Attachment N.4D
Ecosystems Photographs

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Attachment N.4D Ecosystem Photographs

This appendix contains site photographs of wetlands, streams, and wildlife habitat, obtained during field surveys in 2019 and 2020. They are separated by West Seattle Extension and by Ballard Link Extension to mirror discussions within the Ecosystems Technical Report.

West Seattle Link Extension Ecosystem Photographs

Figure N4.D-1. Wetland WSE1
Facing north, west of the West Seattle Golf Course 18th fairway, taken July 15, 2019.

Figure N4.D-2. Wetland WSE2 and Longfellow Creek
Facing north in ravine by the 13th golf hole, taken July 15, 2019.

Figure N4.D-3. Wetland WSE3
Facing south, by the water control structure in Longfellow Creek, taken July 15, 2019.

Figure N4.D-4. Wetland WSE4
Facing west, from atop the retaining wall under the West Seattle Bridge overpass, taken May 29, 2019.

Figure N4.D-5. Longfellow Creek – Golf Course
Facing upstream in ravine by the 13th hole, taken July 15, 2019.

Figure N4.D-6. Longfellow Creek – Southwest Nevada Street Overpass
South of the Southwest Nevada Street overpass, facing downstream, taken July 15, 2019.

Figure N4.D-7. Longfellow Creek – Southwest Andover Street
Facing upstream from Southwest Andover Street, taken January 23, 2020.

Figure N4.D-8. Duwamish Waterway – East Waterway
Looking east from the Port of Seattle's Harbor Marina Corporate Center, taken October 10, 2019.

Figure N4.D-9. Duwamish Waterway – Rail Bridge over West Waterway
Looking west from Port of Seattle's Harbor Marina Corporate Center, taken October 10, 2019.

Figure N4.D-10. Vegetation in the West Seattle Golf Course
Facing Longfellow Creek, Wetland WSE2, and 13th hole green, taken July 15, 2019.

Figure N4.D-11. Vegetation at the Longfellow Creek Natural Area
Looking west on Southwest Genessee Street, taken October 10, 2019.

Figure N4.D-12. Delridge Community Center and Playfield
From Southwest Genesee Street and 26th Avenue Southwest, taken October 10, 2019.

Figure N4.D-13. Vegetation below West Seattle Bridge Overpass
Facing east, taken May 29, 2019.

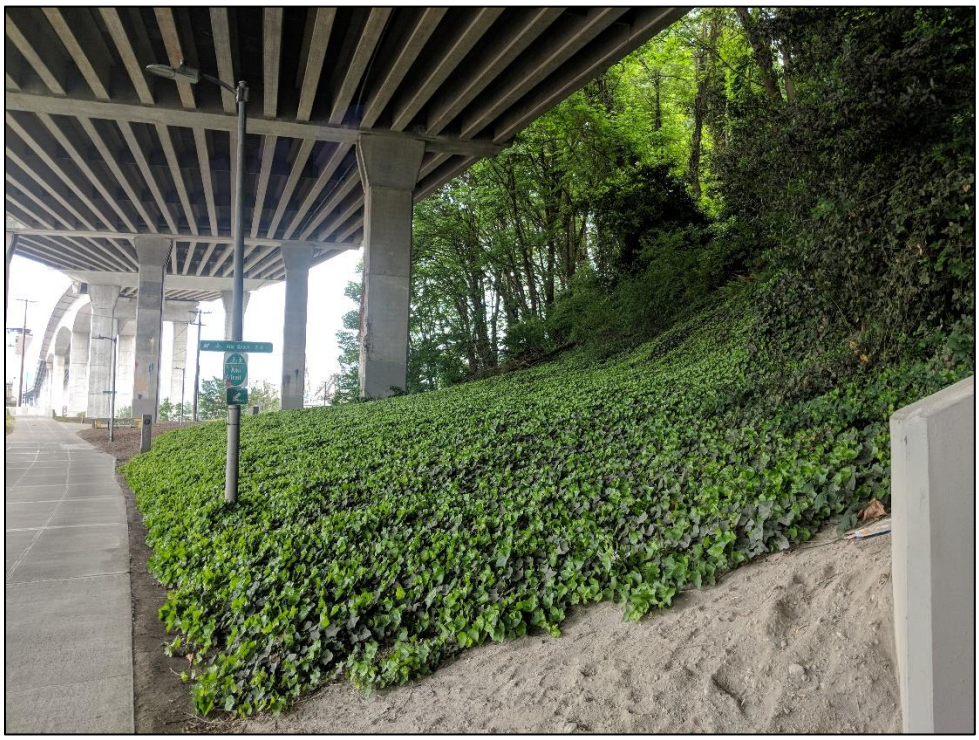

Figure N4.D-14. West Duwamish Greenbelt by West Seattle Bridge Overpass
Facing northwest, taken October 10, 2019.

Figure N4.D-15. Great Blue Heron Rookery at West Duwamish Greenbelt
From stairwell trail, taken May 14, 2019.

Figure N4.D-16. Duwamish Waterway Shoreline – Harbor Marina Corporate Center

Around corporate center, taken October 10, 2019.

Figure N4.D-17. Beaver Dam in Longfellow Creek at Wetland WSE2

Photo taken November 25, 2019.

Figure N4.D-18. Vegetation along Longfellow Creek at Southwest Andover Street
Taken January 23, 2020.

Figure N4.D-19. Longfellow Creek Culvert – Southwest Genesee Street
Culvert inlet on the golf course, taken October 10, 2019.

Ballard Link Extension Ecosystem Photographs

Note: No photo available for Wetland WSE-9.

Figure N4.D-20. Wetland WSE5
Facing downhill, from middle of the wetland, taken September 10, 2019.

Figure N4.D-21. Wetland WSE6
Looking north from existing access road, taken May 29, 2019.

Figure N4.D-22. Wetland WSE7
Facing north from within wetland, taken May 29, 2019.

Figure N4.D-23. Wetland WSE8
Wetland WSE8 on the right, facing west, taken on September 10, 2019.

Figure N4.D-24. Wetland WSE10
Facing upslope from the base of the wetland, taken November 25, 2019.

Figure N4.D-25. Salmon Bay Shoreline at Maritime Academy
Facing southeast, taken October 10, 2019.

Figure N4.D-26. Vegetation at the Interbay Golf Center
West boundary facing north, taken September 10, 2019.

Figure N4.D-27. Kinnear Park
From trail staircase between upper and lower park areas, taken May 29, 2019.

Figure N4.D-28. Southwest Queen Anne Greenbelt Overlook
West Garfield Street and 12th Avenue West facing northwest, taken May 29, 2019.

Figure N4.D-29. Jurisdictional Ditch 1
Looking northwest towards BNSF tracks, taken November 25, 2019.

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Attachment N.4E
Wetland and Stream Impacts within the Study Area

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Figures

Tables

1 AFFECTED ENVIRONMENT

This Attachment N.4E to the *West Seattle and Ballard Link Extensions Ecosystems Technical Report* (Appendix N.4 of the West Seattle and Ballard Link Extensions Draft Environmental Impact Statement) identifies wetlands and water crossings in the West Seattle and Ballard Link Extensions (WSBLE) project limits. The wetland study area includes all lands within 300 feet of the project's construction and operation footprints. The water crossings study area includes any streams or waterbodies within 200 feet of the project limits and, at water crossings, the aquatic resources were reviewed 300 feet downstream and 100 feet upstream of the project limits.

Additional information can be found in other attachments to the Appendix N.4. Full wetland and stream analysis methods are provided in Attachment N.4A. Wetland determination data forms and wetland rating forms are provided in Attachment N.4B. Photographs of the individual wetlands and waterbodies are included in Attachment N.4D.

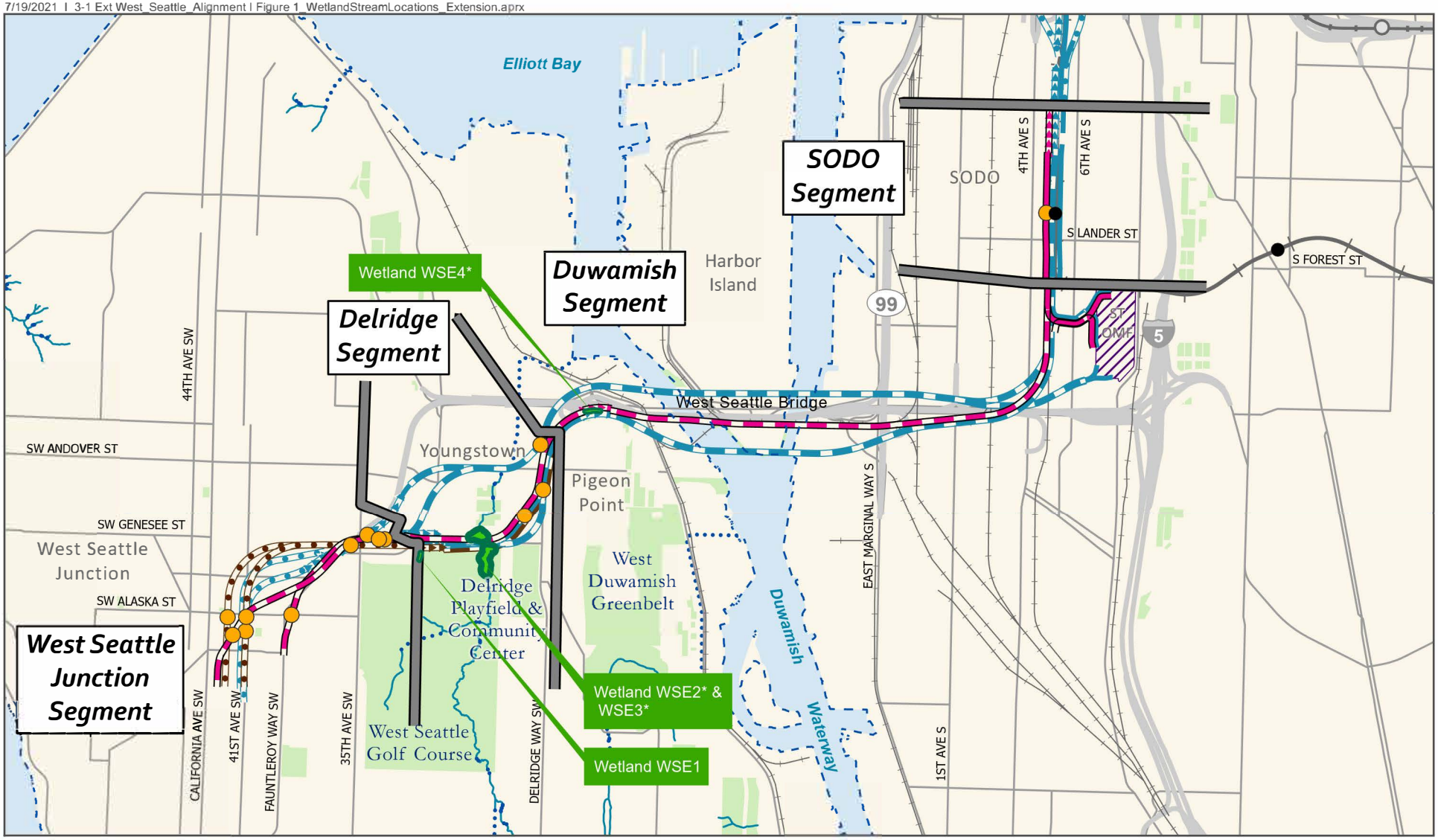
1.1 West Seattle Link Extension Wetlands

In the West Seattle Link Extension study area, four wetlands were identified that meet the criteria outlined in the *Corps of Engineers Wetland Delineation Manual* (United States [U.S.] Army Corps of Engineers 1987) and its regional supplement (U.S. Army Corps of Engineers 2010). This method looks for three wetland indicators: wetland hydrology, hydric soils, and hydrophytic vegetation (Lichvar et al. 2016). To determine hydrophytic vegetation, the method refers to the wetland indicator status assigned by U.S. Department of Agriculture to each species. A site is considered to have hydrophytic vegetation when dominant plants have the indicator code of "obligate" (always found in wetlands), "facultative wetland" (usually found in wetlands), or "facultative" (found equally in wetland or upland habitats).

Wetland surveys took place on publicly owned property and private properties where accessible. Wetlands have been rated according to the *Washington State Wetland Rating System for Western Washington* (Washington State Department of Ecology [Ecology] 2014). At these wetlands, vegetation, soil, and hydrology conditions were documented at sample plots. Wetlands were classified according to the U.S. Fish and Wildlife Service (Cowardin et al. 1979) and hydrogeomorphic (Brinson 1993) classification systems and rated according to the City of Seattle critical area ordinance and the Washington State Wetland Rating System for Western Washington, 2014 Update (Hruby 2014). Wetland functions were evaluated using WSDOT's Wetland Functions Characterization Tool for Linear Projects (Null et al. 2000). Regulatory buffers were determined based on Seattle Municipal Code Chapter 25.09. Areas surveyed that appear to possess all three wetland indicators are included in this attachment.

The wetlands are termed wetland WSE1, wetland WSE2, wetland WSE3, and wetland WSE4 (see Figure 1-1). Wetlands WSE1 and WSE4 are slope wetlands associated with the West Seattle Golf Course and the north end of the West Duwamish Greenbelt, and wetlands WSE2 and WSE3 are riverine wetlands associated with Longfellow Creek. Table 1-1 summarizes classification and rating information for the wetlands in the study area. Figure 1-1 shows where these wetlands occur along the West Seattle Link Extension.

All four wetlands are in an urban setting. Two (wetlands WSE1 and WSE4) are small Category IV wetlands, with low habitat scores (Ecology 2014) because they have limited habitat complexity and are isolated from other wildlife habitats. Wetlands WSE2 and WSE3 are



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
- Tunnel
- At-Grade
- Retained Cut

Station
- New
- Existing

- Segment Line
- Sound Transit Operations and Maintenance Facility (ST OMF)
- Existing Link Light Rail
- East Link Light Rail (Under Construction)
- Railroad
- Stream
- Piped Stream
- Park
- Shoreline
- Wetland
- Wetland Buffer

Note: 1) *Asterisks denote wetlands subject to potential long-term impacts under one or more of the project alternatives. 2) City and federal mapping of wetlands was reviewed and field verified where possible. Mapping may differ from other public wetland mapping sources.

FIGURE 1-1
Wetland and Stream Locations
West Seattle Link Extension

West Seattle and Ballard Link Extensions

0 0.5 1 Mile

N

Category II due to their higher levels of water quality functions, flood storage, and wildlife habitat. Beaver activity is evident in both wetlands WSE2 and WSE3; fish use the creek that flows through these wetlands; shrub and tree layers could provide shelter for other wetland-associated mammals and birds; and areas with seasonal inundation could provide amphibian habitat.

The City of Seattle maps an additional potential wetland, along the western shoreline of the West Duwamish Waterway just south of the 3800 West Marginal Way Southwest parcel. The National Wetlands Inventory shows this potential wetland as a 0.14-acre Estuarine and Marine Wetland. However, views from adjacent properties, aerial photos, and on Ecology's Shoreline Photo Viewer (2016/2017 photos) indicate that no wetland is present. Plants along this corridor do not indicate the presence of wetland.

Table 1-1. Wetlands in the West Seattle Link Extension Study Area

Wetland Identification	Estimated Size [a] (acre)	Cowardin Class	H.G.M. Class	Rating [b]	Function Score [b, c]	Buffer Width [d]	Location
WSE1	0.05	palustrine emergent	Slope	IV	3 (low)	50 feet	West Seattle Golf Course
WSE2	0.45	palustrine emergent, palustrine scrub-shrub	Riverine	II	6 (moderate)	110 feet	West Seattle Golf Course along Longfellow Creek
WSE3	0.35	palustrine forested	Riverine, Depressional	II	6 (moderate)	110 feet	Longfellow Creek Natural Area between Southwest Genesee and Southwest Nevada streets
WSE4	0.08	palustrine emergent, palustrine scrub-shrub	Slope	IV	4 (moderate)	50 feet	Pigeon Point under West Seattle Bridge

[a] Based on ArcGIS estimates and field reconnaissance-level surveys; wetlands will be fully delineated prior to the Final Environmental Impact Statement.

[b] Ecology 2014.

[d] Seattle Municipal Code 25.09.160 classifies habitat function score (Ecology 2014) of 3 to 4 as low, 5 to 7 as moderate, and 8 to 9 as high.

[d] Seattle Municipal Code 25.09.160: Category IV wetlands 1,000 square feet or more, regardless of connections to waters, receive a 50-foot buffer. Category II wetlands over 100 square feet (or of any size abutting a Type S, F, Np, or Ns water) with a moderate habitat score receive a 110-foot buffer.
H.G.M. = hydrogeomorphic

1.1.1 Wetland WSE1

Wetland WSE1 is along a slope at the northwest side of the West Seattle Golf Course, between a golf cart pathway and 31st Avenue Southwest.

1.1.1.1 Wetland Determination

Vegetation is palustrine emergent, following the U.S. Fish and Wildlife Service/Cowardin system. Herbaceous species include field horsetail (*Equisetum arvense*, a facultative species)

and creeping buttercup (*Ranunculus repens*, a facultative species). The non-native, invasive species Himalayan blackberry (*Rubus armeniacus*, a facultative species) was observed scattered throughout. Vegetation passed the dominance test. A site passes the wetland dominance test when dominant plants have the indicator code of obligate, facultative wetland, or facultative.

Soils were examined to a depth of 16 inches; the hydric soil indicator "Depleted Below Dark Surface" was present. Severely compacted soils start at 10 inches below ground surface. From 0 to 4 inches below ground surface, the soil is very dark gray gravelly, silt loam with large gravels present. From 4 inches to 16 inches below ground surface, the soil matrix is dark gray with brown redoximorphic features to 16 inches below ground surface.

Hydrology at wetland WSE1 is primarily supported by groundwater and from stormwater runoff from 31st Avenue Southwest. Saturation from 0 to 10 inches was observed at the time of the site visit (July 15, 2019). Water collects at the toe of the slope along the eastern boundary of the wetland and flows north alongside and over the golf cart pathway that parallels the wetland's eastern boundary.

1.1.1.2 Rating and Buffers

Wetland WSE1 is a slope wetland under the hydrogeomorphic system and is regulated by the U.S. Army Corps of Engineers, Ecology, and City of Seattle as Category IV. Under Ecology's rating system (Ecology 2014), WSE1 scores 13 points (6 for water quality functions, 4 for hydrologic functions, and 3 for habitat functions). The wetland is larger than 1,000 square feet in size; the City of Seattle requires a 50-foot buffer for all Category IV wetlands 1,000 square feet or more.

The plant community in the wetland buffer consists of mowed grass in the golf course and ornamental species such as Norway spruce and English ivy.

1.1.1.3 City of Seattle Functions and Values Summary

Wetland WSE1 provides low functions and values for toxicant removal (it has little capacity to store water but is adjacent to the golf course), as well as education due to its accessibility to golf course visitors. It might provide limited habitat for wetland-associated wildlife due to its proximity to other wetlands (WSE2 and WSE3); however, it is isolated and has limited cover.

1.1.2 Wetland WSE2

Wetland WSE2 is situated at the bottom of a ravine in the north side of the West Seattle Golf Course, just south of Southwest Genesee Street. Wetland WSE2 is bisected by Longfellow Creek, a Type F (fish-bearing) watercourse (Washington Administrative Code 222.16.030 water typing), which flows south to north through the West Seattle Golf Course. Longfellow Creek passes through WSE2 until it reaches a culvert under Southwest Genesee Street.

1.1.2.1 Wetland Determination

Vegetation in Wetland WSE2 contains palustrine emergent and palustrine scrub-shrub plant communities. The emergent community is dominated by reed canarygrass (*Phalaris arundinacea*, a facultative wetland species); some Canada thistle (*Cirsium arvense*, a facultative species) is also present. The scrub-shrub community is dominated by Himalayan blackberry, salmonberry (*Rubus spectabilis*, a facultative species), and jewelweed (*Impatiens capensis,* a facultative wetland species). Bindweed (*Calystegia sepium,* a facultative species) and giant

horsetail (*Equisetum telmateia*, a facultative wetland species) are scattered here as well. Vegetation passed the dominance test.

Soils were examined to a depth of 18 inches; the hydric soil indicator "Depleted Below Dark Surface" was present. From 0 to 9 inches below ground surface, the soil is dark brown loam, with some organic matter. From 9 inches to 18 inches below ground surface, the soil matrix is dark gray loam, with strong brown redoximorphic concentrations.

Hydrology at wetland WSE2 is primarily supported by overbank flooding from Longfellow Creek. A limited amount of water might also flow from the surrounding golf cart pathway. Primary hydrology indicators observed were a high water table (8 inches below ground surface) and oxidized rhizospheres along living roots. In July 2019, the surveying biologists observed a beaver dam. During a second visit in August 2019, Longfellow Creek had noticeably widened upstream of the beaver dam.

1.1.2.2 Rating and Buffers

Wetland WSE2 is a riverine wetland under the hydrogeomorphic system and regulated by the U.S. Army Corps of Engineers, Ecology, and City of Seattle as a Category II wetland. Under Ecology's 2014 rating system, the wetland scores a total of 21 points (8 points for water quality functions, 7 points for hydrologic functions, and 6 points for habitat functions). The City of Seattle requires a 110-foot buffer for all Category II wetlands with a habitat function score of 6 (Seattle Municipal Code 25.09.160.B).

The wetland buffer is dominated by bigleaf maple (*Acer macrophyllum*) and red alder (*Alnus rubra*), English ivy (*Hedera helix*), Himalayan blackberry, and vine maple (*Acer circinatum*). Scotch broom (*Cytisus scoparius*) is scattered along the right bank of Longfellow Creek.

1.1.2.3 City of Seattle Functions and Values Summary

Wetland WSE2 provides several functions and values because of its association with Longfellow Creek, the presence of salmonids in the creek, and the plant cover and seasonal inundation present. The wetland has high potential for sediment removal, toxicant removal, and habitat for aquatic invertebrates and wetland-associated mammals (it contains evidence of beaver use). Its value as habitat may be somewhat limited because it is isolated within the mowed golf course, and plant cover is primarily non-native; however, wetland WSE2 is hydrologically connected to a greenbelt downstream.

1.1.3 Wetland WSE3

Wetland WSE3 is immediately north of Southwest Genesee Street between 26th Avenue Southwest and 30th Avenue Southwest; it stretches from the toe of the slope at Southwest Genesee Street to a pedestrian bridge. Wetland WSE3 is also bisected by Longfellow Creek.

1.1.3.1 Wetland Determination

Vegetation in wetland WSE3 is classified as palustrine, forested. The tree layer is dominated by red alder. The shrub layer is sparsely vegetated with Pacific willow (*Salix lucida*, a facultative wetland species), Indian plum (*Oemleria cerasiformis*; a facultative species), and red-twig dogwood (*Cornus sericea,* a facultative wetland species). The herbaceous layer is dominated by creeping buttercup (a facultative species), with some jewelweed, water parsley (*Oenanthe sarmentosa*, an obligate species), and stinging nettle (*Urtica dioica*, a facultative species). Vegetation passed the dominance test.

Soil was examined to a depth of 20 inches. The hydric soil indicator "Redox Dark Surface" was present. From 0 to 8 inches below ground surface, soils are very dark gray loam with patches of fine sand. From 8 inches to 14 inches below ground surface, soils are very dark gray loam with redoximorphic concentrations (dark reddish brown) in the pore linings of roots. At 14 inches to 20 inches below ground surface, soils are silt loam with some organic matter, and concentrations of dark brown.

Hydrology is primarily supported by overbank flooding from Longfellow Creek. The creek outfalls north of Southwest Genesee Street and immediately forms a pool about 20 feet across. The creek then meanders north through wetland WSE3 until flowing under the pedestrian bridge. The meandering creek is about 6 feet to 15 feet wide with steep banks. No surface water nor a water table were observed within the wetland. Saturation was observed at 14 inches below ground surface. Two secondary hydrologic indicators were observed: a facultative-neutral test and geomorphic position (concave depression at toe of slope).

1.1.3.2 Rating and Buffers

Wetland WSE3 has two hydrogeomorphic classes (depressional and riverine) and in accordance with the 2014 Ecology rating system, was rated as depressional. It is regulated by the U.S. Army Corps of Engineers, Ecology, and the City of Seattle as a Category II wetland. During rating (Ecology 2014), wetland WSE3 scored a total of 22 points (8 for water quality functions, 8 for hydrologic functions, and 6 for habitat functions). The City of Seattle requires a 110-foot buffer for all Category II wetlands with a moderate habitat function score (5 to 7 points; Seattle Municipal Code 25.09.160.B).

Wetland WSE3's buffer is forested with red alder, western red cedar (*Thuja plicata*), and black cottonwood (*Populus balsamifera*). The shrub layer contains tall Oregon grape (*Mahonia aquifolium*) and snowberry (*Symphoricarpos albus).* The herbaceous layer was mostly bare ground, possibly due to recent restoration efforts.

1.1.3.3 City of Seattle Functions and Values Summary

Wetland WSE3 provides several functions due to its association with Longfellow Creek, salmonid presence in the creek, seasonal inundation, and vegetation present. It provides high potential for invertebrate, mammal, and fish habitat, due in part to woody debris installed, vegetation present, and evidence of beaver use. It also provides some educational value because it is situated alongside a public trail, and some sediment removal, erosion control, and production of organic matter.

1.1.4 Wetland WSE4

Wetland WSE4 is at Pigeon Point, underneath the West Seattle Bridge and adjacent to/upslope of a concrete bike path directly south of Southwest Spokane Street. It is just north of the northern edge of the West Duwamish Greenbelt. It stretches up the slope to just above the concrete footing for the West Seattle Bridge.

1.1.4.1 Wetland Determination

Vegetation at wetland WSE4 contains palustrine emergent and palustrine, scrub-shrub communities. Some areas are dominated by Pennsylvania pellitory (*Parietaria pensylvanica*, a facultative upland species), with giant horsetail scattered within the pellitory. Pennsylvania pellitory is an aggressive upland plant that has likely out-competed native wetland vegetation. Therefore, surveyors determined that the hydrophytic vegetation indicator for sample plots here

is “Problematic Hydrophytic Vegetation.” In the scrub-shrub areas, vegetation is dominated by Himalayan blackberry (a facultative species), with sparse herbaceous species: giant horsetail and herb-Robert (*Geranium robertianum*, a facultative upland species).

Soils were examined to a depth of 18 inches. The hydric soil indicator “Redox Dark Surface” was present. In one portion of the wetland, one soil layer was present: black loam, with concentrations of redoximorphic features in the matrix and in pore linings. Trash was present within the soils as well, which indicates some of the soils are construction fill. In another portion of the wetland, two soil layers were described: very dark gray, sandy loam from 0 to 10 inches below ground surface, and from 10 to 16 inches below ground surface, dark gray clay loam, with redoximorphic features (dark yellowish brown).

Hydrology for wetland WSE4 is supported by surface flow from the residential area upslope (Southwest Charleston Street and 20th Avenue Southwest). Water collects at the toe of the slope and flows downhill alongside the bike path. Primary hydrologic indicators at this wetland are a high water table (8 inches below ground surface) and saturation at the surface.

1.1.4.2 Rating and Buffers

Wetland WSE4 is classified as a slope wetland under the hydrogeomorphic system. It is regulated by the U.S. Army Corps of Engineers, Ecology, and the City of Seattle as a Category IV wetland (Ecology 2014). Wetland WSE4 scored a total of 13 points (5 points for water quality, 4 points for hydrologic functions, and 4 points for habitat functions). The City of Seattle (Seattle Municipal Code 25.09.160.B.) requires a 50-foot buffer for all Category IV wetlands of 1,000 square feet or more.

The buffer immediately downslope of wetland WSE4 overlaps pavement, and upslope is deciduous forest dominated by bigleaf maple, oceanspray (*Holodiscus discolor*) and red elderberry (*Sambucus racemosa*), with English ivy and sword fern (*Polystichum munitum*).

1.1.4.3 City of Seattle Functions and Values Summary

Wetland WSE4 provides low potential for a few functions and values: it provides limited flood flow alteration and nutrient/toxicant removal due to its vegetation and presence near paved areas, and provides some wildlife habitat due to its proximity to the West Duwamish Greenbelt (though its low, non-native vegetation and proximity to paved areas, and the bridge may limit the likelihood of wildlife using this location). It also provides some organic matter due to the 100 percent cover of vegetation.

1.2 West Seattle Link Extension Streams and Waterbodies

The West Seattle Link Extension crosses two streams or waterbodies:

- The Duwamish Waterway, which is a shoreline of the state (Type S) with a 200-foot buffer and also is mapped as estuary habitat by Washington Department of Fish and Wildlife’s Priority Habitats and Species database.

- Longfellow Creek, which is a Type F stream with a 100-foot buffer (riparian management area) per City of Seattle regulations, including a limited development area 75 to 100 feet from the creek.

1.2.1 Duwamish Waterway

The Duwamish Waterway is a Shoreline of the State. The City of Seattle regulates in-water or over-water development at the waterway and on uplands within 200 feet of the waterway. The Duwamish Waterway provides open water habitat, pockets of shoreline habitat in between industrial uses, and estuary habitat where it merges with Elliott Bay. The waterway flows through a heavily developed industrial area; very little natural estuarine habitat or intertidal shoreline habitat remains within the study area. Conditions include bulkheads and steep shorelines that are rocky, graveled, or rock with silty areas. Some of the shoreline is hidden by over-water structures, and little vegetation is present. Below-water substrates include sand/mud, gravel or rock, with limited aquatic vegetation.

1.2.2 Longfellow Creek

Longfellow Creek is an approximately 4-mile-long, Type F perennial stream that drains into the Duwamish Waterway. Its watershed drains 2,685 acres of West Seattle. The upper 0.9 mile of the creek (upstream of the study area) has been diverted into underground pipes, and roughly one-third of the total creek flow drains through pipes beneath shopping centers, houses, and roads (City of Seattle 2007). The middle portion of the creek, including the portion within the study area, include daylighted (uncovered) sections with riparian vegetation and large, deep pools that can support fish. The lowest portion of the creek flows about 0.5 mile through underground pipes from just south of Southwest Andover Street to a grated outlet near Terminal 5, where it outfalls to the Duwamish Waterway.

The City of Seattle regulates any development in or over the stream. The City regulates the creek as a riparian watercourse, and the stream and creek together as a fish and wildlife habitat conservation area. This conservation area is designated 100 feet perpendicular from the stream; piped areas are excluded (Seattle Municipal Code 25.09.015; 25.09.200). Some development is allowed in a zone 75 to 100 feet from the stream (the limited development area) if the development meets specific standards, including that it is limited to 35 percent or less of the total limited development area, and complies with requirements for restoration or mitigation (Seattle Municipal Code 25.09.200(3)d).

South of Southwest Genesee Street, Longfellow Creek passes through the West Seattle Golf Course flowing south to north, and ranges from 25 feet to 35 feet wide and is about 4 feet deep. Within the golf course, barriers block anadromous salmon from reaching the creek upstream of the study area (Washington Department of Fish and Wildlife 2019). The creek meanders through patches of reed canarygrass before reaching a beaver dam within wetland WSE2. The water is turbid with glide characteristics (shallow stream with water velocity less than 20 centimeters per second, without surface turbulence) until the beaver dam. The stream below the dam is more channelized. A few pieces of large woody debris are present along this reach. The banks of Longfellow Creek south of Southwest Genesee Street are stable, with beaver slides present. Vegetation on the stream banks consists of Pacific willow, bigleaf maple saplings, Himalayan blackberry, Canada thistle, jewelweed, reed canarygrass, horsetail, and black cottonwood saplings.

Below the beaver dam, the creek flows into an approximately 3-foot-diameter culvert under Southwest Genesee Street. Flooding likely occurs at least 1 foot over the top of the culvert, based on observed water and sediment marks.

North of Southwest Genesee Street, the creek exits the culvert into a pool about 20 feet wide. The left bank of the pool is slightly undercut. Riparian vegetation along the pool is sparse and consists of red alder trees. North of the pool, the creek continues into a glide channel that is 6

feet to 15 feet wide, with steep banks. Moderate riparian vegetation along this reach is provided by willows and red alder. Jewelweed, bittersweet nightshade, reed canarygrass, willows, and slough sedge are present along the banks of the pool and channel. Within the channel, three to four pieces of large woody debris appear to have been installed. The channel widens out before crossing underneath a pedestrian bridge about 100 north of Southwest Genesee Street.

Fines (fine-grained sediment) and cobbles are present in the 25-foot-long stream section just after the pedestrian bridge. Riparian vegetation north of the pedestrian bridge is absent. The creek then enters a series of pools, each about 20 feet long; the ordinary high water marks on the east and west side of the pools are about 40 feet apart at each pool. The drop between each pool is about 18 inches and separated by installed large woody debris. Within each step pool, large cobbles with fines are present. Signs of beaver activity (such as gnawed trees) were observed in Longfellow Creek north of Southwest Genesee Street.

Longfellow Creek continues as an open channel through forested habitat until about 70 feet south of Southwest Andover Street, where it enters underground pipes under Southwest Andover Street and continues underground until its outlet into the Duwamish Waterway near Terminal 5. The open channel reach upstream (south) of Southwest Andover Street is on private property. At the time of survey, project biologists did not have permission to access this private property segment of the reach. A sidewalk survey was conducted along Southwest Andover Street on January 24, 2020. The open channel south of Southwest Andover Street appears to be about 8 to 12 feet wide, with riprapped banks near the culvert. Substrate could not be assessed from the sidewalk. No snags or large woody debris were observed during the sidewalk survey, but 2017 Google Earth aerial imagery suggests that some large woody debris pieces might be present in the channel. Combining visual estimation with tree canopy cover geographic information system data from the City of Seattle (2016), the open channel has dense cover from alder trees, western red cedar, and spruce. The understory is composed of mostly invasive species, including Himalayan blackberry, English ivy, English holly, and reed canarygrass.

1.3 Ballard Link Extension Wetlands

Project biologists identified six wetlands within 300 feet of the Ballard Link Extension study area (Table 1-2; Figure 1-2): wetlands WSE5, WSE6, WSE7, WSE8, WSE9, and WSE10. The wetlands are located in the Southwest Queen Anne Greenbelt and along the slopes bordering the Interbay Golf Center. All of the wetlands are in an urban setting. Wetland WSE9 is a Category IV wetland flanking the Interbay Golf Center. The other five are Category III wetlands associated with the golf center or Southwest Queen Anne Greenbelt. All have limited habitat complexity; however, four have some habitat connectivity because they are all within a biodiversity corridor (the greenbelt), and thus might provide limited habitat for wetland-associated wildlife such as amphibians or small mammals. Each wetland is relatively small and primarily dominated by non-native vegetation (such as Himalayan blackberry, English ivy, and reed canarygrass).

1.3.1 Wetland WSE5

Wetland WSE5 is in the Southwest Queen Anne Greenbelt, adjacent to a dirt pedestrian path behind the Super Supplements store on Elliott Avenue West. The wetland stretches from the toe of the slope immediately next to the pedestrian path to about 215 feet upslope.

Table 1-2. Wetlands Located in the Ballard Link Extension Study Area

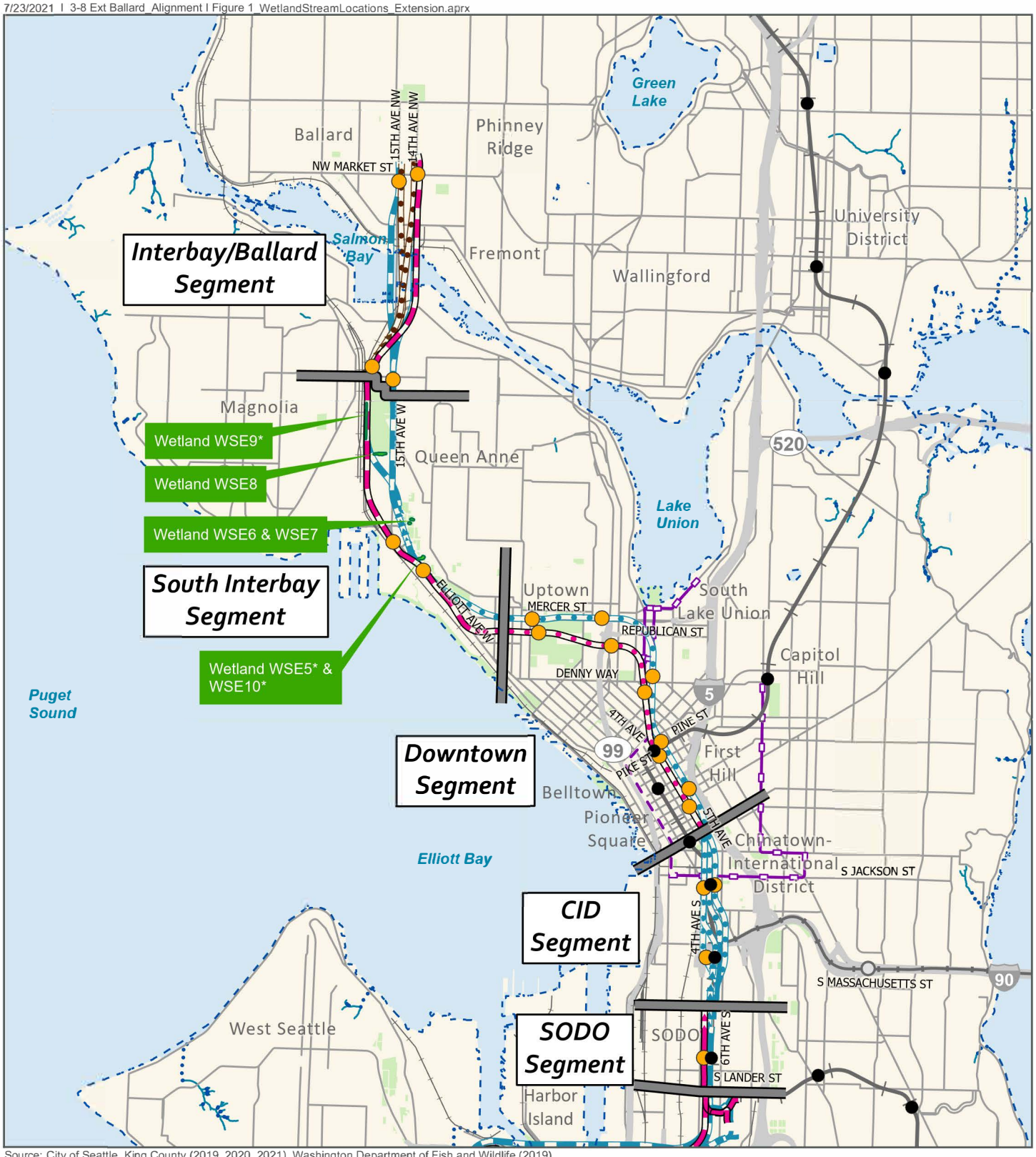
Wetland Identification	Estimated Size [a] (acres)	Cowardin Class	H.G.M. Class	Rating [b]	Function Score [b, c]	Buffer Width [d]	Location
WSE5	0.20	palustrine emergent	Slope	III	4 (low)	60 feet	Behind Super Supplements, in Southwest Queen Anne Greenbelt
WSE6	0.02	palustrine emergent	Depressional	III	4 (low)	60 feet	Southwest Queen Anne Greenbelt
WSE7	0.04	palustrine emergent	Slope	III	4 (low)	60 feet	Southwest Queen Anne Greenbelt
WSE8	0.29	palustrine scrub-shrub	Depressional	III	3 (low)	60 feet	Along south boundary of Interbay Golf Center
WSE9	0.34	palustrine emergent, palustrine scrub-shrub	Depressional	IV	3 (low)	50 feet	Along west boundary of Interbay Golf Center
WSE10	0.01	palustrine scrub-shrub	Slope	III	4 (low)	60 feet	Behind Super Supplements, in Southwest Queen Anne Greenbelt

[a] Based on ArcGIS estimates to determine size relative to rating thresholds; wetlands will be fully delineated prior to the Final Environmental Impact Statement.

[b] Ecology 2014.

[c] Seattle Municipal Code 25.09.160 classifies habitat function score (Ecology 2014) of 3 to 4 as low, 5 to 7 as moderate, and 8 to 9 as high.

[d] Seattle Municipal Code 25.09.160: Category IV wetlands over 1,000 square feet receive a 50 foot buffer. Category III wetlands over 100 square feet (or of any size abutting a Type S, F, Np, or Ns water) with a low habitat score receive a 60-foot buffer.
H.G.M. = hydrogeomorphic



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
- 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
- Shoreline
- Wetland
- Wetland Buffer

Note: 1) *Asterisks denote wetlands subject to potential long-term impacts under one or more of the project alternatives. 2) City and federal mapping of wetlands was reviewed and field verified where possible. Mapping may differ from other public wetland mapping sources.

0 0.5 1 Mile

N

FIGURE 1-2
Wetland and Stream Locations
Ballard Link Extension

West Seattle and Ballard Link Extensions

1.3.1.1 Wetland Determination

The vegetation in wetland WSE5 is palustrine emergent, dominated by bittersweet nightshade (*Solanum dulcamara*, a facultative species) and smallfruit bulrush (*Scirpus microcarpus*, an obligate species). Skunk cabbage (*Lysichiton americanus,* an obligate species), lady fern (*Athyrium felix-femina,* a facultative species), and giant horsetail are scattered throughout. The shrub stratum is sparsely vegetated with Himalayan blackberry and a western red cedar sapling. Vegetation passed the dominance test.

Soils were examined to a depth of 10.5 inches (deeper soils were fully saturated). The hydric soil indicator "Redox Dark Surface" was present. Soils from 0 to 5 inches below ground surface are black sandy loam and from 5 to 10.5 inches below ground surface are black sandy loam, with redoximorphic concentrations (dark reddish brown).

Hydrology at wetland WSE5 is primarily supported by surface flow from the residential area upslope; this water flows through wetland WSE5 until it collects at the pedestrian path. During the site visit, a high water table was observed at 10 inches below ground surface, and saturation was observed at the soil surface.

1.3.1.2 Rating and Buffers

Wetland WSE5 is classified as a slope wetland under the hydrogeomorphic system. It is regulated by the U.S. Army Corps of Engineers, Ecology, and the City of Seattle as a Category III wetland (Ecology 2014), scoring a total of 17 points (7 for water quality, 6 for hydrologic functions, and 4 for habitat functions). The City requires a 60-foot buffer for all Category III wetlands over 100 square feet with a habitat score of 4 (Seattle Municipal Code 25.09.160.B).

The vegetated buffer surrounding wetland WSE5 is mainly on steep slopes with deciduous forest. Dominant trees are bigleaf maple; the buffer understory is sparse with Himalayan blackberry, sword fern, and English ivy.

1.3.1.3 City of Seattle Functions and Values Summary

The vegetation at wetland WSE5 provides moderate value in producing organic matter and some limited ability to remove toxicants. Wetland WSE5 may provide limited habitat for wildlife due to its proximity to other wetlands and the Southwest Queen Anne Greenbelt (although it does not contain areas of standing water). It provides some educational value because it is publicly accessible, and it is in a greenbelt that Washington Department of Fish and Wildlife maps as a Biodiversity Area and Corridor.

1.3.2 Wetland WSE6

Wetland WSE6 is in the Southwest Queen Anne Greenbelt, adjacent to a pedestrian path/vehicle access road.

1.3.2.1 Wetland Determination

Wetland WSE6 contains a palustrine emergent plant community. Vegetation is sparse, possibly due to recent restoration efforts, and contains slough sedge (*Carex obnupta*, an obligate species) and small amounts of skunk cabbage (*Lysichiton americanus*, an obligate species) and field horsetail. The shrub layer had 2 percent total cover entirely comprised of willow stakes (Salix spp.) from restoration efforts. Vegetation passed the dominance test.

Soils were examined to a depth of 16 inches. The soils fit the "Depleted Matrix" hydric soil indicator. Soils from 0 to 9 inches below ground surface are black, sandy loam. From 9 to 16 inches below ground surface, soils are grayish brown, loamy sand with redoximorphic concentrations (very dark gray and strong brown).

Hydrology in wetland WSE6 is primarily supported by surface flow from the residential community upslope. Water flows from the west end of the wetland down the slope and into the depressional bowl. The constricted outlet runs alongside the paved vehicle access road. No primary hydrologic indicators were observed at the time of field visit, but two secondary indicators were observed: drainage patterns and the facultative neutral test.

1.3.2.2 Rating and Buffers

Wetland WSE6 is classified as both a slope and depressional wetland under the hydrogeomorphic system. It is regulated by the U.S. Army Corps of Engineers, Ecology, and the City of Seattle as a Category III wetland (Ecology 2014) and scores a total of 18 points (7 for water quality, 7 for hydrologic functions, and 4 for habitat functions). The City of Seattle requires a 60-foot buffer for all Category III wetlands over 100 square feet in total size with a habitat score of 4 (Seattle Municipal Code 25.09.160.B).

The wetland's buffer is in deciduous forest dominated by bigleaf maple, salmonberry, Indian plum, snowberry, and sword fern.

1.3.2.3 City of Seattle Functions and Values Summary

Wetland WSE6 provides limited functions in several areas rated by the City of Seattle, including flood flow alteration, sediment removal, toxicant removal, and educational potential (as it is publicly accessible). This wetland's sparse vegetation limits its value as wildlife habitat, although it does provide some habitat due to its location in the greenbelt (a Washington Department of Fish and Wildlife Biodiversity Area and Corridor) and proximity to other wetlands (WSE6 and WSE77).

1.3.3 Wetland WSE7

Wetland WSE7 is in the Southwest Queen Anne Greenbelt south of wetland WSE6; its lower edge borders the trail/vehicle access road.

1.3.3.1 Wetland Determination

Vegetation in wetland WSE7 contains a palustrine emergent Cowardin class. The wetland is dominated by thick cover of field horsetail, with some scattered hedge bindweed and low amounts of shrubs (Himalayan blackberry and one Cascara sapling (*Frangula purshiana*, a facultative species). Vegetation passed the dominance test.

Project biologists examined the soil to a depth of 16 inches to determine a hydric soil indicator of "Redox Dark Surface. From 0 to 9 inches below ground surface, the soil is very dark gray loam. Heavy clay forms a restrictive layer at 9 inches below ground surface. From 9 inches to 16 inches below ground surface, the soil matrix is very dark gray and gray clay loam, with redoximorphic concentrations (dark yellowish brown).

Hydrology is primarily supported by surface flow from the slopes and residential community upslope. Water flows downslope through wetland WSE7 and out and over the trail. Soils were saturated to the surface during some site visits, and secondary hydrologic indicators (shallow aquitard and a facultative neutral test) were also present.

1.3.3.2 Rating and Buffers

Wetland WSE7 is classified as a slope wetland under the hydrogeomorphic system. It is regulated by the U.S. Army Corps of Engineers, Ecology, and the City of Seattle as a Category III wetland. During rating (Ecology 2014), wetland WSE7 scored a total of 16 points (7 for water quality, 5 for hydrologic functions, and 4 for habitat functions). The City of Seattle requires a 60-foot buffer for all Category III wetlands over 100 square feet in total size with a habitat score of 4 (Seattle Municipal Code 25.09.160.B).

Wetland WSE7's buffer is in deciduous forest dominated by bigleaf maple, Himalayan blackberry, Indian plum, snowberry, and sword fern.

1.3.3.3 City of Seattle Functions and Values Summary

Wetland WSE7 provides limited functions such as toxicant removal and educational potential (as it is publicly accessible). Its dense herbaceous layer also provides moderate production of organic matter. This wetland's lack of standing water limits its ability to provide flood control, sediment removal, or habitat for wetland-associated wildlife, although it does provide some habitat functions due to its location in the greenbelt (a Washington Department of Fish and Wildlife Biodiversity Area and Corridor) and proximity to other wetlands (WSE5 and WSE6).

1.3.4 Wetland WSE8

Wetland WSE8 is south of the Interbay Golf Center in the Interbay neighborhood. The toe of the slope from the Interbay Golf Center borders north of the wetland, and a dirt access road borders south of the wetland.

1.3.4.1 Wetland Determination

The vegetation community is a palustrine scrub-shrub Cowardin class dominated by dense Himalayan blackberry. The herbaceous layer is dominated with reed canarygrass, with field bindweed (*Convolvulus arvensis*, which does not have a wetland indicator status and is thus considered upland]), lambsquarters (*Chenopodium album*, a facultative upland species), and field horsetail also present. Vegetation passed the dominance test.

Soil was examined to a depth of 14 inches and demonstrated the "Redox Dark Surface" hydric soil indicator. From 0 to 4 inches below ground surface, the soil matrix is a mix of very dark gray and dark reddish brown silt loam. From 4 inches to 12.5 inches below ground surface, this matrix has redoximorphic features (yellowish red) as concentrations and pore linings. From 12.5 inches to 14 inches below ground surface, the matrix is very dark gray with concentrations of yellowish red as concentrations and pore linings.

Hydrology is primarily supported by precipitation and groundwater. Surface flow from Interbay Golf Center may enter the wetland. No surface water, a water table, or saturation were observed during the field visits; however, oxidized rhizospheres (a primary hydrologic indicator) were observed along living roots in the sample soil pit.

1.3.4.2 Rating and Buffers

Wetland WSE8 is classified as depressional under the hydrogeomorphic system. It is regulated by the U.S. Army Corps of Engineers, Ecology, and the City of Seattle as a Category III wetland (Ecology 2014), with a total of 17 points (7 for water quality, 7 for hydrologic functions, and 3 for

habitat functions). The City of Seattle requires a 60-foot buffer for all Category III wetlands over 100 square feet with a habitat score of 3 (Seattle Municipal Code 25.09.160.B).

The wetland buffer is dominated by Himalayan blackberry, as well as areas with reed canarygrass, escaped ornamentals, and vegetable plants.

1.3.4.3 City of Seattle Functions and Values Summary

Wetland WSE8 provides limited functions rated by the City of Seattle, including flood flow alteration (as the wetland is depressional), removal of sediments and toxicants, and production of organic matter (due to the thick vegetative cover). It also provides limited value as wildlife habitat due to the vegetative cover (although it is all non-native) and proximity to other wetlands (WSE9). It is also publicly accessible.

1.3.5 Wetland WSE9

Wetland WSE9 runs north-south near the toe of the slope between the Interbay Golf Center and BNSF Railway rail lines. It is a depressional wetland with no outlet; water is blocked from draining farther downslope by a manmade berm and a cement pipeline along the toe of the slope.

1.3.5.1 Wetland Determination

The vegetation community is palustrine emergent in the wetland's center, dominated by reed canarygrass, and is palustrine scrub-shrub along all of its boundaries, where it is dominated by Himalayan blackberry. Bindweed and bitter nightshade were also present. Vegetation passed the dominance test.

Soils were examined to 12 inches, and they contain the "Depleted Matrix" hydric soil indicator. From 0 to 5 inches soils are very dark brown silt loam; from 5 to 12 inches below ground surface, they are dark gray sandy loam (and may contain fill materials) with brown redoximorphic concentrations. During the site visit, soils were sampled in the upland and wetland scrub-shrub areas, and in emergent wetland. An emergent upland pit was not possible because all upland areas were in the scrub-shrub zone.

Hydrology is primarily supported by precipitation and groundwater (some likely originating from golf course irrigation). In shoulder areas, saturation was present at 6 inches below ground surface, and the water table was present at 10 inches below ground surface.

1.3.5.2 Rating and Buffers

Wetland WSE9 is classified as depressional under the hydrogeomorphic system. It is regulated by the U.S. Army Corps of Engineers, Ecology, and the City of Seattle as a Category IV wetland (Ecology 2014) with a total of 15 points (6 for water quality, 6 for hydrologic functions, and 3 for habitat functions). The City requires a 50-foot buffer for all Category IV wetlands over 1,000 square feet (Seattle Municipal Code 25.09.160.B).

1.3.5.3 City of Seattle Functions and Values Summary

Wetland WSE9 provides some limited functions, including flood flow alteration (because the wetland is depressional), removal of sediments and toxicants (from the golf center), and production of organic matter (due to the thick vegetative cover). It also provides limited value as

wildlife habitat from the vegetative cover (though this is all non-native) and proximity to other wetlands (WSE8).

1.3.6 Wetland WSE10

Wetland WSE10 is a small, wedge-shaped wetland directly across a small trail from wetland WSE5 in the Southwest Queen Anne Greenbelt. It is a slope wetland; water arrives in the wetland from wetland WSE5's drainage, but as the two wetlands are separated by a dirt road, it is described as a separate wetland.

1.3.6.1 Wetland Determination

The wetland WSE10 vegetation community is palustrine scrub-shrub due to thick cover of Himalayan blackberry. English ivy is also present, rooted in non-saturated areas but covering much of the ground. Vegetation passed the dominance test due to the blackberry.

Project biologists examined the soils to 18 inches. Soils there are sandy loam and silty loam; they are not natural conditions, as they appeared to be a mix of native soils and fill, with a thick layer of leaf litter sitting on the top of the soil and many leaves mixed into the top foot of soil. The adjacent parking lot contains several oak trees and the greenbelt contains maples; leaf fall on the parking lot has been regularly placed on the wetland slope. Redoximorphic features were located 11 inches below ground surface on the edge of the seepage area; soils in the wetland center were too heavily saturated to see redox features.

Hydrology is primarily supported by groundwater seeping from the wetland upslope (WSE7). A dirt road separates the two wetlands. Seeping water leaves the wetland along the edge of the paved parking lot at Super Supplements. During the site visit, soils were saturated at 5 inches deep, and the water table was present 13 inches below the surface.

1.3.6.2 Rating and Buffers

Wetland WSE10 is classified as a slope wetland under the hydrogeomorphic system. It is regulated by the U.S. Army Corps of Engineers, Ecology, and the City of Seattle as a Category III wetland (Ecology 2014) with a total of 16 points (7 for water quality, 5 for hydrologic functions, and 4 for habitat functions). The City requires a 60-foot buffer for all Category III wetlands over 100 square feet (Seattle Municipal Code 25.09.160.B) with low-level (function score of 3 or 4) habitat function.

1.3.6.3 City of Seattle Functions and Values Summary

Wetland WSE10 provides some limited functions, including removal of toxicants (from residences upslope above wetland WSE7) and production of organic matter (due to the thick vegetative cover). It also provides limited value as wildlife habitat due to the vegetative cover, its location on the edge of the Southwest Queen Anne Greenbelt, and its proximity to wetland WSE7. It also provides some educational value because it is viewable from a publicly accessible parking lot.

1.4 Ballard Link Extension Streams and Waterbodies

The Ballard Link Extension crosses one waterbody, Salmon Bay, which is a shoreline of the state with a 200-foot buffer. One of the Build Alternatives would cross the Lake Washington Ship Canal. The extension would not cross any streams.

The Salmon Bay shoreline habitat 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. The bay is about 0.2 to 0.3 mile across, from the north shore to the south shore, within the study area.

East of Ballard Bridge is the Lake Washington Ship Canal. There are many old pilings present in the sediment, cut off at or near the mudline. At the Seattle Maritime Academy (on the northeastern side of 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. Plants here include native red osier dogwood (*Cornus sericea*) and grasses, yellow flag iris (*Iris peudacorus*), and morning glory species.

Native shoreline vegetation is also present at the 11th Avenue Northwest Street-end on the northern side of the Lake Washington Ship Canal. 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 and the Lake Washington Ship Canal are Type S (Shoreline of the State) waters with buffers of 200 feet. Shorelines are covered under Seattle's Shoreline Master Program, which specifies shoreline zones, permitted uses, and development standards. The northern shoreline of Salmon Bay and the southern shoreline east of the Ballard Bridge is zoned Urban Industrial. The southern shoreline west of the Ballard Bridge is zoned as Urban Maritime (City of Seattle 2018). The Muckleshoot Indian Tribe and the Suquamish Tribe have usual and accustomed treaty fishing rights in the study area, including Salmon Bay.

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2 DIRECT IMPACTS

This section describes direct impacts that would occur to wetlands and wetland buffers in the study area, including both long-term impacts from the operation of the project and short-term impacts during construction.

Regulatory buffers for wetlands were determined based on Seattle Municipal Code Chapter 25.09. Note that wetland buffer analyses included paved areas within the buffer. The City of Seattle sometimes requires mitigation for changes to such paved areas within a buffer, and addresses these on a case-by-case basis. Wetland buffers may not extend into paved areas when permitting is complete.

2.1 West Seattle Link Extension Wetland Impacts

There would be no direct impacts to wetlands in the SODO Segment because there are no wetlands in the study area for this segment. Impacts in the West Seattle Junction Segment would be limited to 0.002 acre of construction impact to wetland WSE1, which is not expected to occur when permitting is complete because it would be in a paved area of the buffer.

Impacts to wetlands in the Duwamish and Delridge segments are shown in Tables 2-1 and 2-2. Figures 2-1 through 2-4c show wetland impacts for each alternative in the West Seattle Link Extension corridor.

Table 2-1. Summary of Direct Impacts to Wetlands, West Seattle Link Extension – Duwamish Segment

Alternative Name	Alternative Identification	Long-term Wetland Impacts (acres)	Construction-related Wetland Impacts (acres) [a]	Long-term Wetland Buffer Impacts (acres)	Construction-related Wetland Buffer Impacts (acres) [a]	Wetlands Affected
Preferred South Crossing	DUW-1a	0 to 0.1 [b]	0 to 0.1 [b]	0.1 to 0.6 [b]	0 to 0.2 [b]	WSE4
South Crossing South Edge Crossing Alignment Option	DUW-1b	No Impact	0.1	0.2	0.2	WSE4
North Crossing	DUW-2	No Impact	No Impact	No Impact	No Impact	Not Applicable

[a] Construction impacts represent areas temporarily impacted by the project, outside of the long-term project footprint.

[b] Ranges of impacts indicate differences from connecting to different alternatives in adjacent segment.

Table 2-2. Summary of Direct Impacts to Wetlands, West Seattle Link Extension – Delridge Segment

Alternative Name	Alternative Identification	Long-term Wetland Impacts (acres)	Construction-related Wetland Impacts (acres) [a]	Long-term Wetland Buffer Impacts (acres)	Construction-related Wetland Buffer Impacts (acres) [a]	Wetlands Affected
Preferred Dakota Street Station	DEL-1a	No Impact	No Impact	0.5	0.4	WSE2, WSE3
Dakota Street Station North Alignment Option	DEL-1b	No Impact	No Impact	0.8	0.4	WSE2, WSE3
Preferred Dakota Street Station Lower Height	DEL-2a*	No Impact	No Impact	0.4	0.4	WSE1, WSE2, WSE3
Dakota Street Station Lower Height North Alignment Option	DEL-2b*	No Impact	<0.1	0.6	0.4	WSE2, WSE3
Delridge Way Station	DEL-3	No Impact	No Impact	0.6	0.4	WSE2, WSE3
Delridge Way Station Lower Height	DEL-4*	No Impact	No Impact	0.5	0.4	WSE1, WSE2, WSE3
Andover Street Station	DEL-5	No Impact	No Impact	No Impact	No Impact	No Impact
Andover Street Station Lower Height	DEL-6*	No Impact	No Impact	No Impact	No Impact	No Impact

* As described in the introduction to Chapter 2, Alternatives Considered, of the Draft Environmental Impact Statement, 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] Construction impacts represent areas temporarily impacted by the project, outside of the long-term project footprint.

Figure 2-1_2-2_DirectImpact_Wetlands_WSE1 Date: 7/19/2021 4:00 PM

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

Operations Footprint

- Dakota Street Station (Lower Height) (DEL-2a)
- Delridge Way Station (Lower Height) (DEL-4)
- Construction Footprint
- Wetland
- Wetland Buffer

FIGURE 2-1
Direct Impacts to Wetland WSE1
West Seattle Link Extension - Delridge Segment
West Seattle and Ballard Link Extensions

0 125 250 Feet

N

Figure 2-1_2-2_DirectImpact_Wetlands_WSE1 Date: 7/19/2021 4:01 PM

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

Operations Footprint

- Tunnel 41st Avenue Station (WSJ-3a)
- Tunnel 42nd Avenue Station Option (WSJ-3b)
- Construction Footprint
- Wetland
- Wetland Buffer

FIGURE 2-2

Direct Impacts to Wetland WSE1

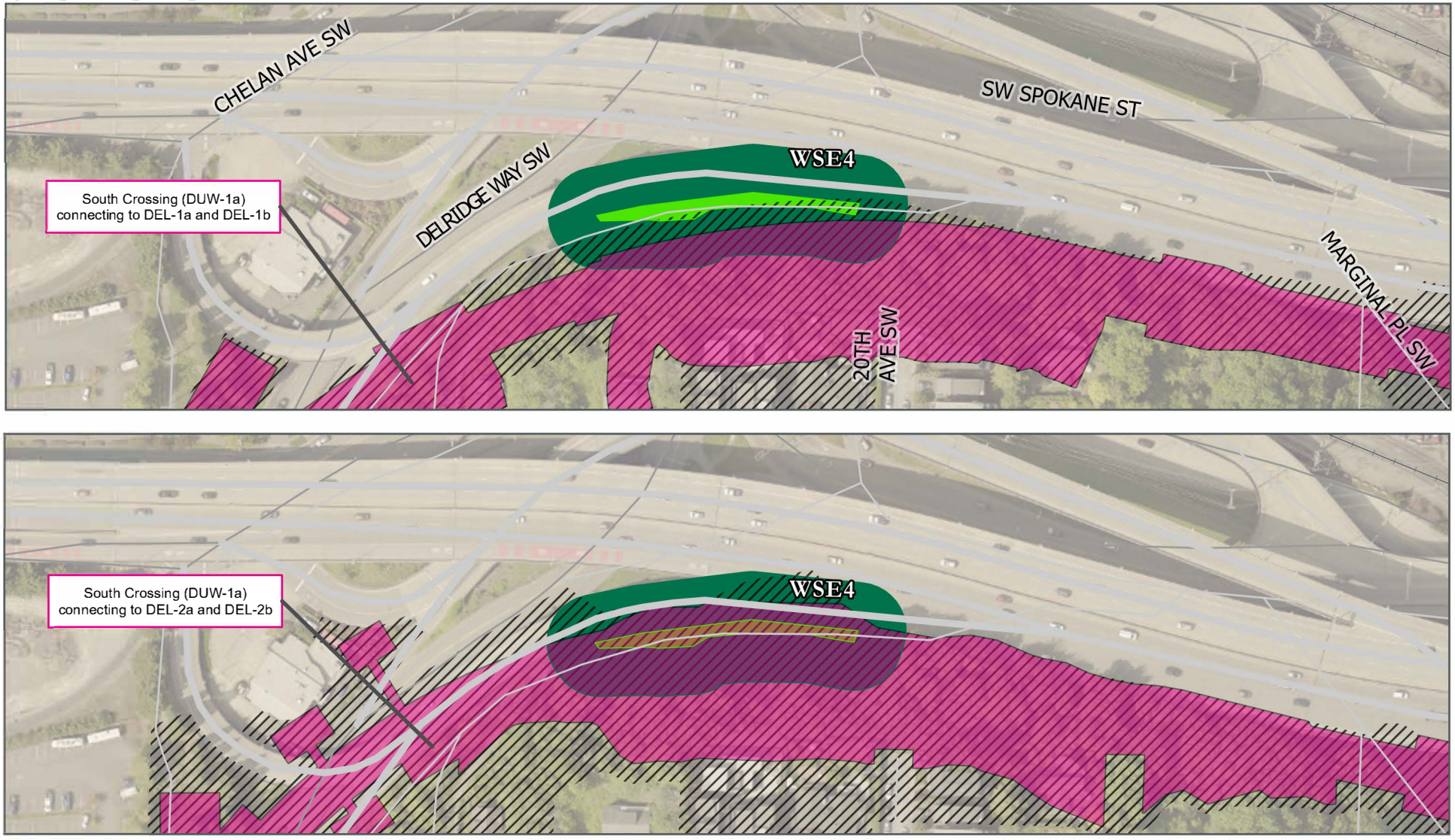
West Seattle Link Extension - West Seattle Junction Segment

West Seattle and Ballard Link Extensions

0 125 250 Feet

N

Figure 2-3_DirectImpact_Wetlands_WSE1 Date: 7/19/2021 4:06 PM



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

Operations Footprint

- South Crossing (DUW-1a) connecting to DEL-1a and DEL-1b
- South Crossing (DUW-1a) connecting to DEL-2a and DEL-2b
- Construction Footprint
- Wetland
- Wetland Buffer

FIGURE 2-3a

Direct Impacts to Wetland WSE4

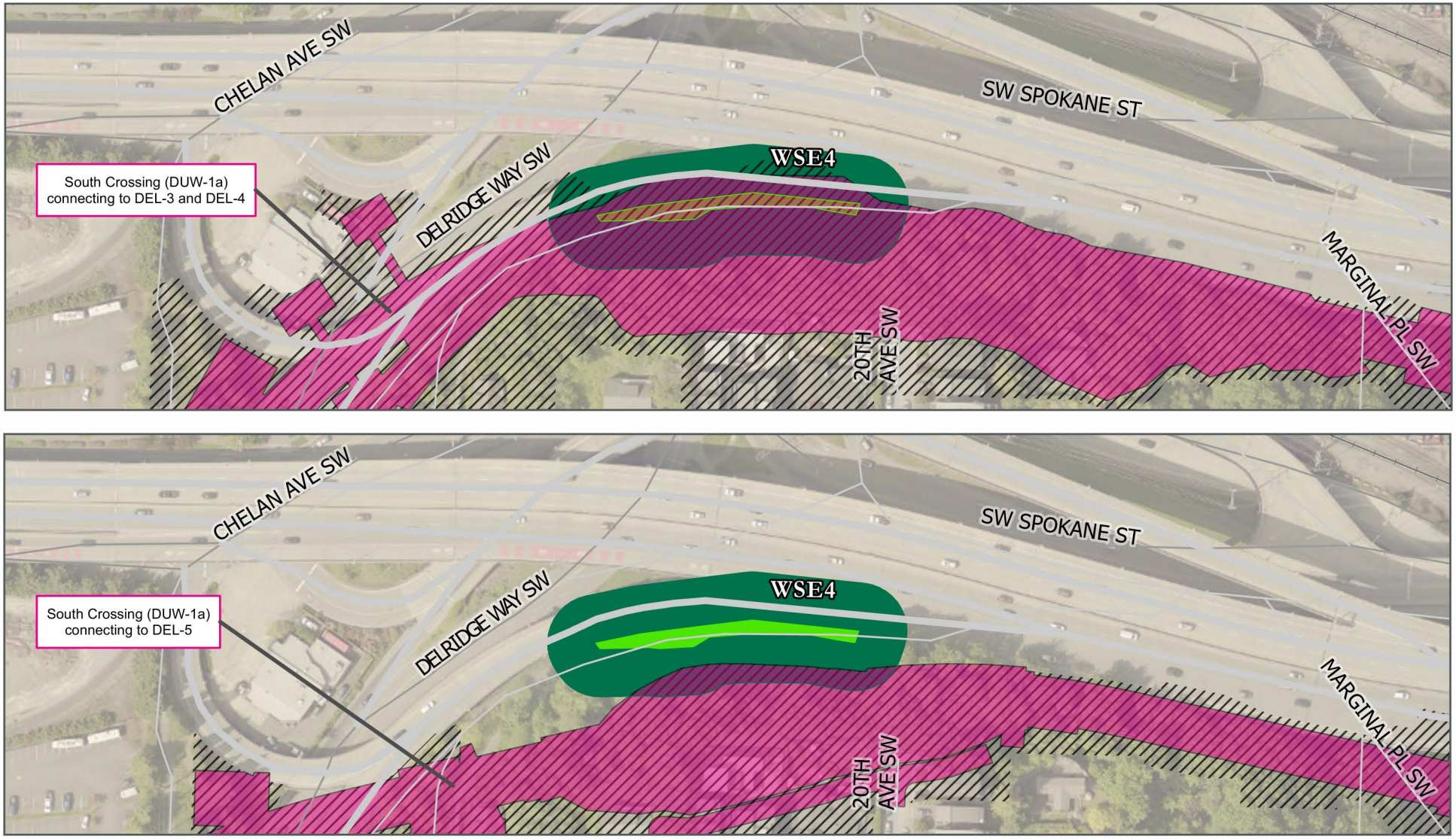
West Seattle Link Extension - Duwamish Segment

West Seattle and Ballard Link Extensions

0 100 200 Feet

N

Figure 2-3_DirectImpact_Wetlands_WSE1 Date: 7/19/2021 4:06 PM



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

Operations Footprint

- South Crossing (DUW-1a) connecting to DEL-3 and DEL-4
- South Crossing (DUW-1a) connecting to DEL-5
- Construction Footprint
- Wetland
- Wetland Buffer

FIGURE 2-3b

Direct Impacts to Wetland WSE4

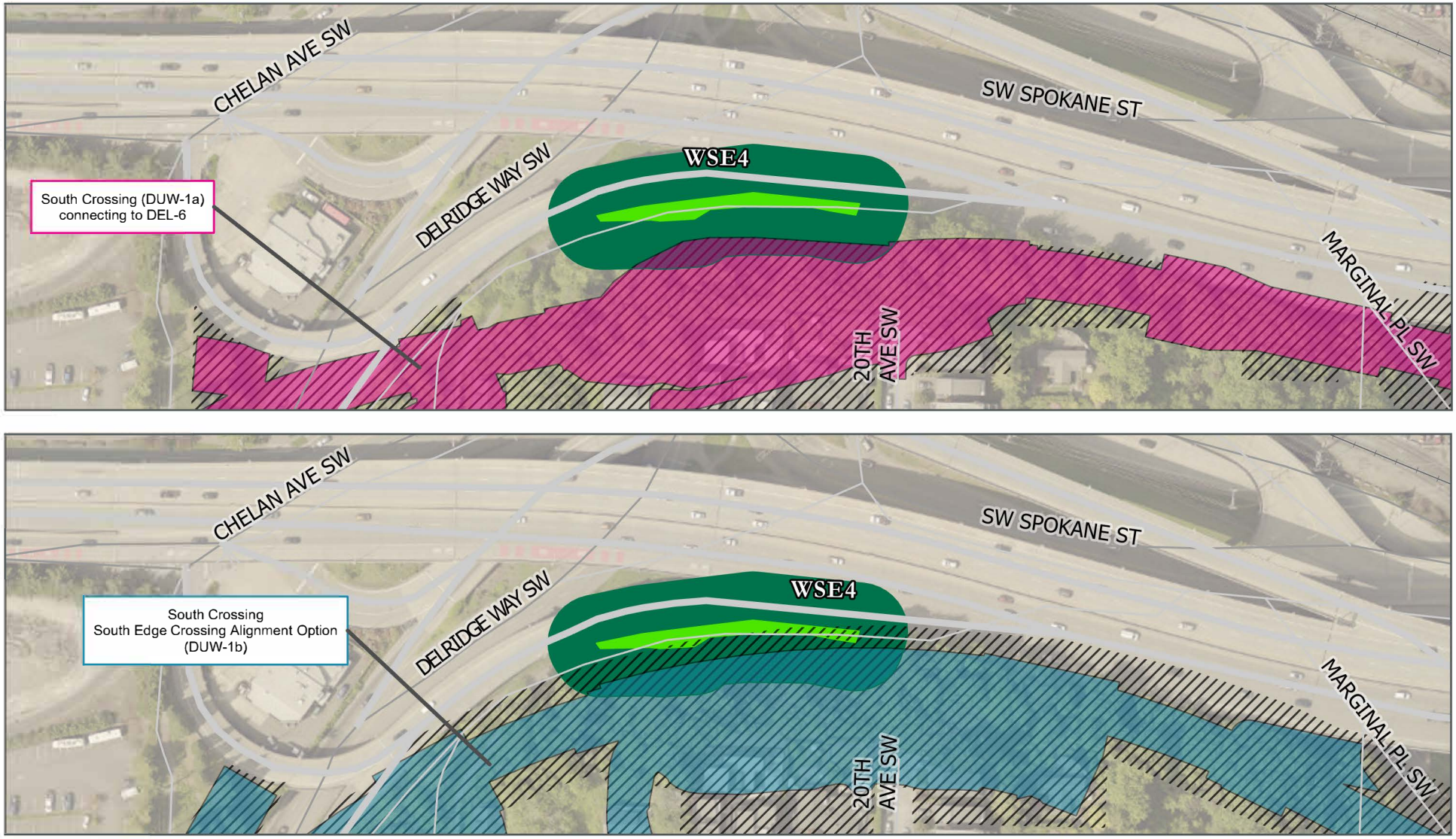
West Seattle Link Extension - Duwamish Segment

West Seattle and Ballard Link Extensions

0 100 200 Feet

N

Figure 2-3_DirectImpact_Wetlands_WSE1 Date: 7/19/2021 4:08 PM



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

Operations Footprint

- South Crossing (DUW-1a) connecting to DEL-6
- South Crossing South Edge Crossing Alignment Option (DUW-1b)
- Construction Footprint
- Wetland
- Wetland Buffer

FIGURE 2-3c

Direct Impacts to Wetland WSE4

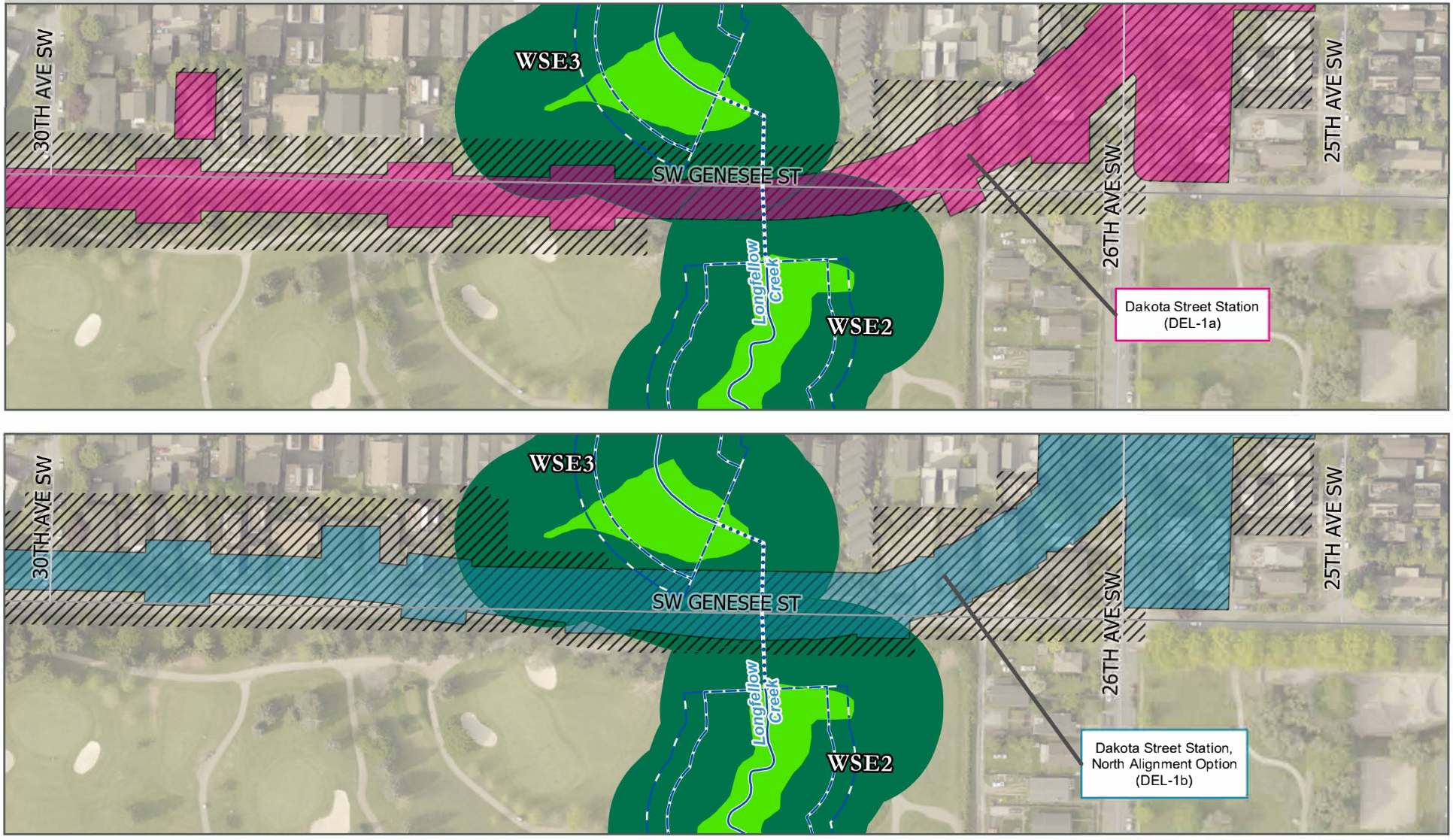
West Seattle Link Extension - Duwamish Segment

West Seattle and Ballard Link Extensions

0 100 200 Feet

N

Figure 2-4_DirectImpact_Wetlands_WSE2_WSE3_LongfellowCreek Date: 7/23/2021 6:12 PM



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

Operations Footprint

- Dakota Street Station (DEL-1a)
- Dakota Street Station, North Alignment Option (DEL-1b)
- Construction Footprint
- Wetland
- Wetland Buffer
- Stream
- Piped Stream
- Riparian Management Zone
- Limited Development Zone

FIGURE 2-4a

Direct Impacts to Wetlands WSE2, WSE3 and Longfellow Creek

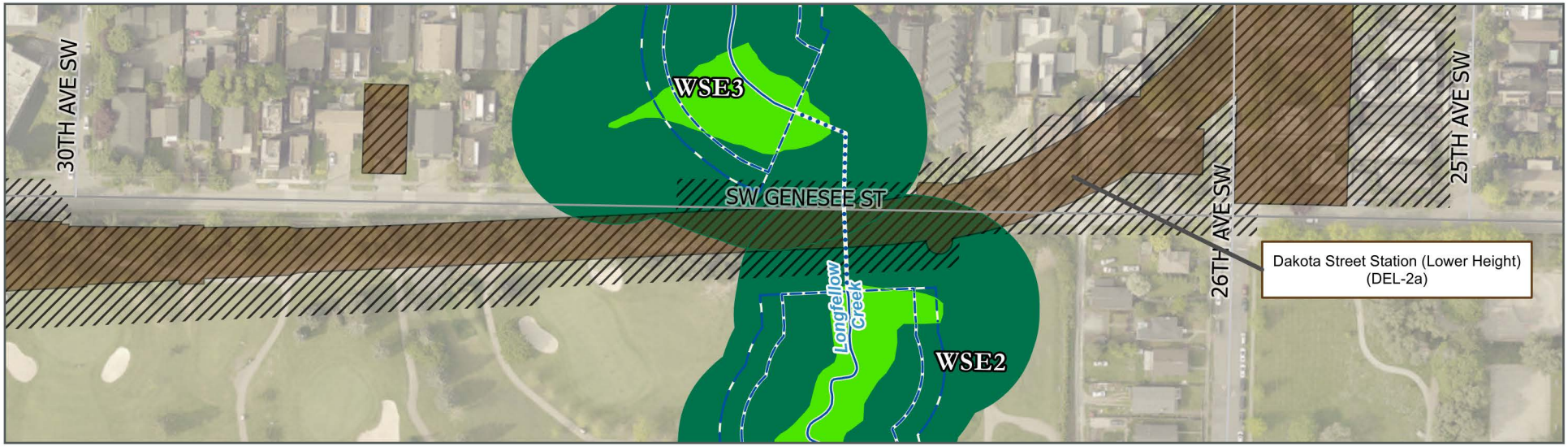
West Seattle Link Extension - Delridge Segment

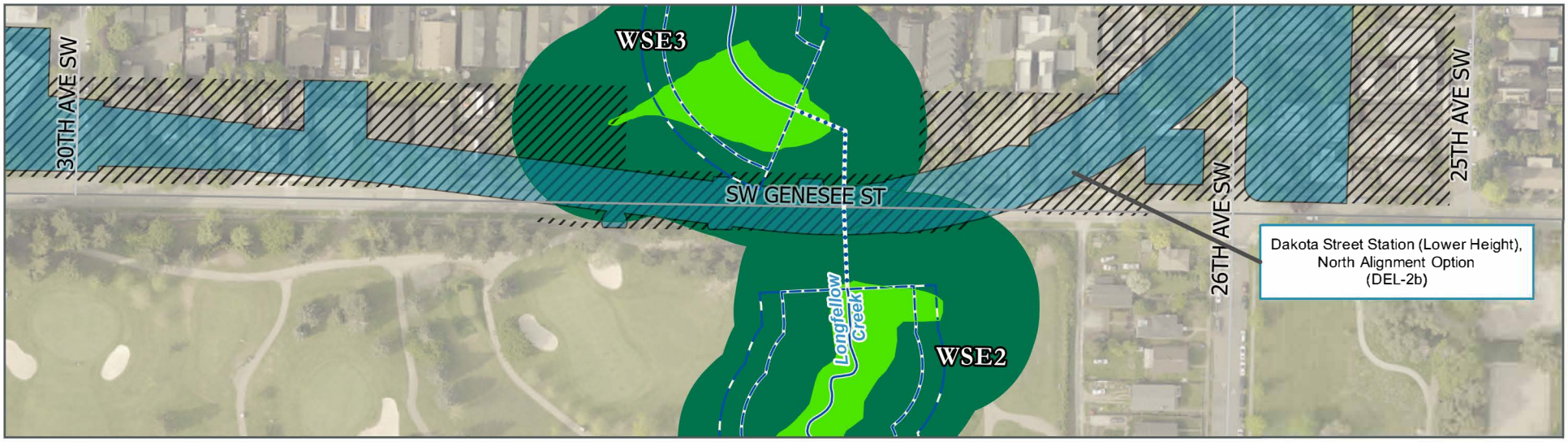
West Seattle and Ballard Link Extensions

0 150 300 Feet

N

Figure 2-4_DirectImpact_Wetlands_WSE2_WSE3_LongfellowCreek Date: 7/23/2021 6:10 PM





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

Operations Footprint

- Dakota Street Station (Lower Height) (DEL-2a)
- Dakota Street Station (Lower Height), North Alignment Option (DEL-2b)
- Construction Footprint
- Wetland
- Wetland Buffer
- Stream
- Piped Stream
- Riparian Management Zone
- Limited Development Zone

FIGURE 2-4b

Direct Impacts to Wetlands WSE2, WSE3 and Longfellow Creek

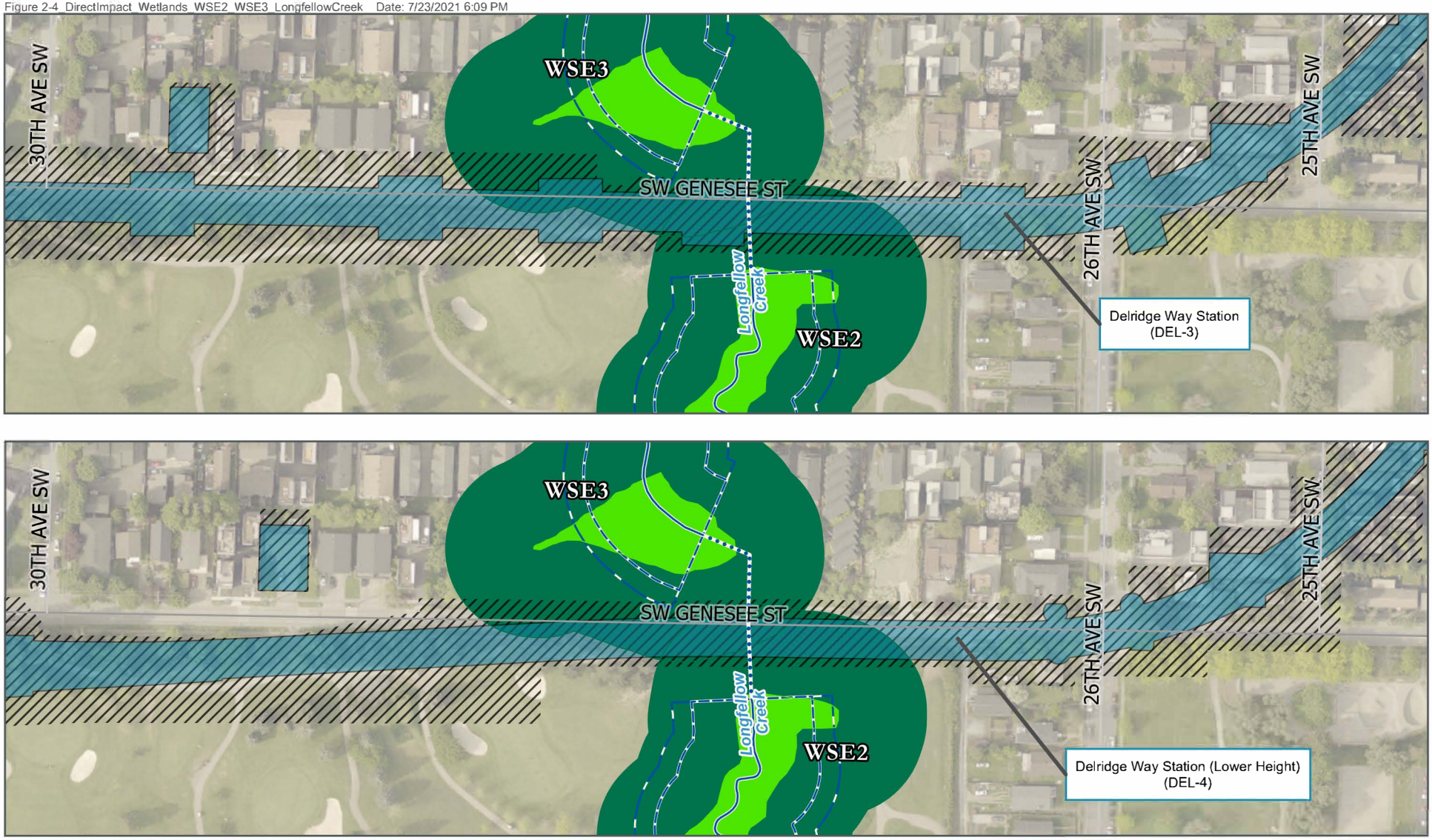
West Seattle Link Extension - Delridge Segment

West Seattle and Ballard Link Extensions

0 150 300 Feet

N

Figure 2-4_DirectImpact_Wetlands_WSE2_WSE3_LongfellowCreek Date: 7/23/2021 6:09 PM



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

Operations Footprint

- Delridge Way Station (DEL-3)
- Delridge Way Station (Lower Height) (DEL-4)
- Construction Footprint
- Wetland
- Wetland Buffer
- Stream
- Piped Stream
- Riparian Management Zone
- Limited Development Zone

FIGURE 2-4c

Direct Impacts to Wetlands WSE2, WSE3 and Longfellow Creek

West Seattle Link Extension - Delridge Segment

West Seattle and Ballard Link Extensions

0 150 300 Feet

N

2.2 West Seattle Link Extension Impacts to Streams/Waterbodies

Direct impacts to waterbodies along the West Seattle Link Extension would occur in the Duwamish and Delridge segments. Direct impacts to the Duwamish Waterway and Longfellow Creek are presented in Tables 2-3, 2-4, and 2-5. Longfellow Creek impacts for each alternative are shown on Figures 2-4a through 2-4c above. Duwamish Waterway impacts are shown on Figures 2-5a and 2-5b.

Table 2-3. Summary of Impacts to Streams/Waterbodies, West Seattle Link Extension – Duwamish Segment

Alternative Name	Alternative Identification	Number of Permanent In-Water Piers	Approximate Area of Construction Impacts in Waterbody (acres) [a]	Over-water Structures (acre) [b]	Permanent Benthic Surface Impacts (acre)
Preferred South Crossing	DUW-1a	0 to 2	0 to 0.3 [c]	0.6 to 0.8	0 to <0.1 [c]
South Crossing South Edge Crossing Alignment Option	DUW-1b	4 to 5	0.2 to 1.0 [c]	0.7 to 0.9	<0.1 to 0.4 [c]
North Crossing	DUW-2	0 to 3	0 to 0.9	0.7 to 0.9	0 to 0.5

Note: The ranges of impacts shown represent impacts from different bridge types; support guideway column locations would vary by bridge type, and some bridge types for Preferred Alternative DUW-1a and Alternative DUW-2 could avoid in-water work.

[a] These construction impacts represent the total area of the cofferdam footprints and work trestle column support footprints that would be placed on the benthic surface, minus the area of columns that would remain permanently in the waters. All this in-water work would occur in salmonid critical habitat and essential fish habitat.

[b] This area represents the total area of elevated bridge features over the Duwamish Waterway; this does not include bridge guideway columns or pile caps in the water; these are shown in the permanent benthic impacts column.

[c] Less than 0.1 acre of impact is associated with storm drain outfall relocations during construction and for permanent impacts.

Table 2-4. Summary of Impacts to Shorelines, West Seattle Link Extension – Duwamish Segment

Alternative Name	Alternative Identification	Shoreline: Long-term Impacts (linear feet) [a]	Shoreline: Construction Impacts (linear feet) [b, c]	Shoreline Buffer: Long-term Impacts (acres) [a, c]	Shoreline Buffer: Construction Impacts (acres) [b, c]
Preferred South Crossing	DUW-1a	600	400	2	3
South Crossing South Edge Crossing Alignment Option	DUW-1b	500	1,000	2	3
North Crossing	DUW-2	500	700	2	6

[a] To estimate permanent shoreline impacts, the impact analyses for all alternatives assumed a complete loss of habitat within the permanent footprint. Actual impacts may be less where the guideway is elevated or where shoreline is already developed.

[b] These construction impacts represent areas that would be temporarily impacted by the project, outside of the long-term project footprint.

[c] Shoreline buffer includes both paved and unpaved surfaces; paved areas may be eliminated when permitting is complete.

Table 2-5. Summary of Impacts to Streams/Waterbodies, West Seattle Link Extension – Delridge Segment

Alternative Name	Alternative Identification	Longfellow Creek: Long-term or Construction Impact (acres)	Longfellow Creek Riparian Management Area within 75 feet [a]: Long-term Impact (acres) [b]	Longfellow Creek Riparian Management Area within 75 feet [a]: Construction Impact (acres) [b]	Longfellow Creek Limited Riparian Development Area [a]: Long-term Impact (acres) [b]	Longfellow Creek Limited Riparian Development Area [a]: Construction Impact (acres) [b]
Preferred Dakota Street Station	DEL-1a	No Impact	No Impact	<0.1 [c, d]	No Impact	<0.1 [c, d]
Dakota Street Station North Alignment Option	DEL-1b	No Impact	<0.1 [c, d]	No Impact	<0.1 [c, d]	No Impact
Preferred Dakota Street Station Lower Height*	DEL-2a	No Impact	No Impact	No Impact	No Impact	<0.1 [c, d]
Dakota Street Station Lower Height North Alignment Option*	DEL-2b	No Impact	No Impact	No Impact	No Impact	<0.1 [c, d]
Delridge Way Station	DEL-3	No Impact	No Impact	No Impact	No Impact	<0.1 [c, d]
Delridge Way Station Lower Height*	DEL-4	No Impact	No Impact	No Impact	No Impact	<0.1 [c, d]
Andover Street Station	DEL-5	No Impact	No Impact	<0.1 [c]	No Impact	<0.1 [c]
Andover Street Station Lower Height*	DEL-6	No Impact	No Impact	<0.1 [c]	No Impact	<0.1 [c]

* As described in the introduction to Chapter 2, Alternatives Considered, of the Draft Environmental Impact Statement, 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: To estimate stream impacts, the impact analyses for all alternatives includes all stream or buffer areas under the guideways, regardless of whether the guideways are elevated or at-grade/retained-cut. All of the long-term impacts shown in this table would be areas shaded by guideway.

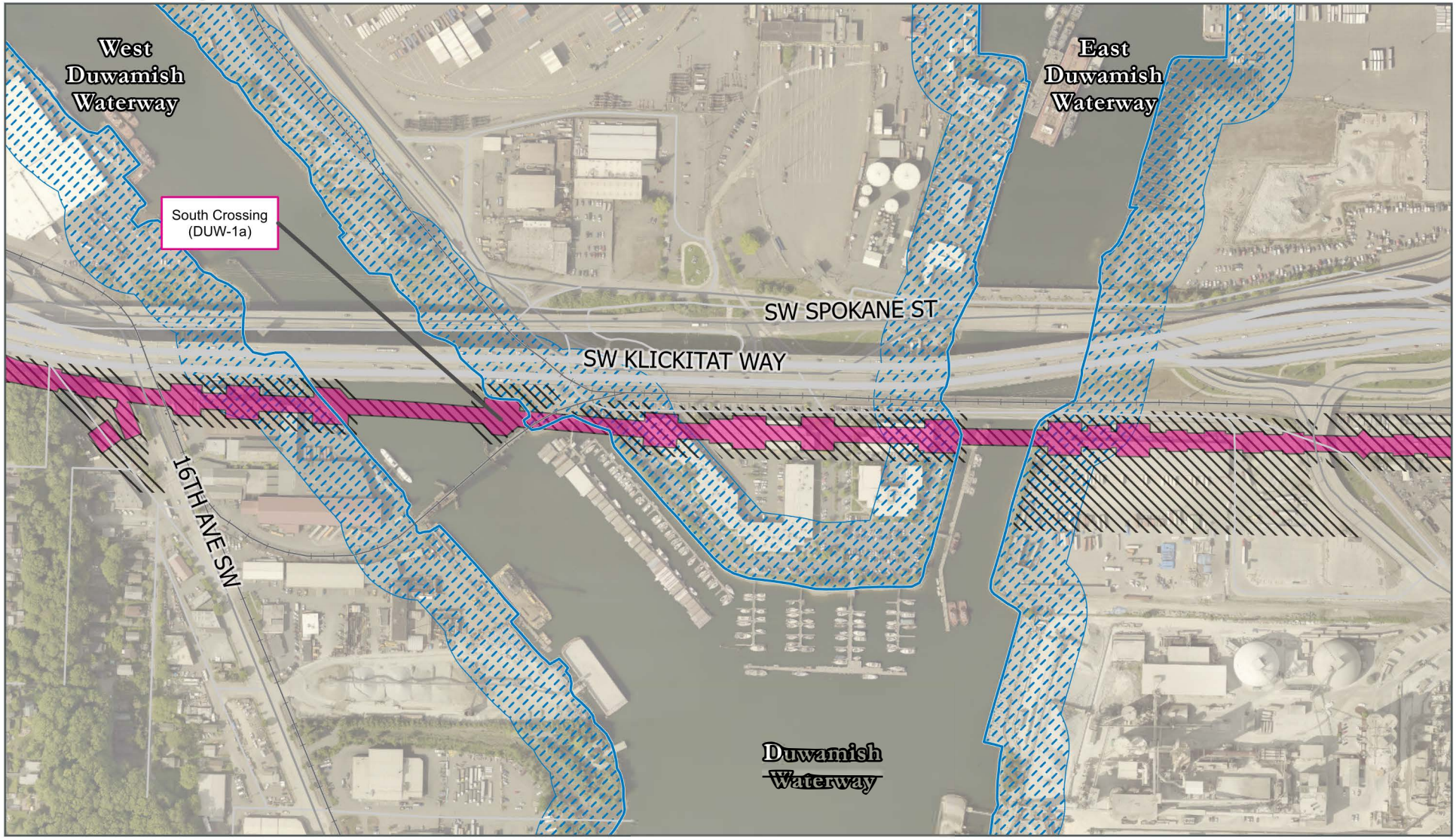
[a] The riparian management area is 0 to 100 feet from the stream. The City of Seattle allows some development activities in a subset of the management area (the limited riparian development area) 75 to 100 feet from the stream (Seattle Municipal Code 25.09.200).

[b] Riparian management area was calculated for areas perpendicular from daylighted sections of Longfellow Creek; piped stream is excluded from City of Seattle riparian management regulations.

[c] These metrics may include paved areas within 75 feet of the stream; these may be removed from impact metrics following coordination with the City of Seattle.

[d] These impact areas are overlapped by the 110-foot wetland buffers around wetlands WSE2 and WSE3.

Figure 2-5_DirectImpact_Waterbody_DuwamishWaterway Date: 7/23/2021 3:35 PM



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

Operations Footprint

South Crossing (DUW-1a)

Construction Footprint

Shoreline

Shoreline Buffer (200 feet)

FIGURE 2-5a

Direct Impacts to Duwamish Waterway

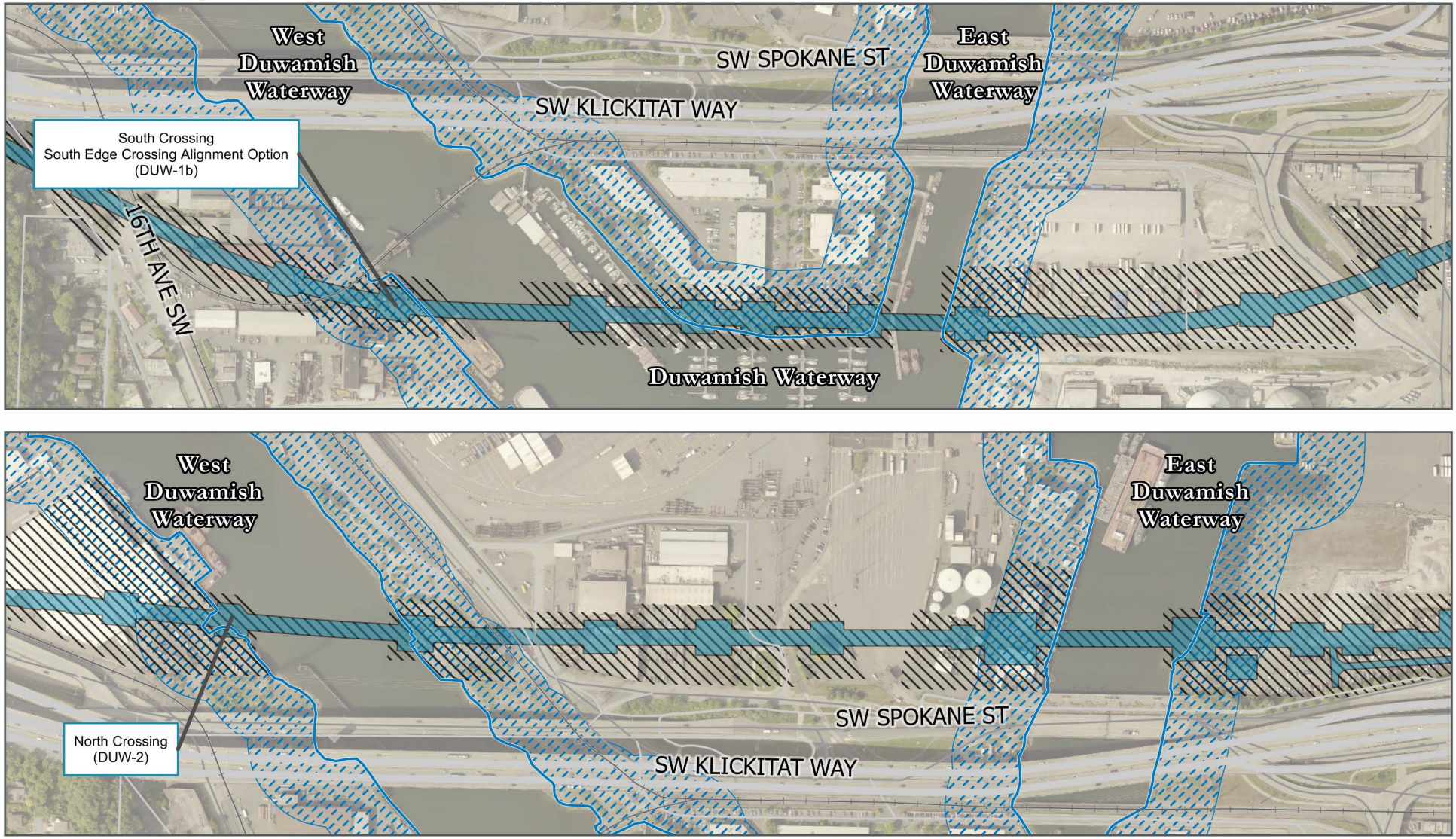
West Seattle Link Extension - Duwamish Segment

West Seattle and Ballard Link Extensions

0 300 600 Feet

N

Figure 2-5_DirectImpact_Waterbody_DuwamishWaterway Date: 7/23/2021 6:20 PM



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

Operations Footprint

- South Crossing South Edge Crossing Alignment Option (DUW-1b)
- North Crossing (DUW-2)
- Construction Footprint
- Shoreline
- Shoreline Buffer (200 feet)

FIGURE 2-5b

Direct Impacts to Duwamish Waterway

West Seattle Link Extension - Duwamish Segment

West Seattle and Ballard Link Extensions

0 300 600 Feet

N

2.3 Ballard Link Extension Wetland Impacts

Impacts to individual wetlands in the Ballard Link Extension study area are shown in Table 2-6. These would occur only in the South Interbay Segment; there are no wetlands in the study area in the SODO, Chinatown-International District, Downtown, or Interbay/Ballard segments.

Areas where buffers overlap impervious surfaces, including roads, have not been excluded from these impact numbers. These conditions may change when permitting is complete.

Figures 2-6a through 2-8 show where these impacts would occur for each wetland with each alternative.

Table 2-6. Summary of Direct Impacts to Wetlands, Ballard Link Extension – South Interbay Segment

Alternative Name	Alternative Identification	Wetland: Long-term Impacts (acres)	Wetland and other Waters of the United States: Construction Impacts (acres) [a]	Wetland Buffer: Long-term Impacts (acres)	Wetland Buffer: Construction Impacts (acres) [a]	Wetlands Affected
Preferred Galer Street Station/Central Interbay	SIB-1	0.2	0.2	1.4	0.9	WSE5, WSE9, WSE10
Prospect Street Station/15th Avenue	SIB-2	0.1	No Impact	0.5	No Impact	WSE5, WSE10
Prospect Street Station/Central Interbay	SIB-3	0.2	0.2	1.9	0.9	WSE5, WSE8, WSE9, WSE10

[a] Construction impacts represent areas temporarily impacted by the project, outside of the long-term project footprint.

Figure 2-6_DirectImpact_Wetland_WSE5_WSE10 Date: 7/19/2021 4:24 PM

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

Operations Footprint

Galer Street Station/Central Interbay (SIB-1)

Construction Footprint

Wetland

Wetland Buffer

FIGURE 2-6a

Direct Impacts to Wetlands WSE5 and WSE10

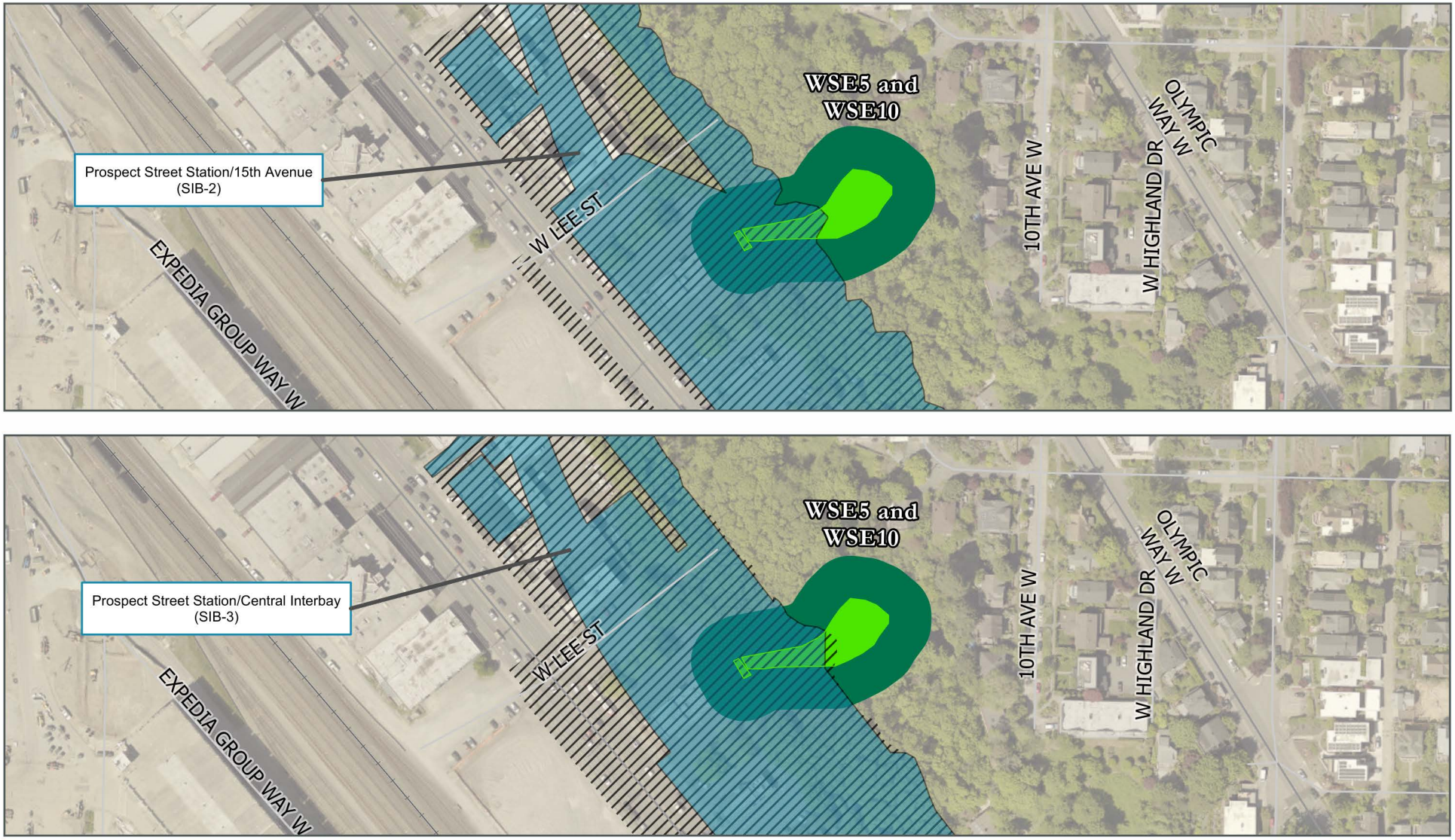
Ballard Link Extension -
South Interbay Segment

West Seattle and
Ballard Link Extensions

0 150 300 Feet

N

Figure 2-6_DirectImpact_Wetland_WSE5_WSE10 Date: 7/19/2021 4:25 PM



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

Operations Footprint

- Prospect Street Station/15th Avenue (SIB-2)
- Prospect Street Station/Central Interbay (SIB-3)
- Construction Footprint
- Wetland
- Wetland Buffer

FIGURE 2-6b

Direct Impacts to Wetlands WSE5 and WSE10

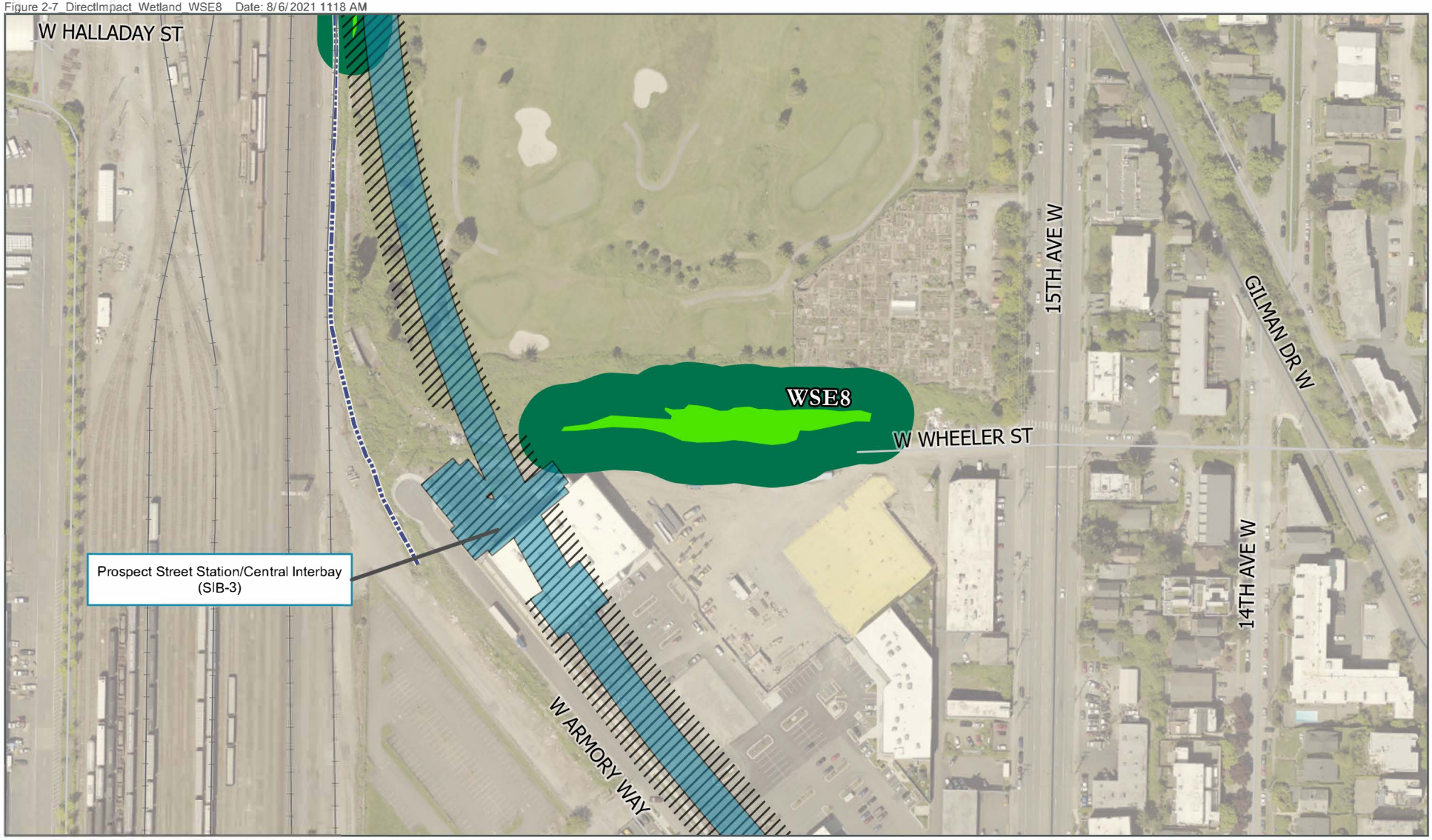
Ballard Link Extension - South Interbay Segment

West Seattle and Ballard Link Extensions

0 150 300 Feet

N

Figure 2-7_DirectImpact_Wetland_WSE8 Date: 8/6/2021 1118 AM



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

Operations Footprint

- Prospect Street Station/Central Interbay (SIB-3)
- Construction Footprint
- Wetland
- Wetland Buffer
- Jurisdictional Ditch

FIGURE 2-7

Direct Impacts to Wetland WSE8

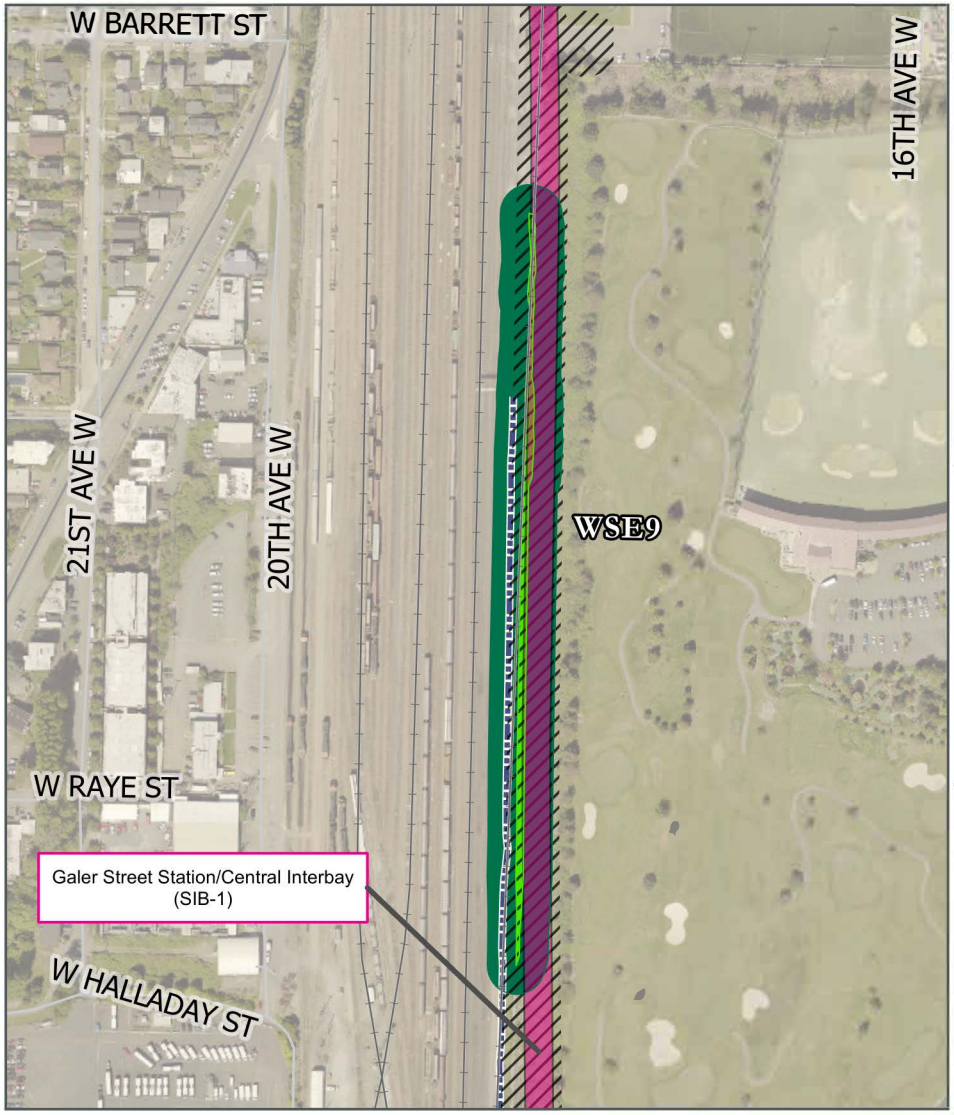
Ballard Link Extension - South Interbay Segment

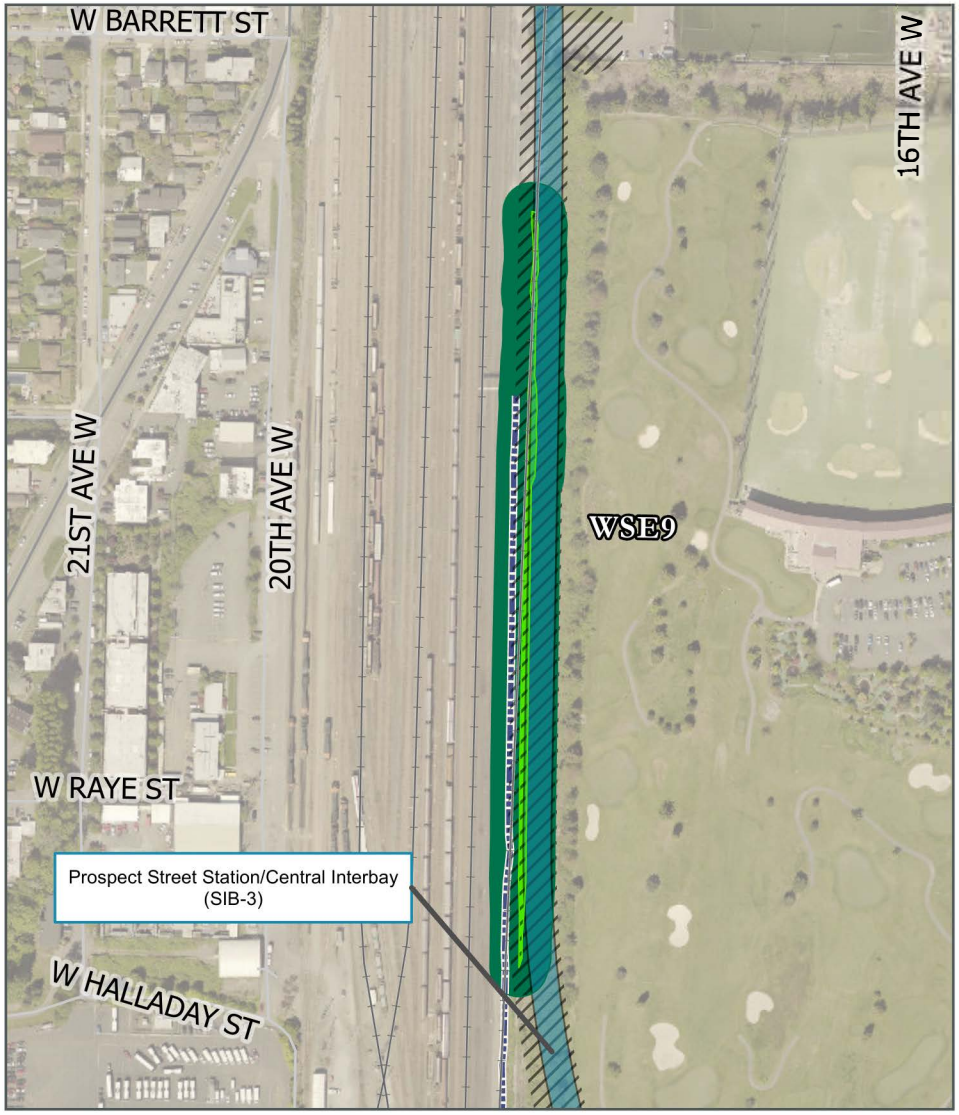
West Seattle and Ballard Link Extensions

0 140 280 Feet

N

Figure 2-8_DirectImpact_Wetland_WSE9 Date: 8/6/2021 11:21 AM





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

Operations Footprint

- Galer Street Station/Central Interbay (SIB-1)
- Prospect Street Station/Central Interbay (SIB-3)
- Construction Footprint
- Wetland
- Wetland Buffer
- Jurisdictional Ditch

FIGURE 2-8

Direct Impacts to Wetland WSE9

Ballard Link Extension - South Interbay Segment

West Seattle and Ballard Link Extensions

0 200 400 Feet

N

2.4 Ballard Link Extension Impacts to Streams/Waterbodies

Direct impacts to Salmon Bay/Lake Washington Ship Canal are shown in Tables 2-7 and 2-8. Figures 2-9a and 2-9b show where these impacts would occur for each alternative.

Table 2-7. Summary of Direct Impacts to Streams/Waterbodies, Ballard Link Extension – Interbay Ballard Segment

Alternative	Alternative Identification	Number of Permanent In-Water Piers	Approximate Area of Construction Impacts in waterbody (acres) [a]	Over-water Structures (acres) [b]	Permanent Benthic Surface Impacts (acre)
Preferred Elevated 14th Avenue	IBB-1a	1 to 3	0.5 to 1.5 [c]	0.7 to 0.9	0.8 to 1.2 [d]
Elevated 14th Avenue Alignment Option (from Prospect Street Station/15th Avenue)	IBB-1b	1 to 3	0.5 to 1.5 [c]	0.7 to 0.9	0.8 to 1.2 [d]
Preferred Tunnel 14th Avenue	IBB-2a*	0	No Impact	No Impact	No Impact
Preferred Tunnel 15th Avenue Station Option	IBB-2b*	0	No Impact	No Impact	No Impact
Elevated 15th Avenue	IBB-3	5 to 9	0.7 to 1.7 [e]	1.2 to 1.3	0.2 to 0.8 [e]

* As described in the introduction to Chapter 2, Alternatives Considered, of the Draft Environmental Impact Statement, 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: The range of impacts shown represent impacts from different bridge types; support guideway column locations would vary by bridge type.

[a] These construction impacts represent the total area of the cofferdam footprints and work trestle column support footprints that would be placed on the benthic surface, minus the area of guideway columns that would remain permanently in the waters.

[b] This area represents the total area of elevated bridge features that would shade Salmon Bay. It does not include the area of bridge guideway columns and pile caps in the water, which are presented as benthic surface impacts. The over-water structures would occur over salmonid critical habitat and essential fish habitat for salmonids and groundfish.

[c] These impacts include 0.1 acre of construction impact associated with the replacement of the 14th Avenue outfall and 0.2 acre of impact associated with relocation of the 14th Avenue Northwest Boat Ramp.

[d] These impacts include 0.6 acre of permanent impact associated with the replacement of the 14th Avenue outfall and <0.1 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 during construction and for permanent impacts.

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Table 2-8. Summary of Direct Impacts to Shorelines, Ballard Link Extension – Interbay Ballard Segment

Alternative	Alternative Identification	Shoreline: Long-term Impacts (linear feet of shoreline) [a]	Shoreline: Construction Impacts (linear feet of shoreline) [b]	Shoreline Buffer: Long-term Impacts (acres) [a, c]	Shoreline Buffer: Construction Impacts (acres) [b, c]
Preferred Elevated 14th Avenue	IBB-1a	400 [d]	1,000 [e]	1	6
Elevated 14th Avenue Alignment Option (from Prospect Street Station/15th Avenue)	IBB-1b	400 [d]	1,000 [e]	1	6
Preferred Tunnel 14th Avenue	IBB-2a*	No Impact	No Impact	No Impact	No Impact
Preferred Tunnel 15th Avenue Station Option	IBB-2b*	No Impact	No Impact	No Impact	No Impact
Elevated 15th Avenue	IBB-3	500	800	1	2

* As described in the introduction to Chapter 2, Alternatives Considered, of the Draft Environmental Impact Statement, 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] To estimate permanent shoreline impacts, the impact analyses for all alternatives assumed an at-grade profile that would result in a complete loss of habitat within the permanent footprint. Actual impacts may be less where the guideway is elevated.

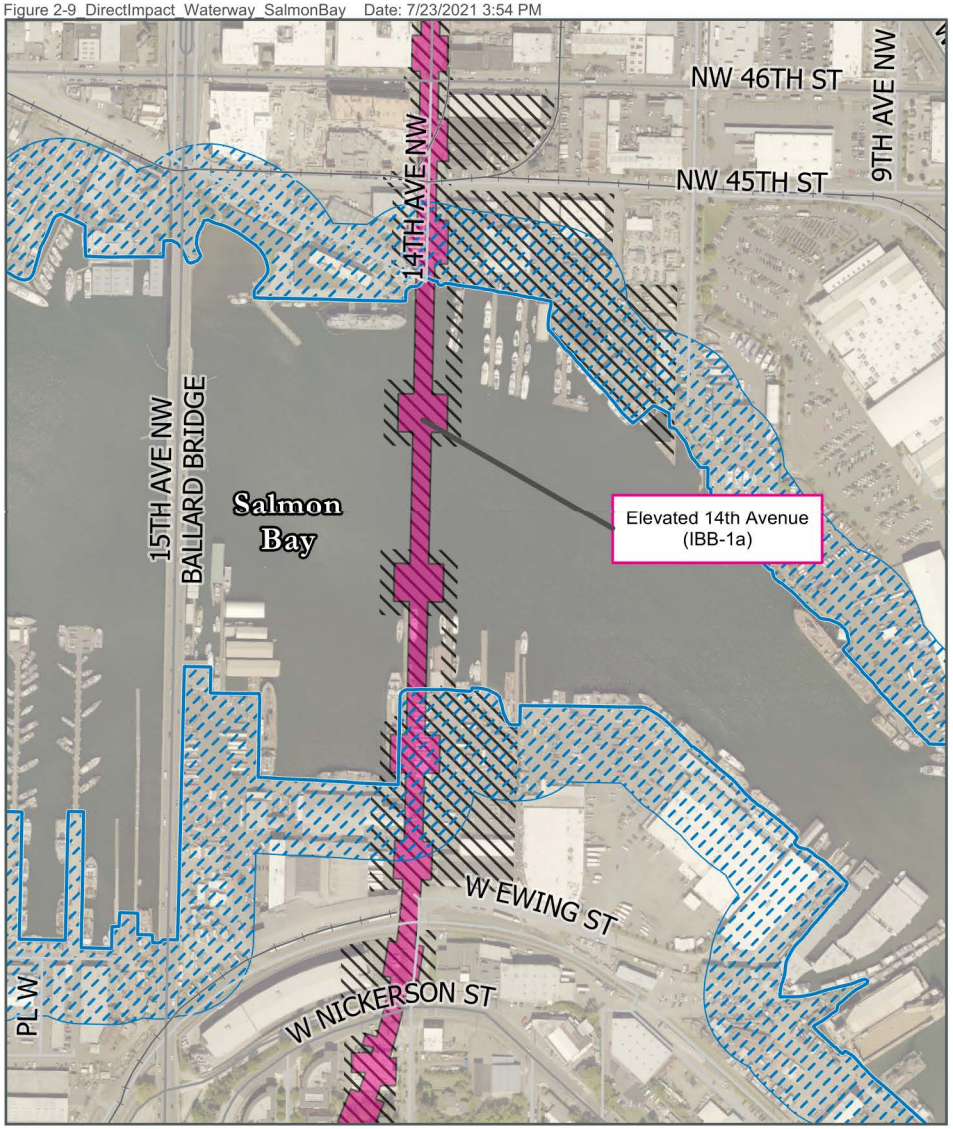
[b] These construction impacts represent areas that would be temporarily impacted by the project, outside of the long-term project footprint.

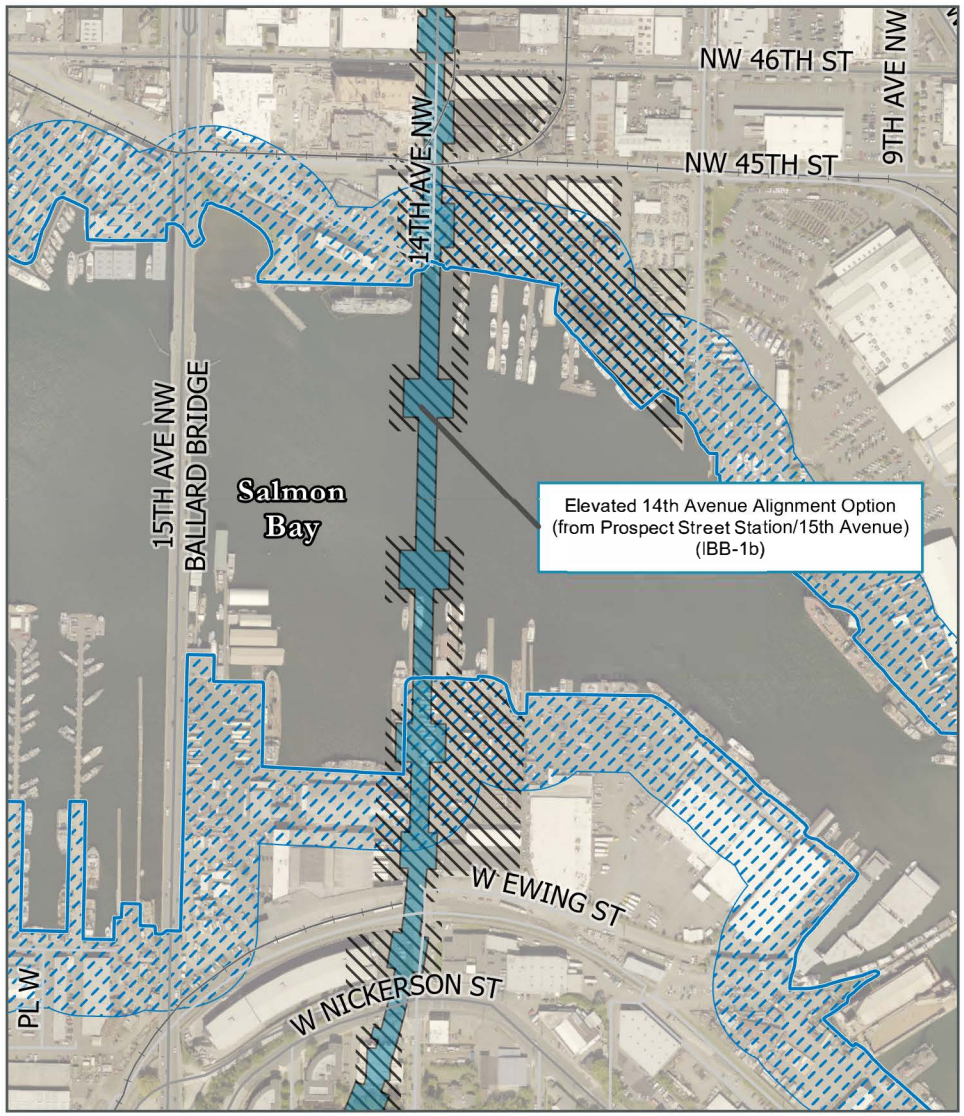
[c] Shoreline buffer includes both paved and unpaved surfaces; paved areas may be eliminated once permitting is complete.

[d] These shoreline impacts include 74 linear feet of permanent impact from the relocation of the 14th Avenue outfall and 64 linear feet of permanent impact associated with relocation of the 14th Avenue Northwest Boat Ramp.

[e] These shoreline impacts include 116 linear feet of construction impact from the relocation of the 14th Avenue outfall and 91 linear feet of construction impact associated with relocation of the 14th Avenue Northwest Boat Ramp.

Figure 2-9_DirectImpact_Waterway_SalmonBay Date: 7/23/2021 3:54 PM





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

Operations Footprint

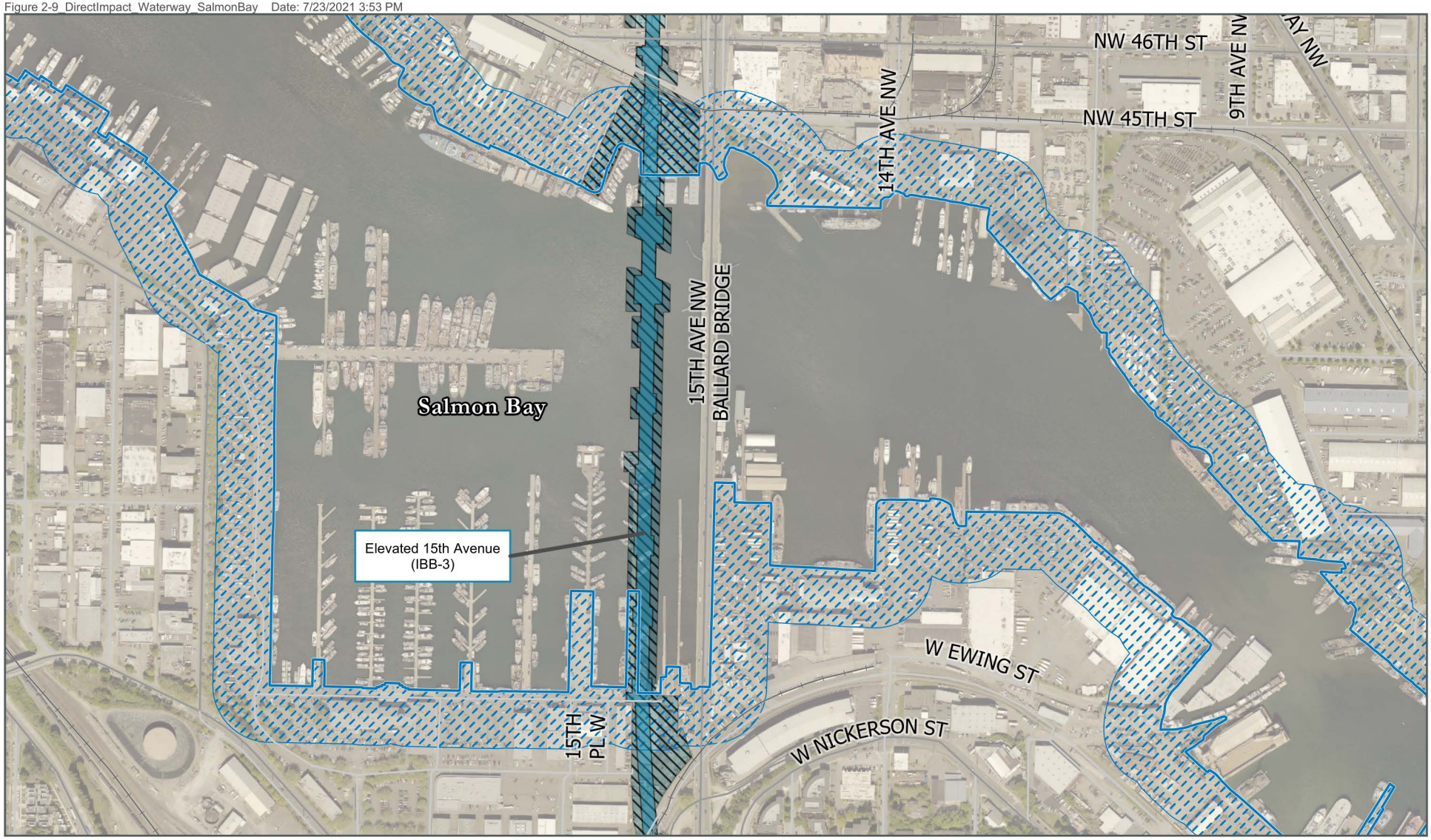
- Elevated 14th Avenue (IBB-1a)
- Elevated 14th Avenue Alignment Option (From Prospect Street Station/15th Avenue) (IBB-1b)
- Construction Footprint
- Shoreline
- Shoreline Buffer (200 feet)

FIGURE 2-9a
Direct Impacts to Salmon Bay
Ballard Link Extension - Interbay/Ballard Segment
West Seattle and Ballard Link Extensions

0 350 700 Feet

N

Figure 2-9_DirectImpact_Waterway_SalmonBay Date: 7/23/2021 3:53 PM



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

Operations Footprint

- Elevated 15th Avenue (IBB-3)
- Construction Footprint
- Shoreline
- Shoreline Buffer (200 feet)

FIGURE 2-9b

Direct Impacts to Salmon Bay

Ballard Link Extension - Interbay/Ballard Segment

West Seattle and Ballard Link Extensions

0 350 700 Feet

N

3 REFERENCES

Brinson, M.M. 1993. *A Hydrogeomorphic Classification for Wetlands. Wetlands Research Program Technical Report* WRP-DE-4. U.S. Army Corps of Engineers Waterways Experiment Station. Vicksburg, Mississippi.

City of Seattle. 2007. *State of the Waters 2007 Report: Volume 1, Seattle Watercourses*. https://www.seattle.gov/util/cs/groups/public/@spu/@conservation/documents/webcontent/spu01_003413.pdf.

City of Seattle. 2018. Seattle Department of Construction & Inspections GIS. http://seattlecitygis.maps.arcgis.com/apps/webappviewer/index.html?id=f822b2c6498c4163b0cf908e2241e9c2.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States.* FWS/OBS-70/31, United States Fish and Wildlife Service. Washington, D.C.

Hruby, T. 2014. *Washington State Wetland Rating System for Western Washington: 2014 Update.* (Publication #14-06-029). Washington Department of Ecology. Olympia, Washington.

Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016. *2016 National Wetland Plant List*. U.S. Army Corps of Engineers. https://www.lrp.usace.army.mil/Portals/72/2016%20National%20Wetland%20Plant%20List.pdf?ver=2016-06-16-094823-560. April 28, 2016.

Null, W.S., G. Skinner, and W. Leonard. 2000. *Wetland functions characterization tool for linear projects*. Washington State Department of Transportation, Environmental Affairs Office, Olympia, Washington.

U.S. Army Corps of Engineers. 1987. *Corps of Engineers Wetland Delineation Manual*.

U.S. Army Corps of Engineers. 2010. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (Version 2.0). U.S. Army Engineer Research and Development Center. Vicksburg, Mississippi.

Washington State Department of Ecology (Ecology). 2014. *Washington State Wetland Rating System for Western Washington*. Publication 14-06-029. https://fortress.wa.gov/ecy/publications/documents/1406029.pdf. October.

Washington Department of Fish and Wildlife (WDFW). 2019. SalmonScape. Online database. http://apps.wdfw.wa.gov/salmonscape/map.html. Accessed October 2020.

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Attachment N.4F
Best Management Practices for Ecosystems Resources

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Attachment N.4F Best Management Practices for Ecosystems Resources

1 BEST MANAGEMENT PRACTICES

This document describes best management practices (BMPs) that can be used to avoid and minimize construction and long-term impacts of the West Seattle and Ballard Link Extensions (WSBLE) Project on sensitive ecosystem resources. These BMPs are either required by state or federal agencies to obtain permits required for the project or may be required to comply with typical permit conditions. They are based on Sound Transit's knowledge of permit requirements and experience for numerous other projects in the Puget Sound region.

2 DESIGN BEST MANAGEMENT PRACTICES TO MITIGATE OPERATIONAL EFFECTS

2.1 Wetlands, Streams and Waterbodies

Sound Transit would avoid or minimize adverse long-term effects of the WSBLE Project on wetlands, streams, and waterbodies through design, to the greatest extent practicable. Design aspects that would be incorporated into the project include elevated guideways; siting guideway columns and other elevated guideway features to span and avoid direct impacts on wetlands, streams. and waterbodies; and using retaining walls to reduce the footprint of at-grade guideway sections, thus reducing the extent of fill in wetlands.

Sound Transit would mitigate unavoidable impacts on wetlands, wetland and stream buffers, shorelines, and benthic habitats that are protected under federal, state, and local regulations. The project design would avoid direct impacts on Longfellow Creek, the only stream crossed by the project. Some unavoidable impacts on Longfellow Creek's riparian area would be mitigated by improving stream habitat and riparian function by replanting affected areas with native vegetation. Unavoidable impacts to the Duwamish Waterway (also known as the Duwamish River) and Salmon Bay's shoreline and benthic habitat would also be mitigated through compensatory mitigation, in accordance with applicable federal, state, and local requirements and guidelines, to achieve no net loss of ecosystem function.

In addition, the following measures and BMPs would be implemented:

- Sound Transit would design permanent stormwater treatment infrastructure and flow-control measures to minimize impacts on stream water quality and flow. These features would meet the requirements of the City of Seattle.

- The proposed stormwater management for the WSBLE Project follows the *Sound Transit Design Criteria Manual* (Sound Transit 2021), which requires stormwater design for Sound Transit projects to conform to the requirements of the local jurisdictions. The project will comply with the local design manual, Volume 3: Project Stormwater Control of the City of Seattle Stormwater Manual (City of Seattle 2021), which exceeds the criteria required by the state (Washington State Department of Ecology).

- Runoff treatment BMPs that are best suited to the site conditions and best capable of achieving the required levels of treatment would be selected, designed, and installed. These may include natural or engineered dispersion BMPs; biofiltration BMPs such as vegetated filter strips, rain gardens, biofiltration swales, or media filters; wet-pool BMPs; and infiltration BMPs.

- Water discharged from dewatering activities would be settled to reduce sediments before release. Discharge of dewatering water to a sanitary sewer may also be an option if permission can be secured from the local sewer utility.

2.2 Upland Vegetation and Wildlife Resources

Project effects on vegetation, wildlife, and wildlife habitat would be minimized to the greatest extent practicable by minimizing the footprint of light rail alignments through large greenbelts and connected riparian corridors. 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. Also, Sound Transit would implement a weed-control plan to minimize the risk of introducing and spreading noxious and invasive species.

3 CONSTRUCTION-RELATED BEST MANAGEMENT PRACTICES

3.1 General Best Management Practices for All Sensitive Areas

Sound Transit's construction contractor would implement construction BMPs that would apply to all work in or around sensitive areas. The construction contractor would work within construction limits marked with fencing and signage to prevent unintended impacts on riparian vegetation, wetlands, woodlands, and other sensitive sites outside of the construction limits. The construction limits would be clearly marked with high-visibility construction fencing and signage prior to any ground-disturbing or construction-related activities. There would be no direct site disturbance outside of the construction limits.

Soil and rock stockpiles, excavated materials, and excess soil materials would be prevented from eroding into sensitive habitats, including stream channels, wetlands, riparian areas, and shorelines outside of the construction limits by high water or storm runoff. Before discharging or allowing runoff from the project site, the construction contractor would be required to develop, implement, and monitor a Temporary Erosion and Sediment Control plan to address potential erosion for the duration of construction. The contractor would implement the plan before discharging or allowing runoff from the site. Monitoring requirements specified in the plan would provide feedback to ensure that the erosion control practices are operating properly and effectively.

BMPs would limit soil compaction in sensitive areas. For example, tracked equipment rather than tire-based equipment may be used in areas that are sensitive to adverse effects from soil compaction. Temporary work trestles or other measures that minimize impacts would be used where practical, such as along Southwest Genesee Street near the Longfellow Creek riparian area.

Other measures to reduce the risk of erosion and sedimentation may include the following:

- Installing erosion-control blankets or an equally effective BMP on steep slopes that are susceptible to erosion and where ground-disturbing activities have occurred, in order to prevent erosion and assist with establishment of native vegetation.
- Covering temporarily stored materials with plastic or other impervious material during rain events to prevent sediments from being washed from the storage area to surface waters.
- Inspecting temporary and permanent erosion and sedimentation control measures on a regular basis and maintaining and repairing the measures to ensure continued performance of their intended function.
- Inspecting silt fences after each rainfall, and at least daily during periods of prolonged rainfall.

3.2 Fish and Aquatic Habitat Protection

All work below the ordinary high water mark (OHWM) of waterbodies would comply with the terms and conditions set forth in the Hydraulic Project Approval (HPA) issued for the project by the Washington Department of Fish and Wildlife. The HPA program is the vehicle through which Washington Department of Fish and Wildlife regulates activities that affect the bed or flow of waters of the state for the protection of fish life. A HPA is required for construction or structural work associated with any bridge structure or culvert construction within or below the OHWM of waters of the state. HPAs typically specify provisions designed to avoid or minimize the potential for adverse effects on habitat in receiving waters. Provisions required for the WSBLE project could include restrictions on the timing of construction below the OHWM and other measures designed to avoid or minimize the potential for construction activities to deliver sediment or pollutants to streams and to minimize disturbance of the benthic community from anchors, barge spuds, or other equipment used to secure barges. To reduce the risk of adverse effects on migrating salmonids during project construction, Sound Transit would require construction contractors to direct lighting away from fish-bearing waters and to place hoods or shields on lights, as needed, to minimize the amount of backlight or dispersed light cast toward the water's surface.

Any temporarily affected riparian area or shoreline with existing vegetation would be permanently restored after in-water work with plantings of native or other woody and herbaceous species approved by the City of Seattle. Bank protection would follow the guidelines set forth in Washington Department of Fish and Wildlife's *Integrated Streambank Protection Guidelines* (Washington State Aquatic Habitat Guidelines Program 2003) or Seattle's Shoreline Master Plan (Seattle Municipal Code 23.60A), and would be approved by the City of Seattle.

3.3 Water Quality Protection

The federal Clean Water Act established water quality goals for the navigable (surface) waters of the United States. One of the mechanisms for achieving the goals of the Clean Water Act is the National Pollutant Discharge Elimination System (NPDES) permit program, which is administered by the United States Environmental Protection Agency. The Environmental Protection Agency has delegated responsibility to administer the NPDES permit program to the State of Washington on the basis of Chapter 90.48 of the Revised Code of Washington, which

defines the authority and obligations of the Washington State Department of Ecology (Ecology) in administering the wastewater discharge permit program.

The project would obtain and adhere to a NPDES construction stormwater general permit to reduce or eliminate stormwater pollution and other impacts on surface waters. The construction contractor would be required to adhere to water quality standards as stated in the Clean Water Act Section 401 Water Quality Certificate and the NPDES permit issued for the project.

Ecology's construction stormwater general permit is required for certain construction activities. The goal of the permit program is to reduce or eliminate stormwater pollution and other impacts on surface waters. The project must complete a Notice of Intent for coverage under the permit. A Construction Stormwater Pollution Prevention Plan approved by Ecology would also be implemented before the start of construction. The plan would include BMPs to (1) prevent erosion, (2) prevent sedimentation, and (3) identify, reduce, eliminate, or prevent stormwater contamination and water pollution from construction activities. The Stormwater Pollution Prevention Plan would include each of the following plans:

- Temporary Erosion and Sediment Control Plan – This plan would outline the design and construction specifications for BMPs to be used to identify, reduce, eliminate, or prevent sediment and erosion problems.

- Spill Prevention, Control, and Countermeasures Plan – This plan would outline requirements for and implementation of spill prevention, inspection protocols, equipment and material containment measures, and spill response procedures.

- Concrete Containment and Disposal Plan – This plan would outline the management, containment, and disposal of concrete debris, slurry, and dust, and would discuss BMPs that would be used to contain, collect, and dispose of residue and slurry.

- Dewatering Plan – This plan would outline procedures for pumping groundwater away from the construction area and for storing (as necessary), testing, treating (as necessary), and discharging or disposing of the dewatering water.

- Fugitive Dust Plan – This plan would outline measures to prevent the generation of fugitive dust from exposed soil, construction traffic, and material stockpiles.

Turbid water produced (including untreated water from dewatering activities) would be prevented from discharging to fish-bearing waters or wetlands. Turbid wastewater may be routed to temporary or permanent detention facilities, or to upland areas that provide adequate rates of infiltration.

In accordance with conditions of a typical HPA, heavy equipment used during the course of in-water work would operate from above the OHWM wherever possible. Use of equipment below the OHWM would be limited to that necessary to gain position for work. Drive mechanisms would not enter or operate below the OHWM, except under the terms of the HPA. Work areas below the OHWM would be isolated from other surface waters with a cofferdam, turbidity curtain, or similar system to prevent suspended sediment or pollutants from leaving the work area.

Uncured concrete and/or concrete byproducts would be prevented from coming in contact with streams or water conveyed directly to streams during construction. A concrete truck chute cleanout area or equally effective BMP would be established to properly contain wet concrete. Any water having direct contact with uncured concrete would be contained and treated or

removed from the site (as appropriate) to prevent discharge to streams, waterbodies, or wetlands.

Permanent footings or drilled or pile-driven shafts installed below the OHWM in the Duwamish Waterway or Salmon Bay would be installed in a manner consistent with Section 404 and other permits issued for the project by the United States Army Corps of Engineers and other parties (as applicable). When constructing drilled shafts, the contractor would ensure that all drilling equipment, drill recovery and recycling pits, and any waste or spoil produced are properly contained to prevent discharge of drill wastes or fluids to any surface water or wetlands. Equipment (excluding track-mounted equipment, large cranes, and other relatively immobile equipment) would be refueled and maintenance activities conducted at a distance from the nearest wetlands, ditches, and flowing or standing water, as approved by regulatory permits. Appropriate spill prevention measures and fuel containment systems would be designed and implemented to completely contain a potential spill as specified in the Spill Prevention, Control, and Countermeasures Plan. As appropriate, equipment used for construction activities would be cleaned and inspected before arriving at the project site to ensure no potentially hazardous materials are introduced, no leaks are present, and the equipment is functioning properly. Wash water would not be discharged directly into any water body without pretreatment. Construction equipment and vehicles would be maintained to prevent them from leaking fuel or lubricants. Should a leak be detected on heavy equipment used for the project, the equipment would be repaired before use.

3.4 Vegetation and Wildlife Protection

The measures listed below would be implemented before and during project construction to avoid or minimize effects on vegetation and wildlife resources. These measures would be implemented along with others designed to avoid or minimize effects on other resources, such as streams, wetlands, and soils. The additional measures would be expected to provide more protection to vegetation and wildlife resources within and adjacent to streams and wetlands.

- Limit construction activity to a relatively small area immediately adjacent to the existing cleared area to minimize vegetation clearing and leave as much vegetation undisturbed as possible.
- As appropriate, restore areas temporarily affected by construction to pre-construction conditions or better through replanting or reseeding.
- Prepare and implement a revegetation plan that emphasizes the use of native species as appropriate.
- In accordance with the Migratory Bird Treaty Act, consult with United States Fish and Wildlife Service on methods to implement during construction to avoid impacts on migratory birds. Such methods could include conducting pre-construction surveys for migratory birds and/or placing restrictions on vegetation clearing during the breeding season for migratory birds.
- To minimize the extent of habitat disturbance associated with the removal of potential hazard trees, Sound Transit would identify and remove such trees on an individual basis, based on tree species, tree health, and distance from the alignment.

In addition to the measures identified above, a monitoring plan and adaptive management plan would be implemented, as directed by permit requirements, for revegetated sensitive areas or

buffers. The plans would generally require verification of survival of all installed native trees and shrubs 1 year after installation, and maintenance of a specific plant density in successive years. Plant communities and the specific monitoring schedule would be identified in the revegetation plan.

3.5 Control of Noxious and Invasive Species

The most effective means of reducing the introduction and spread of noxious and invasive species are weed control and restoration of disturbed construction sites with native plant species suitable for the type of site disturbed. Weed control is important before and during construction. Per federal, state, and local requirements and guidance, Sound Transit would implement appropriate measures to minimize risk of introduction and spread of noxious and invasive species, including restoring temporarily disturbed areas immediately following construction in each project segment. To minimize use of herbicides and fertilizers, restoration of disturbed areas would include the use of mulching, ground cover, and other planting strategies that discourage growth of undesirable species.

4 REFERENCES

City of Seattle. 2021. *City of Seattle Stormwater Manual*, *Volume 3: Project Stormwater Control*. Seattle Public Utilities Department of Construction and Inspection. https://www.seattle.gov/Documents/Departments/SDCI/Vault/Stormwater/2021SWFullManualFinalTrkChgs.pdf. July.

Sound Transit. 2021. *Sound Transit Design Criteria Manual*. Revision 5, Amendment 11. https://www.soundtransit.org/sites/default/files/documents/design-criteria-manual-may-2021.pdf. May.

Washington State Aquatic Habitat Guidelines Program. 2003. *Integrated Streambank Protection Guidelines*. https://wdfw.wa.gov/sites/default/files/publications/00046/wdfw00046.pdf.