearby and through 12th West & West Howe Park.
- **Interbay Golf Center** is 40.3 acres and one of five public golf courses in the city of Seattle. The 9-hole course features a driving range, pro-shop, and mini-golf course. The property also includes the **Interbay P-Patch**, a 1.9-acre community garden, one of Seattle's largest, with raised planting beds, tool sheds, and a food bank area.
- **Interbay Athletic Complex** is a 7.4-acre facility with a soccer stadium and baseball fields. The baseball fields, used for both football and baseball, are grass and used between May and November. Users are primarily teams from Magnolia and Queen Anne. The soccer stadium fields are synthetic turf and are used year-round. Seattle Parks and Recreation has an agreement with Seattle Pacific University for use of the soccer stadium. The stadium is also used by local high schools. There is a parking area adjacent to the baseball fields and soccer stadium that serves both facilities.

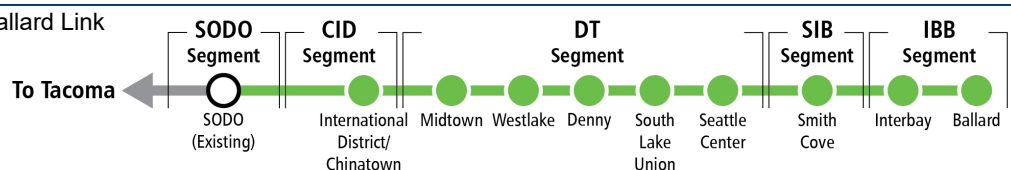
4.3.17.1.5 Interbay/Ballard Segment

There are nine parks and recreational resources in the Interbay/Ballard Segment study area. The following five resources would be closest to the project (Figure 4.3.17-4):

- **Fishermen's Terminal** is a public shoreline access area on the south side of Salmon Bay. The resource provides public access to Salmon Bay, as well as a public plaza, outdoor seating, and the Seattle Fishermen's Memorial.
- **14th Avenue Northwest Boat Ramp** is a 0.6-acre facility that features a free public boat ramp providing access to the Lake Washington Ship Canal. The site has two piers, two launch ramps, handicap parking spaces, and a portable restroom.
- **11th Avenue Northwest Street-end** is a 0.1-acre street-end that features native plantings, a shoreline viewing platform, a bench swing, and birdhouses. These features were installed in spring 2015 through collaboration between Seattle Department of Transportation and the University of Washington Landscape Architecture Program.
- **Greg's Garden P-Patch**, formerly East Ballard P-Patch, is a 0.1-acre fenced cultivated area that is host to 20 community garden plots.
- **Gemenskap Park** is a 0.5-acre park along two blocks of 14th Avenue Northwest between Northwest 59th and Northwest 61st streets. It was recently converted from roadway and parking to a linear green space in 2018.

4.3.17.2 Environmental Impacts of the No Build Alternative

The No Build Alternative would not affect any parks or recreational resources in the Ballard Link Extension study area. Unlike the Build Alternatives, the No Build Alternatives would not improve access to such resources.



4.3.17.3 Environmental Impacts of the Build Alternatives during Operation

Sound Transit analyzed the potential long-term impacts of operation of the Ballard Link Extension Build Alternatives on parks and recreational resources in the study area. If a recreational resource or alternative is not mentioned, no impacts would occur for that resource or alternative.

Long-term impacts would include permanent changes to parks and recreational resources from the Ballard Link Extension operations. Impacts could include permanent property acquisition or easements; changes to resource amenities, activities, parking, or access; and substantial change in the experience of users due to changes in visual conditions and noise levels adjacent to the resource.

The visual and aesthetic resource analysis approach is based upon the FHWA methodology for assessing visual impacts related to transportation projects (FHWA 1988), along with more recent guidelines (FHWA 2015). Further detail on the methods and analysis, including larger visual simulations, is provided in Appendix N.2, Visual and Aesthetics Technical Report. The noise sensitivity analysis was conducted according to the FTA *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018). Noise-sensitive parks and recreational resources are those where quiet is an essential element in their intended purpose or where it is important to avoid interference with activities such as speech, meditation, and reading. Kinnear Park and the Southwest Queen Anne Greenbelt in the South Interbay Segment are the only noise-sensitive parks in the study area.

4.3.17.3.1 SODO Segment

The SODO Segment study area does not contain any parks or recreational resources and therefore would have no permanent impacts.

4.3.17.3.2 Chinatown-International District Segment

None of the Chinatown-International District Segment alternatives would have long-term impacts to parks and recreational resources.

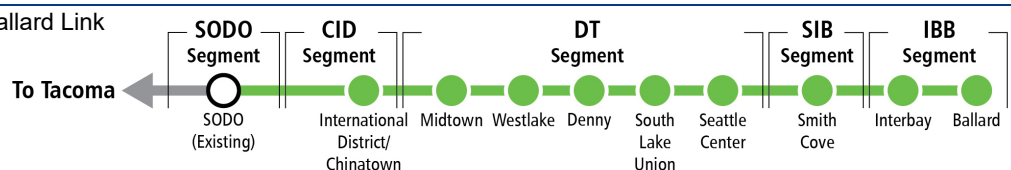
4.3.17.3.3 Downtown Segment

The Downtown Segment alternatives would have permanent impacts to three parks and recreational resources in the study area (Table 4.3.17-1): Naramore Fountain Park, Freeway Park, and Seattle Center.

Table 4.3.17-1. Permanent Impacts to Parks and Recreational Resources in Downtown Segment

Alternative	Naramore Fountain Park	Freeway Park	Seattle Center
Preferred 5th Avenue/Harrison Street (DT-1)	None	None	0.4 acre
6th Avenue/Mercer Street (DT-2)	0.1 acre	0.5 acre	None

In addition to surface impacts, easements would be required for underground project components that include tunnels and tie-backs. Easements may be required for some project components in park areas, but they would not impact the use of the park as a recreational resource in that area.



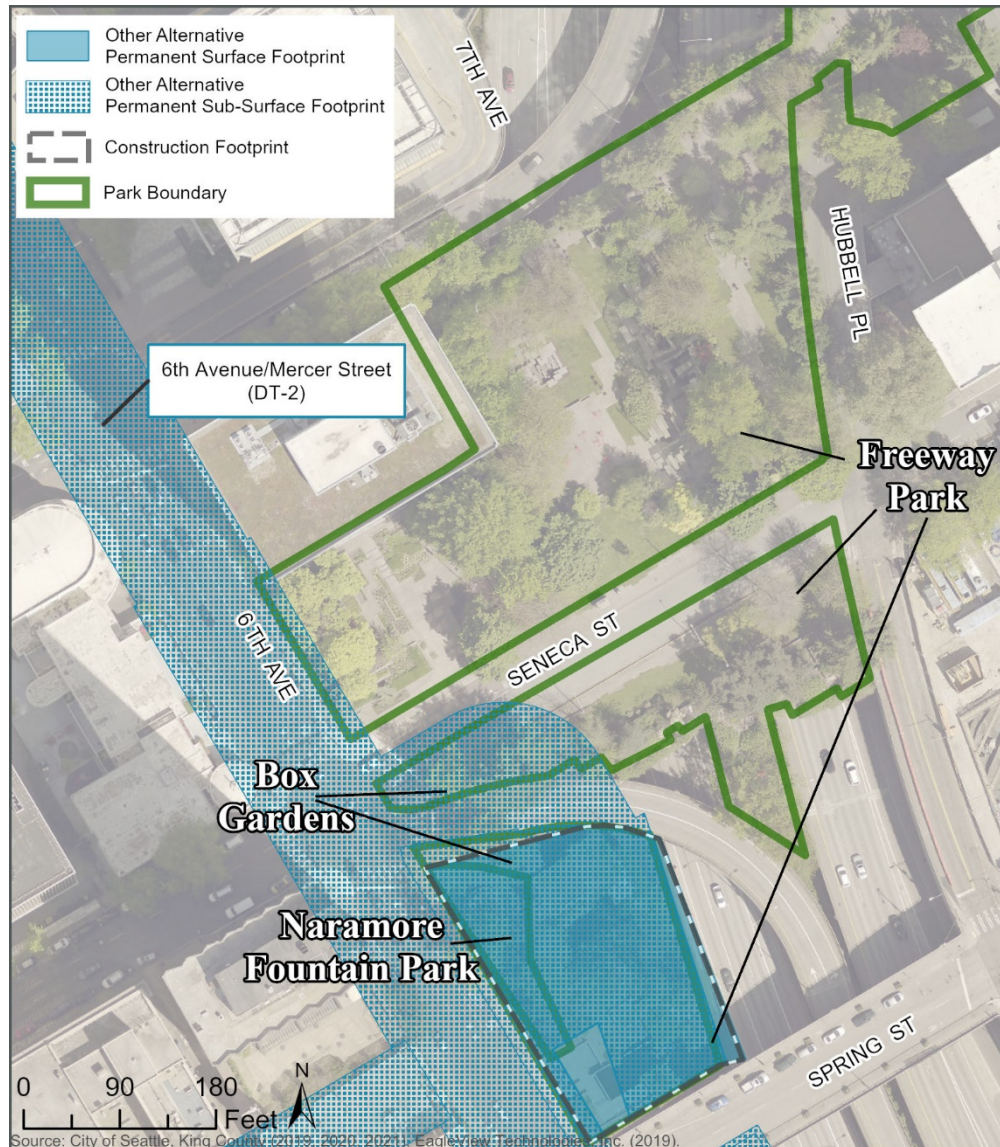
Naramore Fountain Park

Figure 4.3.17-5 shows the permanent impacts to this resource from Alternative DT-2, which would convert the current Naramore Fountain Park into a station entrance for the Midtown Station and incorporate the historic fountain and plaza into station entrance. The fountain would be relocated during construction, and replaced following construction as part of the station area design.

Freeway Park

Figure 4.3.17-5 shows the permanent impacts to this resource from Alternative DT-2, which would use the area of Freeway Park between Seneca Street and Spring Street for the Midtown Station entrance and would displace the current park use of this area known as the Box Gardens. The part of Freeway Park north of Seneca Street would not be affected.

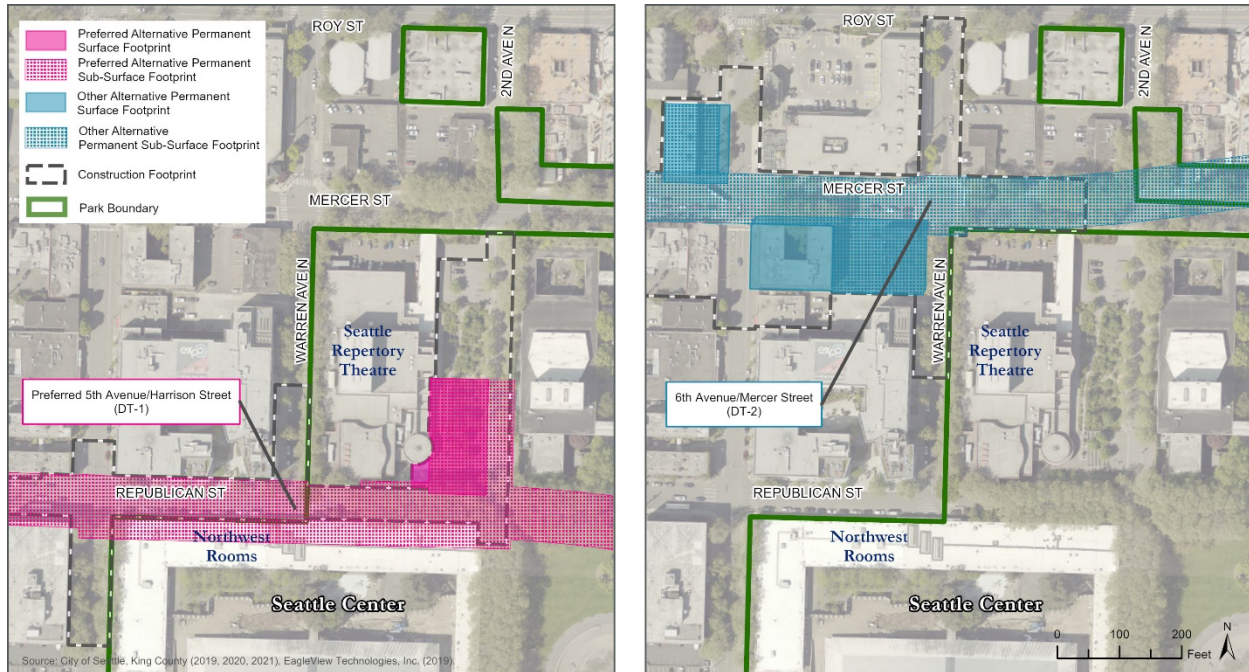
Figure 4.3.17-5. Naramore Fountain Park and Freeway Park Permanent and Construction Impacts, Ballard Link Extension – Downtown Segment



Seattle Center

Figure 4.3.17-6 shows the permanent impacts to this resource from Alternative DT-1, which would permanently impact the Seattle Center for a Seattle Center Station entrance. The entrance would be on the east side of the Seattle Repertory Theatre and could remove the southern exit to the Seattle Repertory Theatre, as well as landscaping, which includes Donnelly Garden and Theater Commons. The main entrance to the Seattle Repertory Theatre from Mercer Street would not be affected.

Figure 4.3.17-6. Seattle Center Permanent and Construction Impacts, Ballard Link Extension – Downtown Segment



Views of the International Fountain and the Space Needle from the Seattle Repertory Theatre lobby could be blocked by the station entrance.

The station would be primarily under Republican Street but would extend to the south under the Northwest Rooms. Potential vibration impacts during operation are discussed in Section 4.3.7, Noise and Vibration. No buildings would be removed.

Alternative DT-2 could require a small area of underground easement on the northwest corner of the Seattle Repertory Theatre, but this would not affect the current use of this property.

4.3.17.3.4 South Interbay Segment

The South Interbay Segment alternatives would have permanent impacts to four parks and recreational resources in the study area (Table 4.3.17-2): Kinnear Park, Southwest Queen Anne Greenbelt, Interbay Golf Center, and Interbay Athletic Complex.

A summary of the visual impacts to parks and recreational resources in the South Interbay Segment is presented in Table L4.17-4 in Appendix L4.17. A detailed discussion of the visual impact analysis and findings is in Section 4.3.5, Visual and Aesthetic Resources.

Table 4.3.17-2. Permanent Impacts to Parks and Recreational Resources in South Interbay Segment

Alternative	Kinnear Park	Southwest Queen Anne Greenbelt	Interbay Golf Center	Interbay Athletic Complex
Preferred Galer Street Station/Central Interbay (SIB-1)	0.1 acre ^a	None	2.2 acres	0.7 to 0.8 acre ^b
Prospect Street Station/15th Avenue (SIB-2)	0.1 to 0.2 acre ^{a, b}	0.4 acre ^a	0.1 acre ^c	None
Prospect Street Station/Central Interbay (SIB-3)	<0.1 acre ^a	0.9 acres ^a	2.4 acres	0.7 acre

^a Acreage includes surface areas only. Additional area for underground easements would be needed but are not expected to change the use of the park area above.

^b The range of impacts represents differences with the connection to other segments.

Easements would be required for underground project components that include tunnels and tie-backs. Easements may be required for some project components in park areas, but they would not impact the use of the park as a recreational resource in that area. In addition to the permanent impacts to parks and recreational resources in this segment, Alternative SIB-3 would displace the Seattle Parks and Recreation Department West Central Maintenance Warehouse. Alternative SIB-2 guideway columns would eliminate some parking on this property but is not expected to displace the facility. Impacts to this property are discussed further in Section 4.3.14, Public Services, Safety, and Security. Preferred Alternative SIB-1 would avoid impacts to the property.

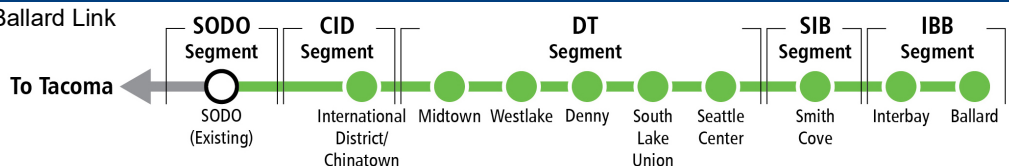
Kinnear Park

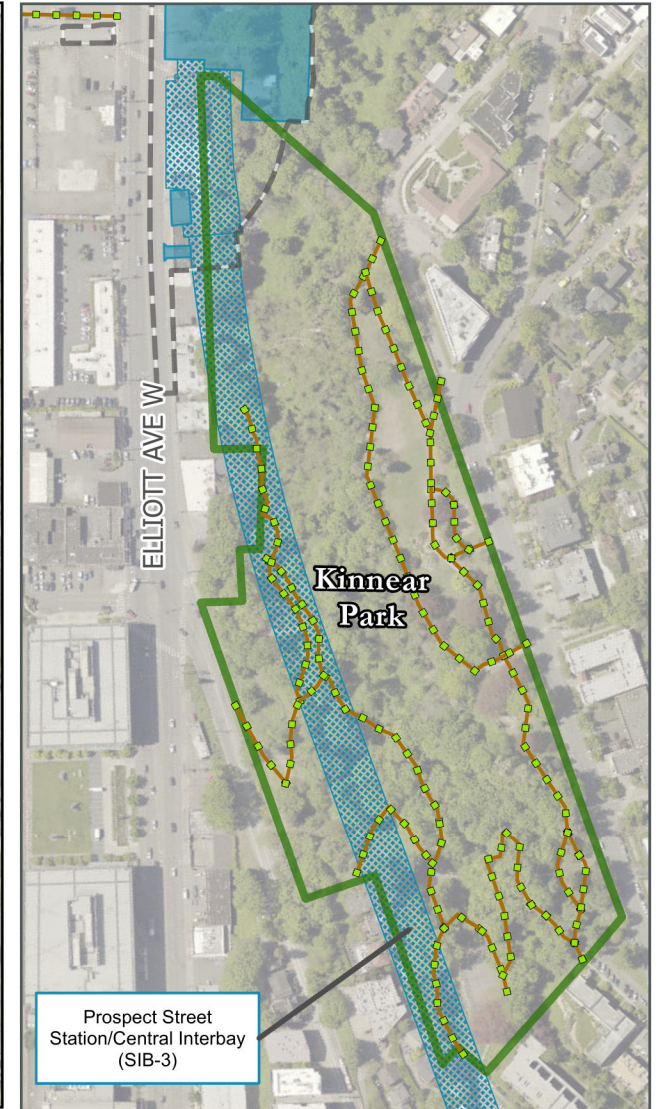
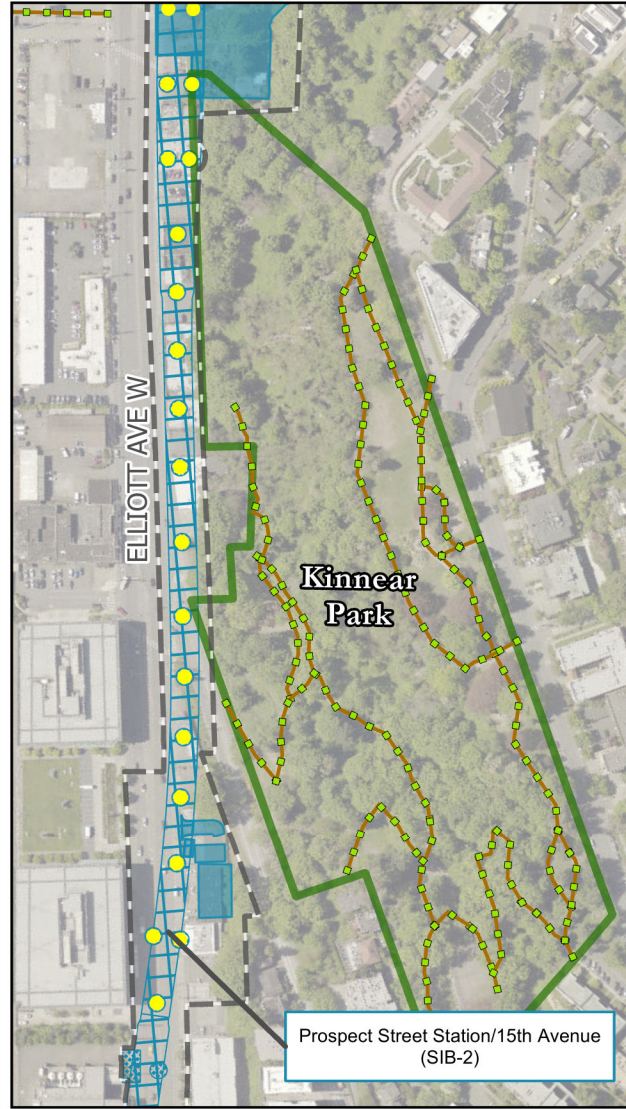
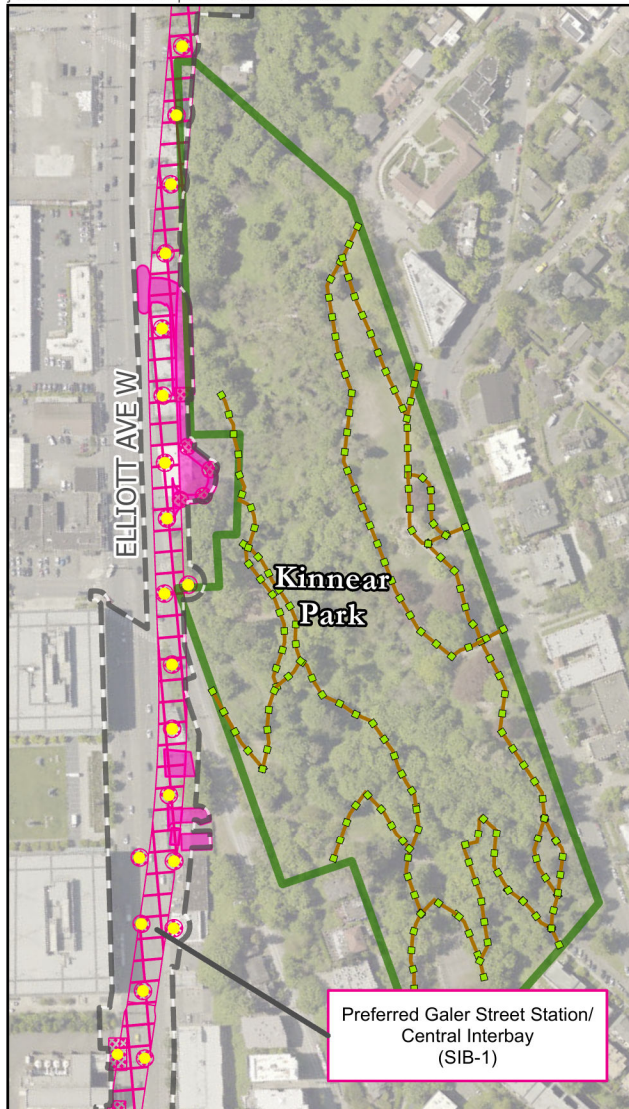
Figure 4.3.17-7 shows the permanent impacts to Kinnear Park from the South Interbay Segment alternatives.

Both Preferred Alternative SIB-1 and Alternative SIB-2 would permanently impact a small portion of Kinnear Park for an elevated guideway column and hi-rail access. Both would follow the east side of Elliott Avenue West past the west side of Kinnear Park and would encroach upon the steep slope along the western edge of the park, at a distance from park amenities. These impacts would not affect amenities, activities, or user experience. The connection of Alternative SIB-2 to Option IBB-1b in the Interbay/Ballard Segment would require a pocket track along this part of the alternative, which would impact a slightly larger area of Kinnear Park but would not impact park use.

Alternative SIB-3 would have a small amount of surface impacts in Kinnear Park. This alternative would be tunneled under the park with a tunnel portal at the north end. The tunnel portal would remove trees and vegetation from an undeveloped area of the park; no amenities or activities in Kinnear Park would be impacted.

Kinnear Park was found to be noise-sensitive under the FTA criteria, based on passive park uses and existing noise levels. None of the South Interbay Segment alternatives would have a noise impact on Kinnear Park due to the distance from the tracks and the existing noise level.





Source: City of Seattle, King County (2019, 2020, 2021), EagleView Technologies, Inc. (2019).

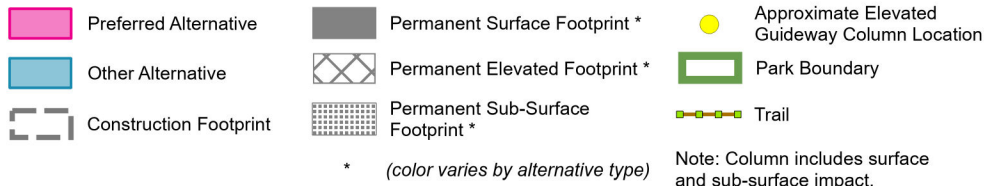


FIGURE 4.3.17-7
Kinnear Park Permanent and Construction Impacts
 Ballard Link Extension -
 South Interbay Segment
*West Seattle and
 Ballard Link Extensions*



Southwest Queen Anne Greenbelt

Figure 4.3.17-8 shows the permanent impacts to the Southwest Queen Anne Greenbelt from the South Interbay Segment alternatives.

Preferred Alternative SIB-1 guideway would pass west of the greenbelt and would avoid impacts to this resource.

Alternative SIB-2 would have permanent impacts on the western edge of the Southwest Queen Anne Greenbelt from the elevated guideway and the Smith Cove Station. The station and the guideway north of the station would require limited tree removal in this part of the greenbelt. The character of views from the western portion of the greenbelt would be changed, which would be a visual impact. Alternative SIB-2 would also require slope stabilization above the guideway and station using slope drains. The slope drains would be installed under the greenbelt without disturbing the surface or use of the area. This would be a benefit to the greenbelt, which currently has soil stability issues. Alternative SIB-2 would cause the existing trail system in the greenbelt to be cut off from user access to 15th Avenue West, and there would be impacts on conservation and wildlife habitat functions in the greenbelt.

Alternative SIB-3 would have permanent impacts along the western edge of the greenbelt, where it would be in a retained cut for the Smith Cove Station. The guideway transitions from elevated to at-grade in this vicinity. This alternative would remove trees along much of the western edge of the greenbelt north of the Smith Cove Station.

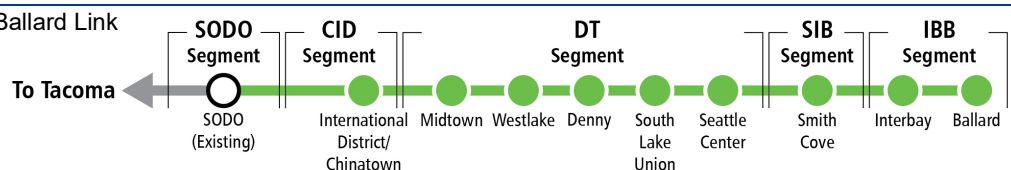
It would also require slope stabilization using slope drains as described for Alternative SIB-2. Also similar to Alternative SIB-2, the trail system would be cut off from 15th Avenue West and there would be impacts on conservation and wildlife habitat functions, similar to Alternative SIB-2. The Southwest Queen Anne Greenbelt was found to be noise-sensitive under the FTA criteria, based on passive park uses and existing noise levels. None of the South Interbay Segment alternatives would have a noise impact on the Southwest Queen Anne Greenbelt due to the distance from the tracks and existing noise levels.

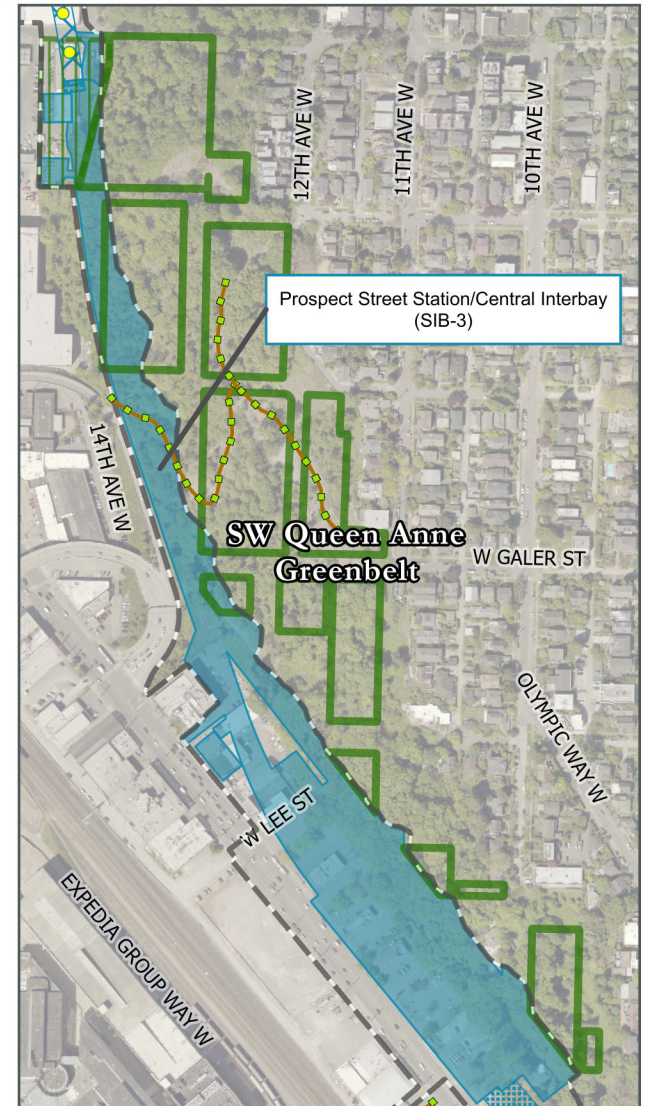
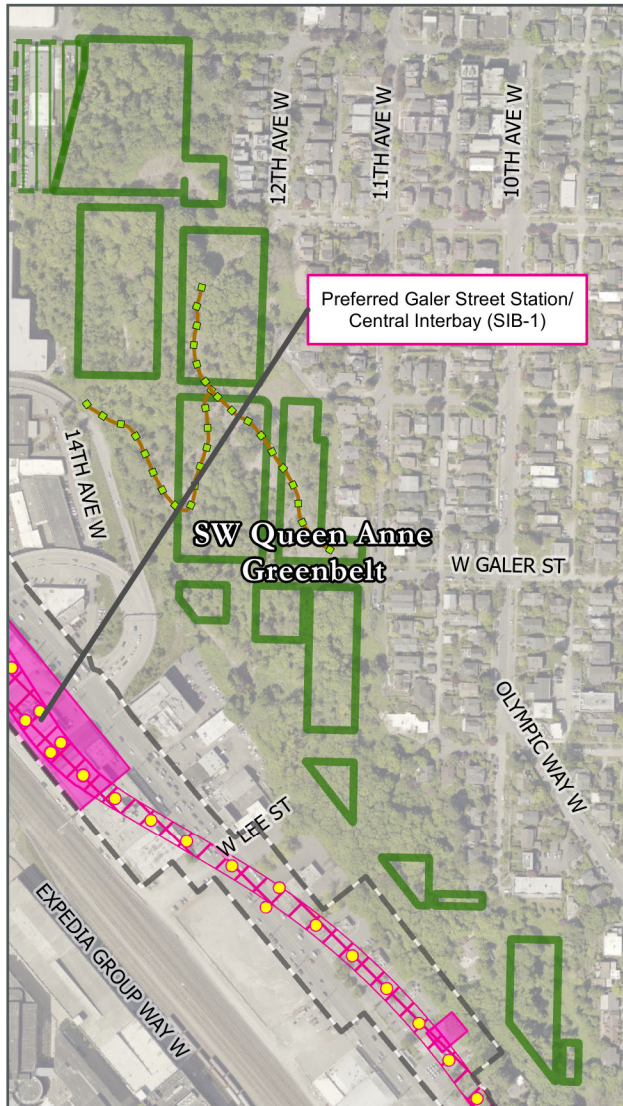
Interbay Golf Center

Figure 4.3.17-9 shows the permanent impacts to this resource from the South Interbay Segment alternatives. Figure 4.3.17-10 shows the simulated views of the project from the Interbay Golf Center.

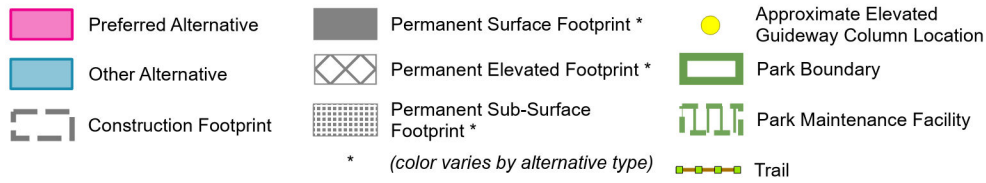
Preferred Alternative SIB-1 would place guideway columns along the bottom of the western slope of the Interbay Golf Center property between the playable area and the BNSF Railway tracks, without permanently impacting the playable area. Vegetation along the west side of the Interbay Golf Center that screens some views to the west of BNSF tracks and freight trains would be removed. Protective fencing would need to be installed between the course and the elevated guideway to prevent golf balls from falling on the guideway or hitting passing trains. The guideway would be slightly lower at the north end of the golf course when transitioning to Preferred Alternative IBB-2a* or Preferred Option IBB-2b* in the Interbay/Ballard Segment.

Alternative SIB-2 would have a minor impact on the east side of the Interbay Golf Center property for the widening of 15th Avenue West and installing straddle bents across this roadway (Figure 4.3.17-9). This would impact a small landscaped area and an area at the south entrance to the Interbay Golf Center (at approximately Gilman Drive West). Playable areas would not be affected, and access to the golf course would be maintained. The widening of 15th Avenue West would also encroach on the Interbay P-Patch portion of the property, but this impact would be at the edge of a small landscaped area near this community garden, outside the garden and parking areas and would not permanently impact use or access to the Interbay P-Patch.





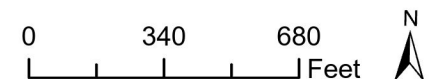
Source: City of Seattle, King County (2019, 2020, 2021), EagleView Technologies, Inc. (2019).

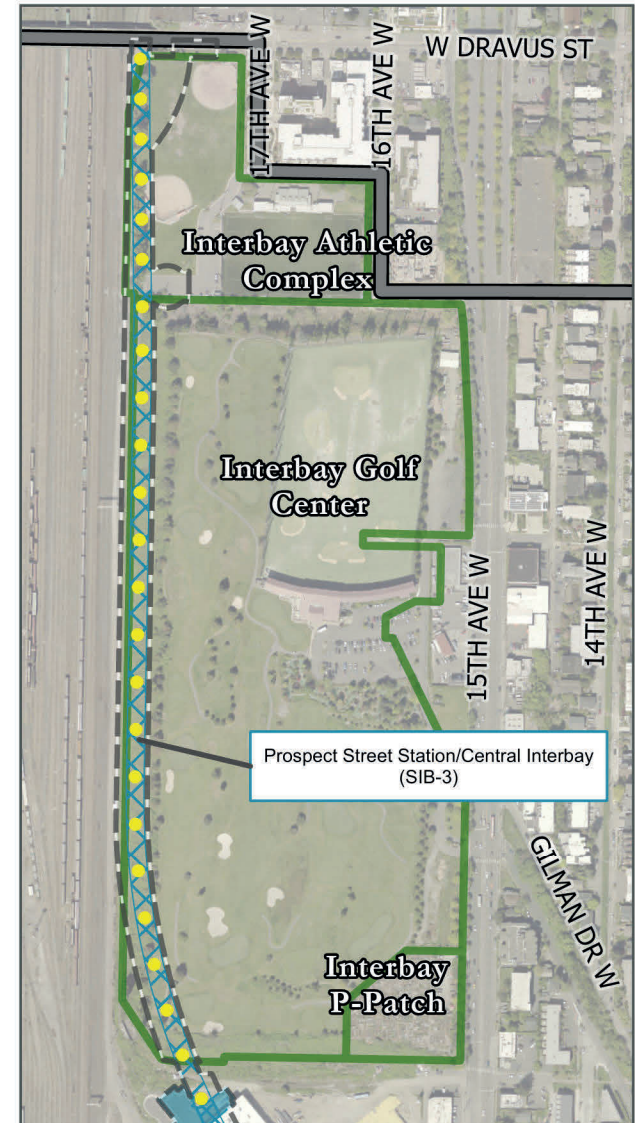
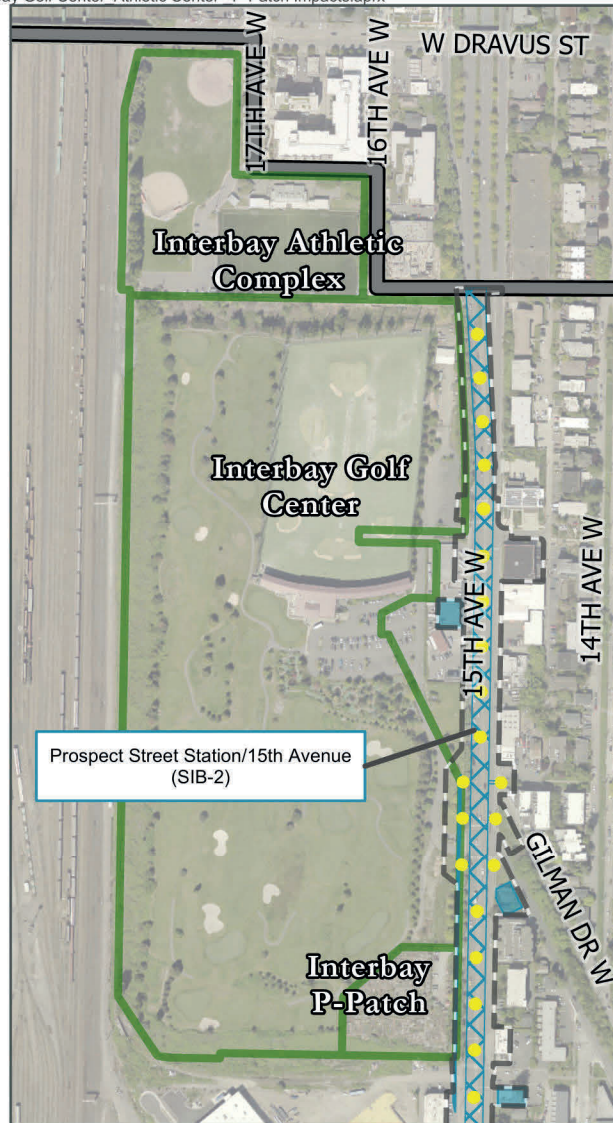
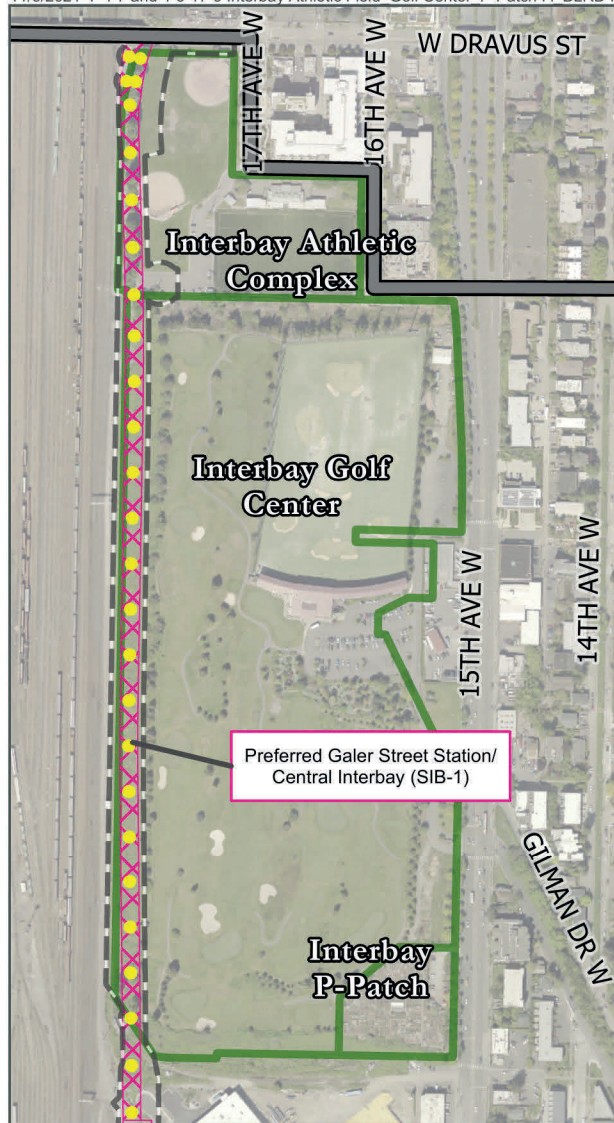


Note: Column includes surface and sub-surface impact.

FIGURE 4.3.17-8
Southwest Queen Anne Greenbelt
Permanent and Construction Impacts
 Ballard Link Extension -
 South Interbay Segment

*West Seattle and
 Ballard Link Extensions*





Source: City of Seattle, King County (2019, 2020, 2021), EagleView Technologies, Inc. (2019).

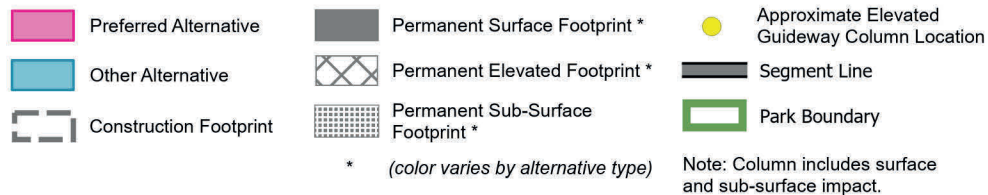


FIGURE 4.3.17-9
Interbay Golf Center, Interbay Athletic Complex, and
Interbay P-Patch Permanent and Construction Impacts
 Ballard Link Extension -
 South Interbay Segment

West Seattle and
 Ballard Link Extensions

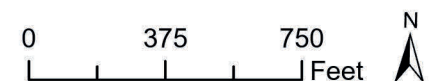


Figure 4.3.17-10. View from Interbay Golf Center

Existing Conditions



Preferred Galer Street Station/Central Interbay Alternative (SIB-1)



Prospect Street Station/Central Interbay Alternative (SIB-3)

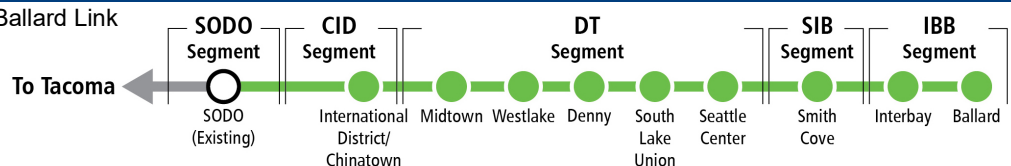


Alternative SIB-3 would have guideway columns across the southwest corner of the Interbay Golf Center property, where the guideway would turn north from West Armory Way, and would remove vegetation. This alternative would require protective fencing similar to Preferred Alternative SIB-1, except it would be slightly higher in this area of the golf course. Alternative SIB-3 would impact the largest area of the Interbay Golf Center, including the playable area at the southwest corner of the golf course. It would impact the #5 green and the #6 tee box because the area under the guideway would be behind protective fencing and would no longer be usable.

Interbay Athletic Complex

Figure 4.3.17-9 shows the permanent impacts to the Interbay Athletic Complex from the South Interbay Segment alternatives. Alternative SIB-2 would not have permanent impacts to this property.

Preferred Alternative SIB-1 and Alternative SIB-3 would have similar permanent impacts on the Interbay Athletic Complex. Both alternatives would have guideway columns on the grass fields,



making them unusable for their purpose as baseball and football fields. At the south end of the property, both alternatives would also remove up to half of the parking for emergency access to the guideway. The soccer stadium and associated stands would remain.

4.3.17.3.5 Interbay/Ballard Segment

The Interbay/Ballard Segment Build Alternatives would have long-term impacts to one park and recreational resource in the study area, the 14th Avenue Northwest Boat Ramp.

14th Avenue Northwest Boat Ramp

The bridge crossing Salmon Bay for both Preferred Alternative IBB-1a and Option IBB-1b would remove access to the 14th Avenue Boat Ramp. Sound Transit would relocate the boat ramp between the existing location and 11th Avenue Northwest, which would be accessible from Northwest 45th Street. Relocation would occur prior to construction to maintain shoreline access. Relocation of the public boat ramp could have benefits to the resource such as improved parking.

Preferred Alternative IBB-2a*, Preferred Option IBB-2b*, and Alternative IBB-3 would not impact the 14th Avenue Northwest Boat Ramp.

4.3.17.4 Environmental Impacts of the Build Alternatives during Construction

Sound Transit analyzed the potential construction impacts of the Ballard Link Extension Build Alternatives on parks and recreational resources in the study area. If a recreational resource or alternative is not mentioned, no impacts would occur for that resource or alternative.

Construction effects in the Ballard Link Extension study area would include construction activities and easements, road or lane closures and detours, construction traffic, visual impacts, light, glare, dust, noise, and trail closures and detours that could temporarily alter the resources, impact their function, or reduce or modify access to the resources.

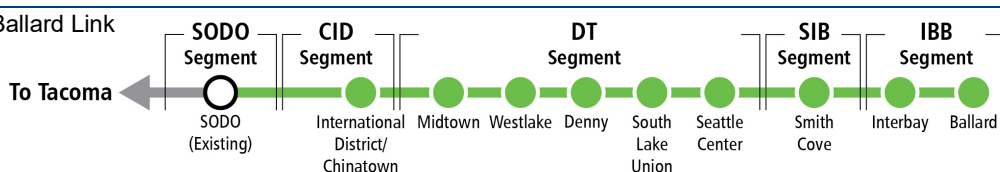
4.3.17.4.1 Impacts Common to All Alternatives

Where construction would occur adjacent to or within a park or recreational resource, users might experience minor proximity effects due to construction activities, such as increased noise and dust, as well as temporary use and access restrictions. Construction best management practices would be used to minimize these effects, and these effects are not likely to substantially affect the use of these resources. The resources within each segment most likely to experience access restrictions are listed for each segment.

For all alternatives, there is potential for temporary construction-related increases in noise levels at nearby parks. However, construction noise levels are not anticipated to substantially affect the use of these resources. Section 4.3.7, Noise and Vibration, and Appendix N.3, Noise and Vibration Technical Report, provide additional information on the potential construction-period noise levels.

4.3.17.4.2 SODO Segment

The SODO Segment does not contain parks or recreational resources, and therefore there are no construction impacts in this segment.



4.3.17.4.3 Chinatown-International District Segment

The Chinatown-International District Segment alternatives could temporarily impact one park and recreational resource during construction, Hing Hay Park.

Hing Hay Park

Both Alternative CID-2a and Option CID-2b would result in minor proximity effects to Hing Hay Park during construction on the west side of 6th Avenue South. Construction would also be visible to park users.

4.3.17.4.4 Downtown Segment

The Downtown Segment alternatives would temporarily impact four park and recreational resources during construction: Freeway Park, Urban Triangle Park, Westlake Park, and Seattle Center (Table 4.3.17-3).

Table 4.3.17-3. Temporary Impacts to Parks and Recreational Resources in Downtown Segment

Alternative	Freeway Park	Urban Triangle Park	Westlake Park	Seattle Center
Preferred 5th Avenue/Harrison Street (DT-1)	None	0.2 acre	0.1 acre	1.1 acres
6th Avenue/Mercer Street (DT-2)	None ^a	None	None	<0.1 acre

^a No impact beyond minor proximity effects.

Freeway Park

Alternative DT-2 could result in minor proximity impacts to Freeway Park adjacent to Seneca Street from construction of the mined Midtown Station. The area of Freeway Park south of Seneca Street would have long-term impacts with this alternative as described in the Long-term Impacts section.

Urban Triangle Park

Preferred Alternative DT-1 would require closure of Urban Triangle Park for construction staging next to the Denny Station. This station would be constructed as a cut-and-cover station and the closure could be up to 6 years plus time for park restoration. The park would be returned to its pre-project condition following construction.

Westlake Park

Preferred Alternative DT-1 would have temporary impacts to a portion of Westlake Park for construction of a pedestrian undercrossing under Pine Street connecting the existing Westlake station and the new station. These temporary impacts would occur in the northeastern portion of the park adjacent to Pine Street for up to 6 years. Figure 4.3.17-11 shows the temporary construction impacts to this resource. Preferred Alternative DT-1 would also result in minor proximity impacts to the remainder of Westlake Park as construction would occur directly adjacent to the park boundary at 5th Avenue and Pine Street. Construction of station entrances for the mined Westlake Station would occur to the north and east, and Pine Street would be closed for construction staging. It is expected the majority of the park would remain usable and accessible from 4th Avenue and Pike Street.

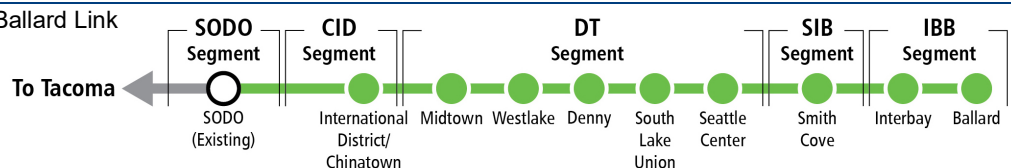
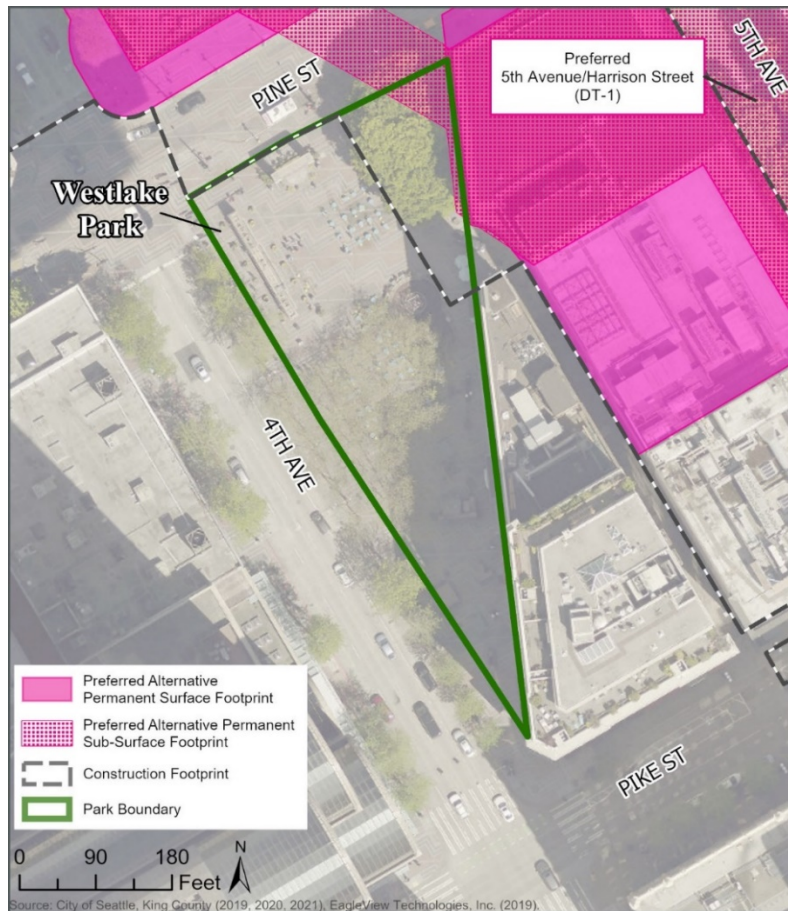


Figure 4.3.17-11. Westlake Park Construction Impacts, Ballard Link Extension – Downtown Segment



Seattle Center

Figure 4.3.17-6 shows the temporary construction impacts to this resource from the Downtown Segment alternatives.

Preferred Alternative DT-1 would have temporary impacts to Seattle Center for construction of a Seattle Center Station entrance for up to 6 years, plus time for park restoration. Construction activities and staging would occur for this cut-and-cover station entrance in front of the Seattle Repertory Theatre, in a landscaped area known as Donnelly Garden and Theater Commons. This disturbed landscaped area would be restored after construction.

Cut-and-cover construction would also occur on Republican Street, east of 1st Avenue North, to the north of the Northwest Rooms. The Northwest Rooms house K.E.X.P. radio station, the Vera Project, and the Seattle International Film Festival Film Center. These facilities in the Northwest Rooms are expected to continue to operate during construction, but temporary relocation may also be considered due to noise and vibration impacts. Noise and vibration impacts associated with construction are described in Section 4.3.7.4, Environmental Impacts of the Build Alternatives During Construction.

Access from Mercer Street to August Wilson Way on the east side of the Seattle Repertory Theatre (2nd Avenue North) would be closed during construction, but other access points exist to the west and east along Mercer Street. This would affect non-motorized access as well as

campus maintenance and delivery access that uses this roadway. It is expected the theater would maintain operation during construction, accessible from the main entrance off Mercer Street. Access to Seattle Center from the west along Republican Street and August Wilson Way would also be closed, but access farther south at the current Climate Pledge Arena and Thomas Street would be maintained. Construction would avoid the International Fountain Lawn and the path around the lawn would be maintained. Seattle Center events and activities are expected to be able to continue during construction. Mature trees along August Wilson Way that are designated as Exceptional Trees by the City would be removed for construction. New landscaping would be provided after construction in coordination with the City of Seattle and Seattle Center. Public artwork at 2nd Avenue North and August Wilson Way would also be removed during construction, but would be replaced following construction. Sound Transit would coordinate with the Seattle Center during final design regarding construction phasing and timing for work on and near the campus to minimize the construction impacts described above on events at the campus as well as permanent campus tenants.

Alternative DT-2 would impact a very small area of Seattle Center during construction. Minor proximity effects could also occur along Mercer Street near the Seattle Center property but would not impact the retaining wall along the north edge of the property. Seattle Repertory Theatre parking and access would not be affected. Alternative DT-2 would require partial closure of Mercer Street for 3.5 years, between Warren Avenue North and 1st Avenue North, for construction of the Seattle Center Station, which would affect access to the north side of Seattle Center from Mercer Street. Closure of Mercer Street would affect traffic in this area and could make passenger and vehicle access to parking and event loading areas for Seattle Center more difficult. Sound Transit would coordinate with the Seattle Center for road closures during construction in order to minimize impacts on access.

4.3.17.4.5 South Interbay Segment

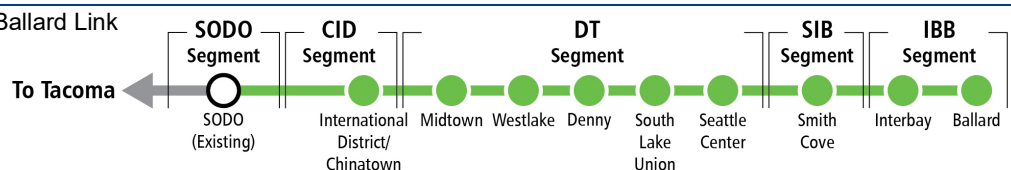
The South Interbay Segment alternatives would have temporary impacts to four parks and recreational resources during construction (Table 4.3.17-4): Kinnear Park, the Southwest Queen Anne Greenbelt, Interbay Golf Center, and the Interbay Athletic Complex.

Table 4.3.17-4. Temporary Impacts to Parks and Recreational Resources in South Interbay Segment

Alternative	Kinnear Park	Southwest Queen Anne Greenbelt	Interbay Golf Center	Interbay Athletic Complex
Preferred Galer Street Station/Central Interbay (SIB-1)	<0.1 acre	None	1.0 to 1.5 acres ^a	None ^b
Prospect Street Station/15th Avenue (SIB-2)	0.1 acre	<0.1 acre	0.3 acre	None
Prospect Street Station/Central Interbay (SIB-3)	0.3 acre	0.4 acre	0.9 acre	None ^b

^a The range of impacts represents differences with the connections to other segments. Impact areas are in addition to the area needed permanently for operation.

^b No impact beyond minor proximity effects.



Kinnear Park

Figure 4.3.17-7 shows the temporary construction impacts to this resource from the South Interbay Segment alternatives.

Preferred Alternative SIB-1 would have temporary impacts along the western edge of Kinnear Park during construction. This alternative would be on the east side of Elliott Avenue West, along the western edge of Kinnear Park, and would require some additional use of the park property for construction of the elevated guideway and hi-rail access but would not affect park amenities or use.

Alternative SIB-2 would also require limited use of Kinnear Park property but would not affect park amenities or use. If this alternative were to connect to Option IBB-1b in the Interbay/Ballard Segment, it would impact a slightly greater area of Kinnear Park during construction.

Alternative SIB-3 would construct a bored tunnel under the park before transitioning from a tunnel portal to a retained cut at the north end. The tunnel portal would require cut-and-cover construction in the park, which would remove trees and vegetation. This work would not affect park amenities or use because it would be in an undeveloped area of the park.

Southwest Queen Anne Greenbelt

Figure 4.3.17-8 shows the temporary construction impacts to this resource from Alternative SIB-2 and Alternative SIB-3. The additional impacted area would be limited to an undeveloped area with no amenities, facilities, or access, so the alternatives would not have additional impacts on the resource during construction.

Preferred Alternative SIB-1 would avoid construction impacts to the Southwest Queen Anne Greenbelt.

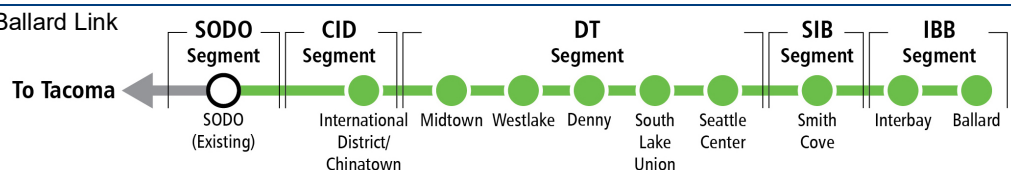
Interbay Golf Center

Figure 4.3.17-9 shows the temporary construction impacts to this resource from the South Interbay Segment alternatives.

Preferred Alternative SIB-1 would have temporary impacts to the Interbay Golf Center during construction of the elevated guideway for 1 to 2 years. This alternative would disturb the western slope of the Interbay Golf Center property between the playable area of the golf course and the BNSF Railway tracks, outside the playable area. These temporary construction impacts would be slightly less if this alternative were to connect to Preferred Alternative IBB-2a* or Preferred Option IBB-2b*.

Alternative SIB-2 would have temporary impacts on of the eastern edge of the Interbay Golf Center property for construction of the widened 15th Avenue West and straddle bents. Construction would not affect use of the golf center or the p-patch, and access would be maintained when these facilities are in use.

Alternative SIB-3 would have temporary impacts on the Interbay Golf Center during construction. The alternative would have construction impacts similar to Preferred Alternative SIB-1 except it would impact more area at the southwest corner of the resource. This alternative would not have temporary impacts to the playable area in addition to the playable area permanently impacted.



Interbay Athletic Complex

Figure 4.3.17-9 shows the temporary construction impacts to this resource from Preferred Alternative SIB-1 and Alternative SIB-3. The soccer stadium would remain operational during construction, and access to the soccer stadium would be maintained when it is in use. It is assumed that the grass field would be relocated to another site prior to construction due to the permanent impacts.

Alternative SIB-2 would avoid construction impacts to the Interbay Athletic Complex.

4.3.17.4.6 Interbay/Ballard Segment

The Interbay/Ballard Segment alternatives would have temporary impacts to three parks and recreational resources during construction: Fishermen's Terminal, 11th Avenue Northwest Street-end, and Gemenskap Park.

Fishermen's Terminal

Construction staging for Alternative IBB-3 would occur near the public use areas and would result in minor proximity effects to this resource.

11th Avenue Northwest Street-end

Construction staging for both Preferred Alternative IBB-1a and Option IBB-1b would occur directly adjacent to 11th Avenue Northwest Street-end and would result in minor proximity effects to this resource.

Gemenskap Park

Construction of the tail track for both Preferred Alternative IBB-1a and Option IBB-1b south of Northwest 59th Street could result in minor proximity effects at Gemenskap Park. Construction would also be visible to park users.

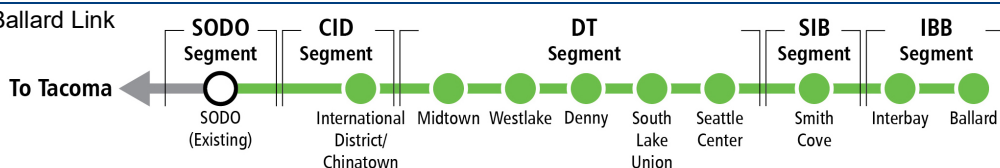
4.3.17.5 Indirect Impacts of the Build Alternatives

Sound Transit analyzed the potential indirect impacts of the Ballard Link Extension Build Alternatives on parks and recreational resources in the study area. If a recreational resource or alternative is not mentioned, no impacts would occur for that resource or alternative.

4.3.17.5.1 Impacts Common to All Alternatives

Parks and recreation resources within 0.5 mile of light rail stations along the Ballard Link Extension are listed in Appendix L4.17 (Table L4.17-3). The project would improve public access to most of these resources, particularly those closest to new stations. Underused parks could experience activation as the parks continue to see increasing numbers of visitors. The resources most likely to experience increased accessibility due to people walking to the parks from the stations are described for each segment below. If a physical barrier such as a freeway (e.g., Interstate 5) would prevent park or recreational resource users from readily accessing a new station, this benefit to the resource is not described.

TOD that could occur around station areas is described in Section 4.3.2, Land Use. Development around station areas would be consistent with City of Seattle planning and zoning. TOD near station areas could increase use of the parks near the stations. TOD could also increase ambient noise heard in nearby parks. However, the parks are urban in nature and their use is not anticipated to be affected by increases in ambient noise.



4.3.17.5.2 SODO Segment

The SODO Segment does not contain any park or recreational resources and therefore there would be no indirect impacts in this segment.

4.3.17.5.3 Chinatown-International District Segment

Indirect effects of the Chinatown-International District Segment Build Alternatives would not impact parks and recreational resources in the Chinatown-International District Segment. Among the resources most likely to benefit from increased accessibility, and potentially activation, are Kobe Terrace, Hing Hay Park, Donnie Chin International Children's Play Park, and Occidental Square.

4.3.17.5.4 Downtown Segment

Indirect effects of the Downtown Segment Build Alternatives would not impact parks and recreational resources in the Downtown Segment study area. Rather, the alternatives (particularly Alternative DT-2) could have the indirect effect of activating underused areas within Freeway Park, which could benefit from improved access due to the nearby light rail station. Other resources most likely to benefit from increased accessibility, and potentially activation, from all Downtown Segment alternatives are Lake Union Park and Boat Launch, Denny Park, Counterbalance Park, and Cascade Playground. For both Downtown Segment alternatives, the Seattle Center Station would provide alternate access to the events and attractions at the Seattle Center, which currently contribute to traffic and parking congestion in the area. Queuing for access to the station after large events could result in patrons potentially remaining longer on the Seattle Center campus near the station. This may be more noticeable with Preferred Alternative DT-1, which would have a station entrance located closer to event facilities than Alternative DT-2.

4.3.17.5.5 South Interbay Segment

Indirect effects of the South Interbay Segment Build Alternatives would not impact parks and recreational resources in the South Interbay Segment study area. Among the resources most likely to benefit from increased accessibility, and potentially activation, are Kinnear Park, Southwest Queen Anne Greenbelt, and 12th West & West Howe Park.

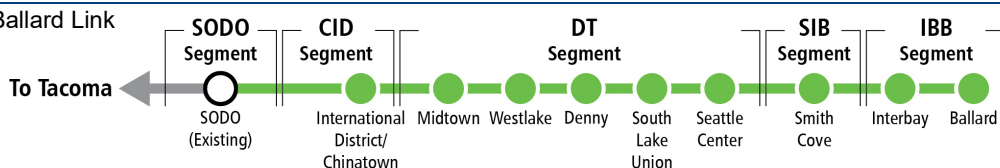
4.3.17.5.6 Interbay/Ballard Segment

Indirect effects of the Interbay/Ballard Segment Build Alternatives would not impact parks and recreational resources in the Interbay/Ballard Segment study area. Both the Gilman Playground and Gemenskap Park could experience increased pass-through foot traffic, given their proximity to stations. Among the resource destinations most likely to benefit from increased accessibility are the Interbay Golf Center and Interbay Athletic Complex, which are within the South Interbay study area but could be accessed by the Interbay Station in this segment.

Preferred Alternative IBB-1a and Option IBB-1b could have an indirect impact on community plans to continue Gemenskap Park from Salmon Bay to Northwest 65th Street along 14th Avenue Northwest. Preferred Alternative IBB-2a* could have a similar indirect impact during construction if future light rail development were to continue north along 14th Avenue Northwest.

4.3.17.6 Mitigation Measures

According to City of Seattle Ordinance 118477, City park land acquired by the project would need to be replaced with land of equivalent or better size, value, location, and usefulness.



Sound Transit would work with the City to identify appropriate replacement property for mitigation where park property would be permanently acquired for the Ballard Link Extension consistent with Ordinance 118447. Sound Transit would work with Seattle Parks and Recreation to relocate the West Central Maintenance Warehouse in the same area.

Restoration of park facilities is assumed to be part of the project, and Sound Transit would coordinate with the resource owner to restore temporarily disturbed parks and recreational resources after construction, consistent with operation requirements that limit tall trees adjacent to the guideway. During construction, pedestrian access to parks and trails would be routed to the remaining open portions of the facilities.

For Preferred Alternative DT-1, Sound Transit would coordinate with the Seattle Center during station planning and final design regarding design of the Seattle Center station and how it would be integrated into the campus. As discussed in Chapter 3, Transportation, and Section 4.3.7, Noise and Vibration, Sound Transit would also coordinate with the Seattle Center on a construction management plan related to access and noise to address construction during large events to minimize impacts to uses of that campus.

Sound Transit would coordinate with the Washington State Recreation and Conservation Office regarding mitigation for parks and recreation resources they have funded. These facilities include the Ship Canal Trail and the 14th Avenue Northwest Boat Ramp. Impacts to the Ship Canal Trail are discussed in Chapter 3, Transportation Environment and Consequences.

Additional potential site-specific mitigation is described below. Other measures to mitigate affected resources could include financial compensation or park enhancement, where appropriate. Potential mitigation for visual impacts in parks is described in Section 4.3.5, Visual and Aesthetic Resources.

4.3.17.6.1 South Interbay Segment

Interbay Golf Center

The impacts of Alternative SIB-3 could be mitigated by reconfiguring the playable area of affected holes. There would not be sufficient room to relocate the impacted holes, but holes could be shortened. This golf course is not rated, so it is unlikely that shortening the course would have a substantial impact on course playability. Modifying the holes could take 1 to 2 years. It could take an additional 18 months to 2 years for construction and growing of turf.

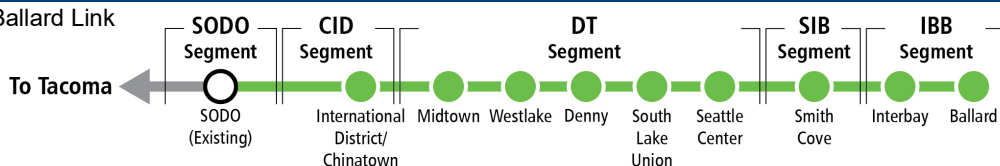
Interbay Athletic Center

Preferred Alternative SIB-1 and Alternative SIB-3 would require replacement fields for baseball and football. Sound Transit would coordinate with Seattle Parks and Recreation to identify replacement property that could serve the same users. Sound Transit would coordinate with Seattle Parks and Recreation and Seattle Pacific University regarding its use of the soccer stadium to minimize the impacts associated with the permanent loss of parking. Sound Transit would also coordinate with these parties regarding use of the soccer stadium during construction.

4.3.17.6.2 Interbay/Ballard Segment

14th Avenue Northwest Boat Ramp

After relocation of the public boat ramp as described in Section 4.3.17.2, Environmental Impacts, the value of the resource features would not be diminished, and no additional mitigation is needed.



4.3.18 Section 4(f) Summary

4.3.18.1 Affected Environment

This section summarizes the Section 4(f) analysis completed in compliance with Section 4(f) of the United States Department of Transportation Act of 1966 (United States Code Title 49 Section 303[c]). The full Section 4(f) analysis can be found in Appendix H, Draft Section 4(f) Evaluation. The study area for the Ballard Link Extension draft Section 4(f) evaluation, shown on Figure 4.3.18.1 includes both the direct impact study area used for the parks and recreational resources analysis (which is 250 feet around the alternatives, construction staging areas, and ancillary facilities) and the area of potential effects for historic and archaeological resources, which was established in accordance with Section 106 of the National Historic Preservation Act. As the project advances, FTA and Sound Transit will continue to consult with the State Historic Preservation Officer and other consulting parties on the area of potential effects to address specific concerns regarding historic districts and individual resources. See Section 4.3.16.1 for a description of the area of potential effects for the Ballard Link Extension.

The Section 4(f) resources in the Ballard Link Extension study area are mapped on Figures 4-1a through 4-1m of Appendix H and are summarized in Table 4.3.18-1. Attachment H.1, Section 4(f) Status of Parks and Recreational Resources in the Study Area, lists the parks and recreational facilities in the study area and identifies which are not Section 4(f) resources and why. More information about the parks and recreational resources can be found in Section 4.3.17, Parks and Recreational Resources. More information about historic and archaeological resources can be found in Section 4.3.16, Historic and Archaeological Resources, and Appendix N.5, Historic and Archaeological Resources Technical Report.

There are four trails in the Ballard Link Extension study area that are used by both commuters and recreationists:

- SODO Trail
- Elliott Bay Trail
- Ship Canal Trail
- Burke-Gilman Trail

FTA has determined that these trails are part of the transportation system and function primarily for transportation based on the Seattle Department of Transportation's inclusion of these trails in its Bicycle Master Plan (City of Seattle 2014). These multi-use, paved trails are entirely or mostly within public right-of-way, and are part of the existing bicycle network, which is considered an extension of the City's transportation network by the City of Seattle. Therefore, these trails are not subject to Section 4(f) protection in accordance with Code of Federal Regulations Title 23 Section 774.13(f)(4). Potential impacts to these trails are discussed in Section 3.7, Non-motorized, in Chapter 3, Transportation Environment and Consequences. The official with jurisdiction for each Section 4(f) park and recreational resource is the resource owner identified in Section 4.1 of Appendix H, Draft Section 4(f) Evaluation; the official with jurisdiction for Section 4(f) historic resources is the State Historic Preservation Officer. For individual properties that are eligible for Section 4(f) protection as both a park resource and a historic resource, Sound Transit will consult with the resource's official with jurisdiction as well as the State Historic Preservation Officer.

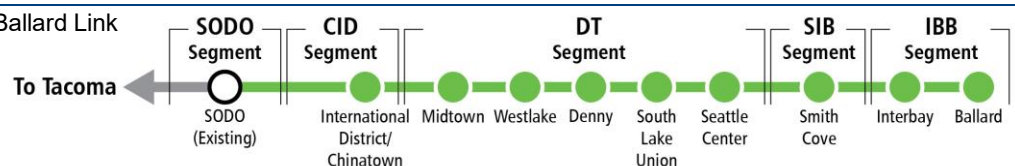


Table 4.3.18-1. Summary of Section 4(f) Resources in the Ballard Link Extension Study Area

Segment	Number of Park/Recreation Resources	Number of Historic Resources
SODO	0	2
Chinatown-International District	2	53
Downtown	6	103
South Interbay	5	43
Interbay-Ballard	2	58
Linear Resources Spanning Multiple Segments	0	2

4.3.18.2 Section 4(f) Uses

If a Section 4(f) resource is not mentioned in this section, there is no use of that resource. The full Section 4(f) analysis can be found in Appendix H.

4.3.18.2.1 SODO Segment

Table 4.3.18-2 summarizes the preliminary Section 4(f) uses for the SODO Segment alternatives.

Table 4.3.18-2. Summary of Preliminary Section 4(f) Use Determinations for the SODO Segment, Ballard Link Extension

Resource	Preferred At-Grade Alternative (SODO-1a)	At-Grade South Station Option (SODO-1b)	Mixed Profile Alternative (SODO-2)
Graybar Electric Company Building	Use ^a	Use ^a	Use ^a

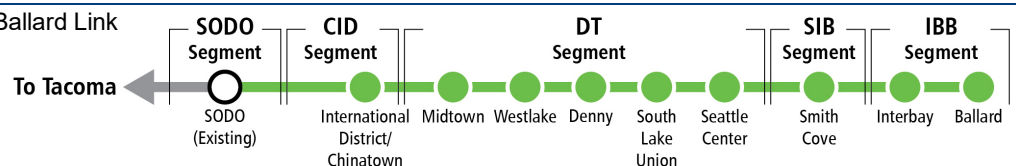
^a When connecting to Alternative CID-1a* in the Chinatown-International District Segment, impacts meet the *de minimis* threshold.

4.3.18.2.2 Chinatown-International District Segment

Table 4.3.18-3 summarizes the proposed Section 4(f) uses for the Chinatown-International District Segment alternatives.

Table 4.3.18-3. Summary of Preliminary Section 4(f) Use Determinations for the Chinatown-International District Segment

Resource	4th Avenue Shallow Alternative (CID-1a)*	4th Avenue Deep Station Option (CID-1b)*	5th Avenue Shallow Alternative (CID-2a)	5th Avenue Deep Station Option (CID-2b)
Seattle Chinatown Historic District	No use	No use	Use	Use
Pioneer Square-Skid Road National Historic District	No use	No use	No use	No use
Retail Stores, 418 5th Avenue South (retail stores)	No use	No use	Use	Use



Resource	4th Avenue Shallow Alternative (CID-1a)*	4th Avenue Deep Station Option (CID-1b)*	5th Avenue Shallow Alternative (CID-2a)	5th Avenue Deep Station Option (CID-2b)
Union Station	Use	Use	No use	No use
Seattle First National Bank - International District Branch	No use	No use	Use	Use

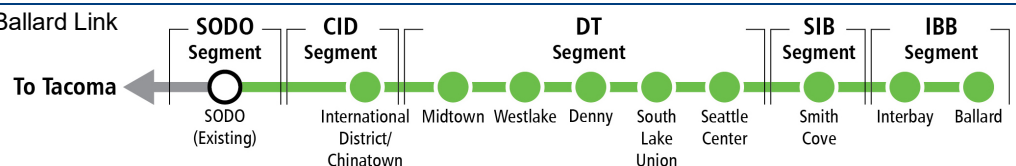
* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

4.3.18.2.3 Downtown Segment

Table 4.3.18-4 summarizes the proposed Section 4(f) uses for the Downtown Segment alternatives.

Table 4.3.18-4. Summary of Preliminary Section 4(f) Use Determinations for the Downtown Segment

Resource	Preferred 5th Avenue/Harrison Street Alternative (DT-1)	6th Avenue/Mercer Street Alternative (DT-2)
Naramore Fountain Park	No use	Use
Freeway Park (park resource)	No use	Use
Urban Triangle Park	Use	No use
Westlake Park	No use: Temporary Occupancy	No use
Seattle Center (park resource)	<i>de minimis</i>	No use: Temporary Occupancy
Frederick and Nelson Building	No use	Use
Retail Stores, 2120 Westlake Avenue	<i>de minimis</i>	No use
Spring Apartment Hotel	No use	Use
Bank of California Building	Use	No use
O'Shea Building	No use	Use
Thurmond's Central Realty	No use	Use
Maxine Apartments	No use	Use
National Bank of Commerce – Queen Anne Branch	No use	Use
Office Building, 557 Roy Street	No use	Use
Freeway Park (historic resource)	No use	Use
International Commerce and Industry Building	No use	No use
Grand Central Garage	Use	No use
Floyd A. Naramore Fountain and Plaza	No use	Use



4.3.18.2.4 South Interbay Segment

Table 4.3.18-5 summarizes the preliminary Section 4(f) uses for the South Interbay Segment alternatives.

Table 4.3.18-5. Summary of Preliminary Section 4(f) Use Determinations for the South Interbay Segment

Resource	Preferred Galer Street Station/Central Interbay Alternative (SIB-1)	Prospect Street Station/15th Avenue Alternative (SIB-2)	Prospect Street Station/Central Interbay Alternative (SIB-3)
Kinnear Park (park resource)	<i>de minimis</i>	<i>de minimis</i>	<i>de minimis</i>
Southwest Queen Anne Greenbelt	No use	Use	Use
Interbay Golf Center	<i>de minimis</i>	<i>de minimis</i>	<i>de minimis</i>
Interbay Athletic Complex	Use	No use	Use
Waterfront Employers of Washington and The Pacific Maritime Association	Use	Use	No use
Duplex, 317 West Republican Street	Use	Use	No use
Duplex, 319 West Republican Street	Use	Use	No use
Residence, 317½ West Republican Street	Use	Use	No use
Federal Employees Credit Union	No use	Use	No use
Kinnear Park (historic resource)	<i>de minimis</i>	<i>de minimis</i>	<i>de minimis</i>
Sheet Metal Works and Roof Company	Use	Use	No use
Wilson Machine Works	Use	Use	Use
Seattle Armory	<i>de minimis</i>	No use	No use
Seattle Armory Field Maintenance Shop Building	Use	No use	No use
King County Metro Pumping Station	<i>de minimis</i>	No use	No use
Western Pacific Chemical Company	<i>de minimis</i>	Use	Use

4.3.18.2.5 Interbay/Ballard Segment

Table 4.3.18-6 summarizes the preliminary Section 4(f) uses for the Interbay/Ballard Segment alternatives.

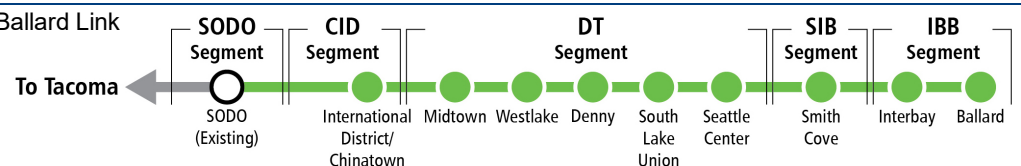
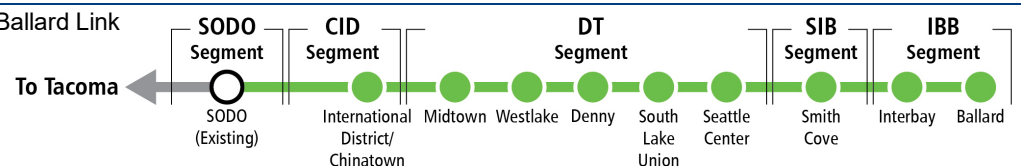


Table 4.3.18-6. Summary of Preliminary Section 4(f) Use Determinations for the Interbay/Ballard Segment

Resource	Preferred Elevated 14th Avenue Alternative (IBB-1a)	Elevated 14th Avenue Alignment Option (from Prospect Street Station/15th Avenue) (IBB-1b)	Preferred Tunnel 14th Avenue Alternative (IBB-2a)*	Preferred Tunnel 15th Avenue Station Option (IBB-2b)*	Elevated 15th Avenue Alternative (IBB-3)
14th Avenue Northwest Boat Ramp	Use	Use	No use	No use	No use
Industrial and Commercial Building, 1121 Northwest 45th Street	Use	Use	No use	No use	No use
Lyle Branchflower Company Processing Warehouse	No use	No use	No use	No use	Use
Lyle Branchflower Company Cold Storage Building/North Star Ice Equipment Building	No use	No use	No use	No use	Use
Nelson Chevrolet Storage Lot Office Building	No use	No use	No use	No use	Use
Nelson Chevrolet Showroom	No use	No use	No use	No use	<i>de minimis</i>
Restaurant, 1510 Northwest Leary Way	No use	No use	No use	No use	No use
Residence, 5713 14th Avenue Northwest	Use	Use	No use	No use	No use
Apartment Complex, 5700 14th Avenue Northwest	No use	No use	Use	No use	No use
HDF Propeller Company Machining and Manufacturing Building	Use	Use	No use	No use	No use
Residence, 3440 15th Avenue West	No use	Use	No use	No use	No use
Residence, 3442 15th Avenue West	No use	Use	No use	No use	No use
Residence, 3220 15th Avenue West	No use	Use	No use	No use	Use
Superior Concrete Products Company	Use	No use	Use	Use	Use
Elmer & Moody Co. Woodwork	No use	No use	No use	No use	<i>de minimis</i>
Sweden Freezer Manufacturing Company	Use	No use	Use	Use	No use
Keller Supply Co	Use	No use	Use	Use	No use
Fishermen's Terminal Historic District	No use	No use	No use	No use	Use
Fishermen's Terminal Fishing Vessel Owner's Winch House	No use	No use	No use	No use	Use



Resource	Preferred Elevated 14th Avenue Alternative (IBB-1a)	Elevated 14th Avenue Alignment Option (from Prospect Street Station/15th Avenue) (IBB-1b)	Preferred Tunnel 14th Avenue Alternative (IBB-2a)*	Preferred Tunnel 15th Avenue Station Option (IBB-2b)*	Elevated 15th Avenue Alternative (IBB-3)
Fishermen's Terminal Fishing Vessel Owners Marine Ways	No use	No use	No use	No use	Use
United States Plywood Corporation Power House	<i>de minimis</i>	<i>de minimis</i>	No use	No use	No use
Office Building, 3220 17th Avenue West	No use	No use	<i>de minimis</i>	<i>de minimis</i>	No use
Duplex, 1145 Northwest 56th Street	Use	Use	No use	No use	No use
Ballard Bridge	No use	No use	No use	No use	No use

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

4.3.18.3 Avoidance Alternatives

The *Section 4(f) Policy Paper* (United States Department of Transportation 2012) states that, along with the No Build Alternative, potential alternatives to avoid the individual use of a Section 4(f) resource must be considered and may include one or more of the following avoidance categories: location alternatives, alternative actions, alignment shifts, and design changes.

All alternatives in the Chinatown-International District, Downtown, South Interbay, and Interbay/Ballard segments would impact a Section 4(f) resource, and there is no full-length project avoidance alternative for the Ballard Link Extension. The Draft Section 4(f) Evaluation in Appendix H includes a discussion of feasible and prudent avoidance alternatives for all the Ballard Link Extension Build Alternatives that would result in the individual use of a Section 4(f) resource in each segment.

The Build Alternatives represent Sound Transit's best attempt to avoid and/or minimize Section 4(f) resources in the densely developed project corridor. The Build Alternatives balance the purpose and need of the project against potential impacts, while providing a range of

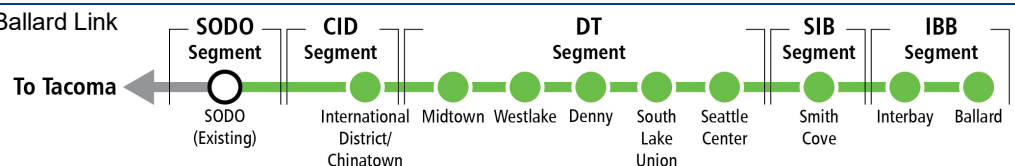
Types of Avoidance Alternatives

Location Alternatives: A location alternative refers to rerouting the entire project along a different alignment.

Alternative Actions: An alternative action could be a different mode of transportation, such as rail transit or bus service, or some other action that does not involve construction such as the implementation of transportation management systems or similar measures.

Alignment Shifts: An alignment shift is rerouting a portion of the project to a different alignment to avoid a specific resource. An example of an alignment shift alternative would be redesigning a proposed freeway exit ramp so that it loops around a Section 4(f) resource (such as a park) on a revised alignment footprint rather than intersecting with the park itself as a way of attempting to avoid a Section 4(f) use of the park.

Design Changes: A design change is a modification of the proposed design in a manner that would avoid impacts, such as reducing the planned median width, building a retaining wall, or incorporating design exceptions. To differentiate from the alignment shift alternative while using the previous freeway exit ramp example, a design change alternative would stay in the same proposed exit ramp footprint but would fly over the park (via an elevated structure) as a way of attempting to avoid a Section 4(f) use of the park.



alternatives for the public to consider and from which FTA and Sound Transit can choose. The project would be within Downtown Seattle and established neighborhoods, with parks, recreational facilities and historic properties throughout the study area. While all the alternatives in Downtown Seattle (the densest part of the study area) are in a tunnel, thereby minimizing impacts, the project still would result in impacts to Section 4(f) resources due to the construction of station entrances and other surface facilities for the light rail. Historic resources, in particular, are widespread within the study area. As design for the WSBLE Project progresses, Sound Transit continues to look for opportunities to reduce project impacts, including impacts on Section 4(f) resources. A detailed discussion of avoidance alternatives is provided in Appendix H, Draft Section 4(f) Evaluation.

4.3.18.4 Measures to Minimize Harm

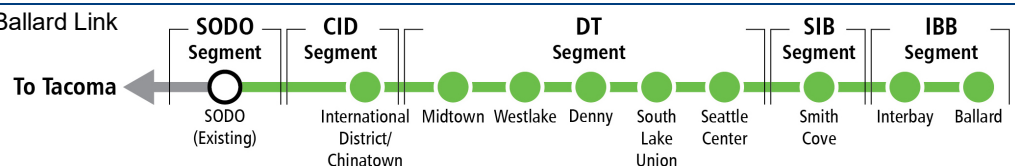
Under Section 4(f), after determining there is no feasible and prudent avoidance alternative to the use of land from a Section 4(f) resource that does not meet the temporary occupancy or *de minimis* exceptions, the action must include all possible planning to minimize harm to the property resulting from such use. The Draft Section 4(f) Evaluation in Appendix H includes a detailed discussion of measures to minimize harm. In addition to the mitigation measures for resource impacts identified in Section 4.3.16.6 of the Historic and Archaeological Resources Section and Section 4.3.17.6 of the Parks and Recreational Resources Section, methods of minimization and avoidance include adjustments to the horizontal alignment, vertical profile, and placement of stations and support facilities. These design adjustments are included in the Build Alternatives that are being evaluated. Typical mitigation measures for visual effects and noise and vibration impacts that could apply to both parks and historic resources are described in Sections 3.5.1 and 3.5.2 in Appendix H. Section 3.5.3, Parks and Recreation Measures to Minimize Harm, describes measures to minimize harm specific to parks, and Section 3.5.4, Historic Resources Measures to Minimize Harm, describes measures specific to historic resources.

4.3.18.4.1 Parks and Recreation Facilities Measures to Minimize Harm

According to the City of Seattle Ordinance 118477, any City park land permanently acquired by the project must be replaced with land of equivalent or better size, value, location, and usefulness. Sound Transit would coordinate with Seattle Parks and Recreation to find suitable replacement property for acquired park land and displaced parks. Appendix H, Draft Section 4(f) Evaluation, summarizes the resource-specific measures to minimize harm to Section 4(f) park resources. Mitigation for all park and recreational resources is described in Section 4.3.17.6, Mitigation Measures, of the Parks and Recreational Resources Section.

4.3.18.4.2 Historic Resources Measures to Minimize Harm

Sound Transit has made design changes during the design process for the project alternatives and will continue to do so throughout project design to minimize impacts on historic properties. Measures to minimize or mitigate harm to Section 4(f) historic resources, beyond the design measures already included in the project, are not known at this time as Sound Transit and FTA continue to consult with the State Historic Preservation Officer, Tribes, and other consulting parties. These measures will be coordinated with the Washington State Department of Archaeology and Historic Preservation, local jurisdictions, and interested parties. They will also be memorialized in the Section 106 memorandum of agreement or programmatic agreement for this project, consistent with Section 106 of the National Historic Preservation Act.



The specific mitigation measures for each affected historic resource will be developed in consultation with the State Historic Preservation Officer, Tribes, and other consulting parties under Section 106. Typical mitigation measures for impacts to historic resources are found in Section 4.3.16.6, Mitigation, of the Historic and Archaeological Resources Section.

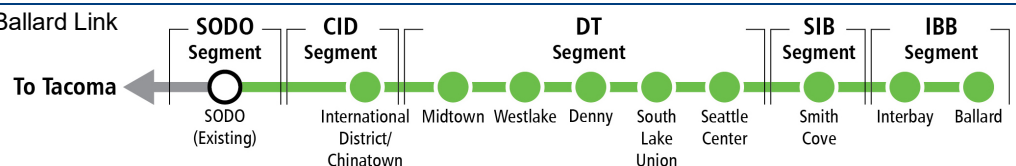
Designated Seattle landmarks and districts that would be directly modified would be subject to review and issuance of a certificate of approval from the Landmarks Board and/or District Review Boards.

4.3.18.5 Least Harm Analysis

When there is no feasible and prudent avoidance alternative, FTA may approve only the alternative(s) that cause the least overall harm based on an assessment of the seven factors listed in Code of Federal Regulations Title 23 Section 774.3(c)(1):

- 1) The ability of the alternative to mitigate adverse impacts to each Section 4(f) property (including any measures that result in benefits to the property).
- 2) The relative severity of the remaining harm, after mitigation, to the protected activities, attributes, or features that qualify each Section 4(f) property for protection.
- 3) The relative significance of each Section 4(f) property.
- 4) The views of the official(s) with jurisdiction over each Section 4(f) property.
- 5) The degree to which each alternative meets the purpose and need for the project.
- 6) After reasonable mitigation, the magnitude of any adverse impacts to resources not protected by Section 4(f).
- 7) Substantial differences in costs among the alternatives.

Following public review of and comment on the WSBLE Draft Environmental Impact Statement and the potential impacts of proposed alternatives (which includes Appendix H, Draft Section 4(f) Evaluation), continued consultation with officials having jurisdiction on the proposed *de minimis* findings after public comment is received, and consultation regarding adverse effects on historic resources with the State Historic Preservation Office and consulting parties, Sound Transit will prepare a Least Harm Analysis to be included in the Final Section 4(f) Evaluation, which will be prepared in conjunction with the Final Environmental Impact Statement for this project.



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