December 2024

Tacoma Dome Link Extension

Draft Environmental Impact Statement

ECOSYSTEM RESOURCES TECHNICAL REPORT

Appendix J4

Sound Transit

U.S. Department of Transportation
Federal Transit Administration

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Figures

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Attachments

(available on the project website or USB Flash Drive attached to the Draft EIS)

Acronyms and Abbreviations

Belmor	Belmor Mobile Home Park
B-IBI	benthic index of biotic integrity
BMP	best management practice
CFR	Code of Federal Regulations
Corps	U.S. Army Corps of Engineers
CWA	Clean Water Act
Ecology	Washington State Department of Ecology
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FR	Federal Register
FWHCA	fish and wildlife habitat conservation area
GIS	geographic information system
GPS	global positioning system
HPA	Hydraulic Project Approval
I-5	Interstate 5
LWD	large woody debris
MMPA	Marine Mammal Protection Act
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NRCS	U.S. Department of Agriculture Natural Resources Conservation Service
NWI	National Wetlands Inventory
OHWM	ordinary high water mark
OMF South	Operations and Maintenance Facility South
PEM	palustrine emergent
PFO	palustrine forested
PGIS	pollution-generating impervious surface
PHS	Priority Habitats and Species
PSS	palustrine scrub-shrub
RCW	Revised Code of Washington
SEPA	Washington State Environmental Policy Act
SR	State Route
SWPPP	stormwater pollution prevention plan
TDLE	Tacoma Dome Link Extension
TESC	Temporary Erosion and Sediment Control
TMDL	total maximum daily load
UGA	Urban Growth Area
USFWS	U.S. Fish and Wildlife Service
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources
WRIA	Water Resource Inventory Area
WSDOT	Washington State Department of Transportation

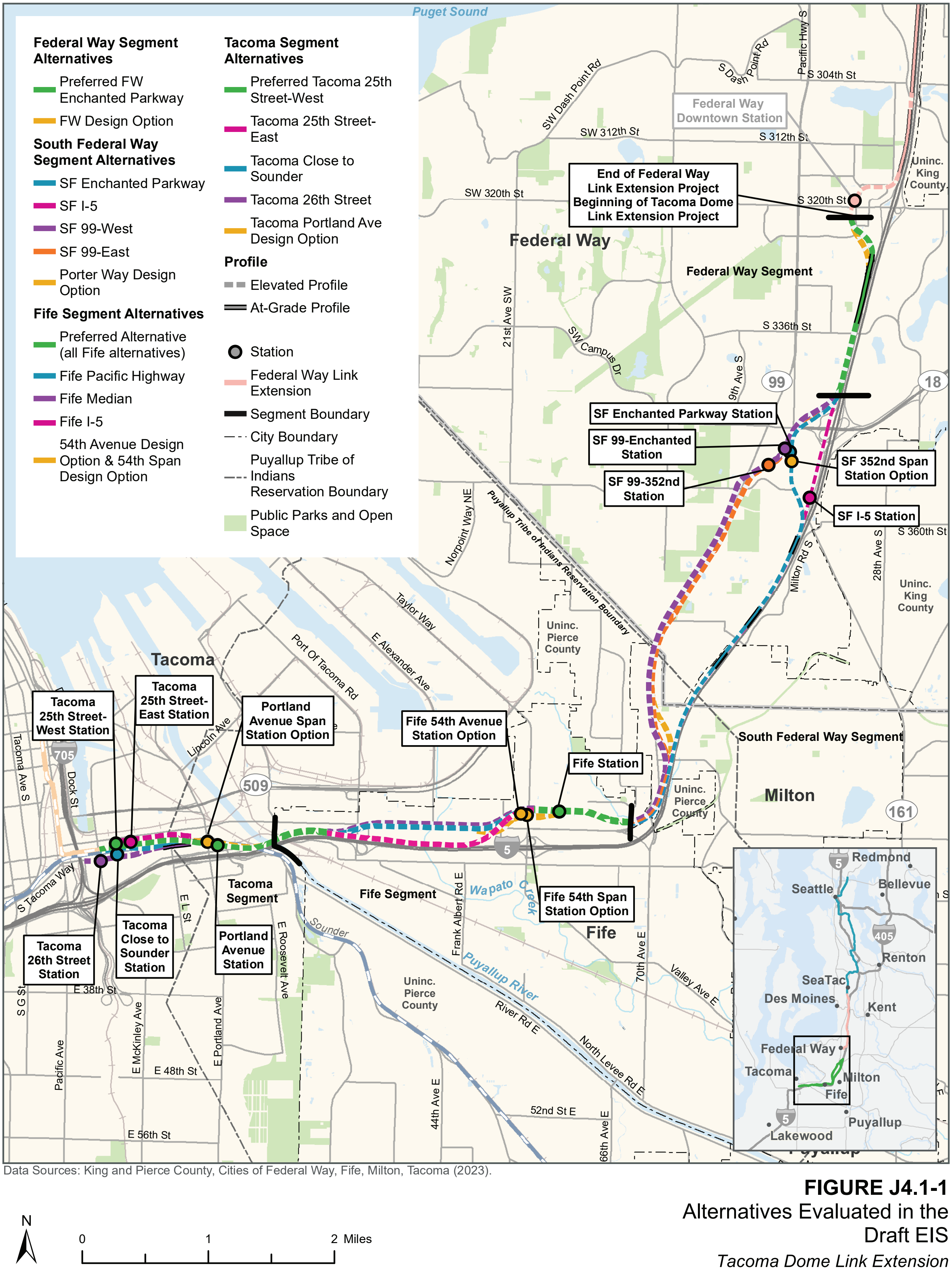
1 INTRODUCTION

The Central Puget Sound Regional Transit Authority (Sound Transit) is proposing to expand the regional light rail system south from the terminus of the Federal Way Link Extension at the Federal Way Downtown Station to the Tacoma Dome area in Tacoma. This project is known as the Tacoma Dome Link Extension (TDLE) project and shown generally on Figure J4.1-1.

This technical report addresses ecosystem components that may be affected by the project alternatives to support analyses in the Draft Environmental Impact Statement (Draft EIS). The ecosystem components addressed in this report are aquatic species and habitat; vegetation, wildlife, and wildlife habitat; wetlands; and special-status species and habitats (including threatened and endangered species; marine mammals; and natural resource areas protected under local critical areas ordinances, shoreline master programs, and/or Tribal resource regulations). This report does not include analysis of other areas (e.g., steep slopes) that are protected under critical area ordinances. For brevity, the first two components are sometimes identified as aquatic resources and terrestrial resources, respectively. This report describes the affected environment, the expected temporary construction impacts, and long-term operational impacts of the proposed alternatives, including the No-Build Alternative, on these resources. It also identifies measures intended to avoid and minimize impacts and potential compensatory mitigation for unavoidable impacts.

Analyses in this report support compliance with the National Environmental Policy Act (NEPA) and the Washington State Environmental Policy Act (SEPA). In addition, this report evaluates potential effects on species listed or proposed for listing as threatened or endangered under the Endangered Species Act (ESA), as well as critical habitat that has been designated or proposed for designation for those species. A biological assessment will be prepared to support consultation with the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Services (NMFS) as required under ESA section 7(c). The biological assessment would be prepared as the Final EIS is initiated, following the identification and/or confirmation/modification of the Preferred Alternative. The assessment would also include a review of potential effects on essential fish habitat, as required by the Magnuson-Stevens Fishery Conservation and Management Act.

This report includes several attachments that describe fieldwork methodologies and provide information to support the evaluations of ecosystem resources. Attachment A describes the wetland delineation methodology. Attachment B describes Sound Transit's Stream Habitat Assessment Guidelines. Attachment C provides background research information related to the wetland assessments. Attachment D provides wetland determination data forms, and Attachment E provides Washington State Department of Ecology (Ecology) wetland rating forms. Attachment F presents photographs of the wetlands, streams, and habitat types discussed, and Attachment G includes a list of common and scientific names of plant and animal species discussed in this report.



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE J4.1-1
Alternatives Evaluated in the Draft EIS
Tacoma Dome Link Extension

1.1 Tacoma Dome Link Extension

TDLE would expand the regional light rail system south from the Federal Way Downtown Station opening in 2025 – 2026, to the Tacoma Dome area near the existing Tacoma Dome Station. The alternatives under consideration for TDLE are shown in Figures J4.1-2 through J4.1-5 and discussed in detail in Chapter 2, Alternatives Considered, of the Draft EIS. Project elements include:

- Approximately 10 miles of new dedicated guideway. Most of the guideway would be elevated, and there would be no at-grade vehicle or pedestrian crossings. The guideway extends across ancestral and reservation lands of the Puyallup Tribe of the Puyallup Reservation (Puyallup Tribe of Indians), as well as the cities of Federal Way, Milton, Fife, and Tacoma, and unincorporated Pierce County.
- New stations in South Federal Way and Fife and two in Tacoma (one near E Portland Avenue and one near the Tacoma Dome area).
- A new rail-only fixed-span bridge crossing the Puyallup River.
- New parking facilities with approximately 500 stalls each at the stations in South Federal Way and Fife in either surface or garage park-and-ride configurations. Construction of TDLE parking facilities at the stations in South Federal Way and Fife could be delayed up to 3 years after initial service opens.

1.2 Data Gathered

The following documents and data sources were reviewed to identify ecosystem features in the project vicinity, including the alternative footprints and potential mitigation sites:

1.2.1 Tribal Data Sources

- Puyallup Tribal Fisheries annual reports for salmon, steelhead, and bull trout in the Puyallup/White River Watershed (Marks et al. 2018, 2019, 2020, 2021).
- Statewide Integrated Fish Distribution web map (NWIFC 2023).

1.2.2 Federal Data Sources

- U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) Web Soil Survey maps (NRCS 2023).
- USFWS National Wetlands Inventory (NWI) website (USFWS 2023a).
- USFWS list of ESA-listed species and critical habitats (obtained via the online Information for Planning and Consultation tool) (USFWS 2023b).
- NMFS ESA species lists (NOAA 2023a).

1.2.3 State Data Sources

- Washington Department of Natural Resources (WDNR) Forest Practice Applications Review System online water typing map (WDNR 2023a).

- Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species (PHS) data (WDFW 2023a).
- StreamNet fish distribution data (StreamNet 2023).
- Species in Washington data (WDFW 2023b).
- Fish passage barrier maps from WDFW (WDFW 2023c).
- Washington Department of Fisheries catalog of Washington streams and salmon utilization (Williams et al. 1975).
- Ecology 303(d)-listed waters information (Ecology 2023).
- WDNR Washington Natural Heritage Program rare plants and high-quality ecosystems datasets (WDNR 2023b).

1.2.4 County Data Sources

- King County iMap interactive mapping tool (King County 2023).
- Pierce County Public GIS mapping tool (Pierce County 2020a).
- Aerial imagery and topographic contour data (King County 2020, Pierce County 2020b).

1.2.5 Other studies and environmental reviews

- City of Federal Way wetland inventory report (Fischer 1999).
- City of Federal Way Critical Areas Map (City of Federal Way 2016).
- Federal Way Link Extension Final EIS – Ecosystems Technical Report (Sound Transit 2016a).
- Sound Transit Operations and Maintenance Facility South (OMF South) Project – Ecosystems Technical Report (FTA and Sound Transit 2024).
- Tacoma Dome Link Extension Pre-Screening and Level 1 Alternatives Evaluation Report (Sound Transit 2019c).
- Tacoma Dome Link Extension Level 2 Alternatives Evaluation Report (Sound Transit 2019d).
- Tacoma Dome Link Extension Scoping Summary Report (Sound Transit 2019e).
- Hylebos Watershed Plan (EarthCorps 2016).
- Washington State Department of Transportation (WSDOT) State Route (SR) 167 Completion Project wetland and stream assessment for Stage 1a (WSDOT 2019) and Stage 1b (WSDOT 2020).

1.3 Related Laws, Regulations, and Guidelines

Project activities that may affect ecosystem resources in the project area are subject to the following regulations, plans, and policies:

1.3.1 Tribal

- Puyallup Tribe of Indians Tribal Code (Puyallup Tribe of Indians 2020).

- The Medicine Creek Treaty of 1854.
- The Point Elliott Treaty of 1855.

1.3.2 Federal

- The National Environmental Policy Act, ESA Section 7, and the Magnuson Stevens Fishery Conservation and Management Act (for projects that receive funding, permits, or other authorization from a federal agency).
- Sections 404, 402, and 401 of the Clean Water Act (CWA).
- Section 14 of the Rivers and Harbors Act of 1899, 33 United States Code 408 (Section 408).
- Section 9 of the Rivers and Harbors Act of 1899 (U.S. Coast Guard Bridge Permit).
- Protection of Wetlands, Presidential Executive Order 11990.
- Invasive Species, Presidential Executive Order 13112.
- Final Rule on Compensatory Mitigation for Losses of Aquatic Resources (73 Federal Register [FR] 19594, April 10, 2008 [currently under revision]).
- U.S. Army Corps of Engineers (Corps) Wetland Delineation Manual (Environmental Laboratory 1987).
- Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0) (Corps 2010).
- Marine Mammal Protection Act (MMPA).
- Bald and Golden Eagle Protection Act.
- Migratory Bird Treaty Act.
- Coastal Zone Management Act.
- The Medicine Creek Treaty of 1854.
- The Point Elliott Treaty of 1855.

1.3.3 State

- SEPA (Chapter 43.21C Revised Code of Washington [RCW]) and implementing rules (Chapter 197-11 Washington Administrative Code [WAC]).
- Washington State Growth Management Act (Chapter 36.70A RCW).
- Shoreline Management Act (Chapter 90.58 RCW).
- Hydraulic code (Chapter 220-110 WAC).
- Protection of Wetlands, Governor’s Executive Order 89-10.
- Protection of Wetlands, Governor’s Executive Order 90-04.
- Water Pollution Control Act (Chapter 90.48 RCW).
- Wetland Mitigation in Washington State (Ecology et. al. 2006, 2021).

- Washington State Wetland Rating System for Western Washington: 2014 update, version 2.0 (Hruby and Yahnke 2023).

1.3.4 Regional and Local

- Sound Transit SEPA rules (Board Resolution No. R2018-17) and Sound Transit Environmental Policy (Board Resolution No. R2004-06).
- Sound Transit 3, the Regional Transit System Plan for Central Puget Sound (Sound Transit 2016b).
- Sound Transit Sustainability Plan (Sound Transit 2019f).
- Sound Transit Stream Habitat Assessment Guidelines (Sound Transit 2016c).
- Sound Transit EO Number 1: Establishing a Sustainability Initiative (Sound Transit 2007).
- Sound Transit Environmental Policy (Board Resolution No. R2004-06).
- Sound Transit Sustainability Plan (Sound Transit 2019f).
- City of Federal Way critical areas regulations (Federal Way Revised Code Chapter 19.145), amended July 15, 2015, current through Ordinance 19-882, passed December 3, 2019.
- City of Milton critical areas regulations (Milton Municipal Code Chapter 18.16), current through Ordinance 1979, passed December 2, 2019.
- City of Milton shoreline master program, adopted 2012.
- City of Fife critical areas regulations (Fife Municipal Code Chapter 17.05 et seq.), current through Ordinance 2020, passed December 10, 2019; and Resolution 1916, passed December 10, 2019.
- City of Fife shoreline master program, adopted July 2019.
- City of Tacoma critical areas preservation ordinance (Tacoma Municipal Code [TMC] Chapter 13.11), current through Ordinance 28636 Ex. A, passed December 3, 2019.
- City of Tacoma shoreline master program (TMC Title 19), adopted 2013, amended 2019.
- Pierce County critical areas regulations (Pierce County Code Title 18E), current through 2019-95, passed November 26, 2019.
- Pierce County shoreline master program, adopted 2015, approved by Ecology 2018.
- King County Mitigation Reserves Program – In-Lieu Fee Program Instrument (King County 2011).
- Hylebos Watershed Plan (EarthCorps 2016).

1.4 Study Areas

Sound Transit established distinct study areas for the various ecosystem resources based on proposed project footprints and areas outside the footprint that could be potentially affected by the project (e.g., nearby areas where sensitive wildlife species could be affected by noise). The project footprint consists of the construction limits (i.e., the maximum extents within which clearing, grading, and operating construction machinery would occur) for the TDLE alternatives, as well as any areas of modifications to roadways and other existing infrastructure to accommodate the proposed facilities. In addition to the project footprint, the study areas also include specified adjacent areas that could be affected by activities within the project footprint. Study areas for each resource are described below and shown in Figure J4.1-2 to J4.1-5.

The study area for aquatic species and habitat (including streams, ESA-listed species, and other aquatic areas protected under local critical areas ordinances or locally adopted shoreline regulations) includes the project footprint and all areas within 300 feet of the project footprint. This encompasses the area within which project construction and operation could cause direct effects, could deliver sediment or pollutants to streams, and/or where vegetation clearing could affect riparian habitat quality. In the Puyallup River, the study area is extended to include all portions of the water body where noise from in-water pile driving could exceed background levels (i.e., to the first bends in the channel upstream and downstream of potential locations of in-water piers).

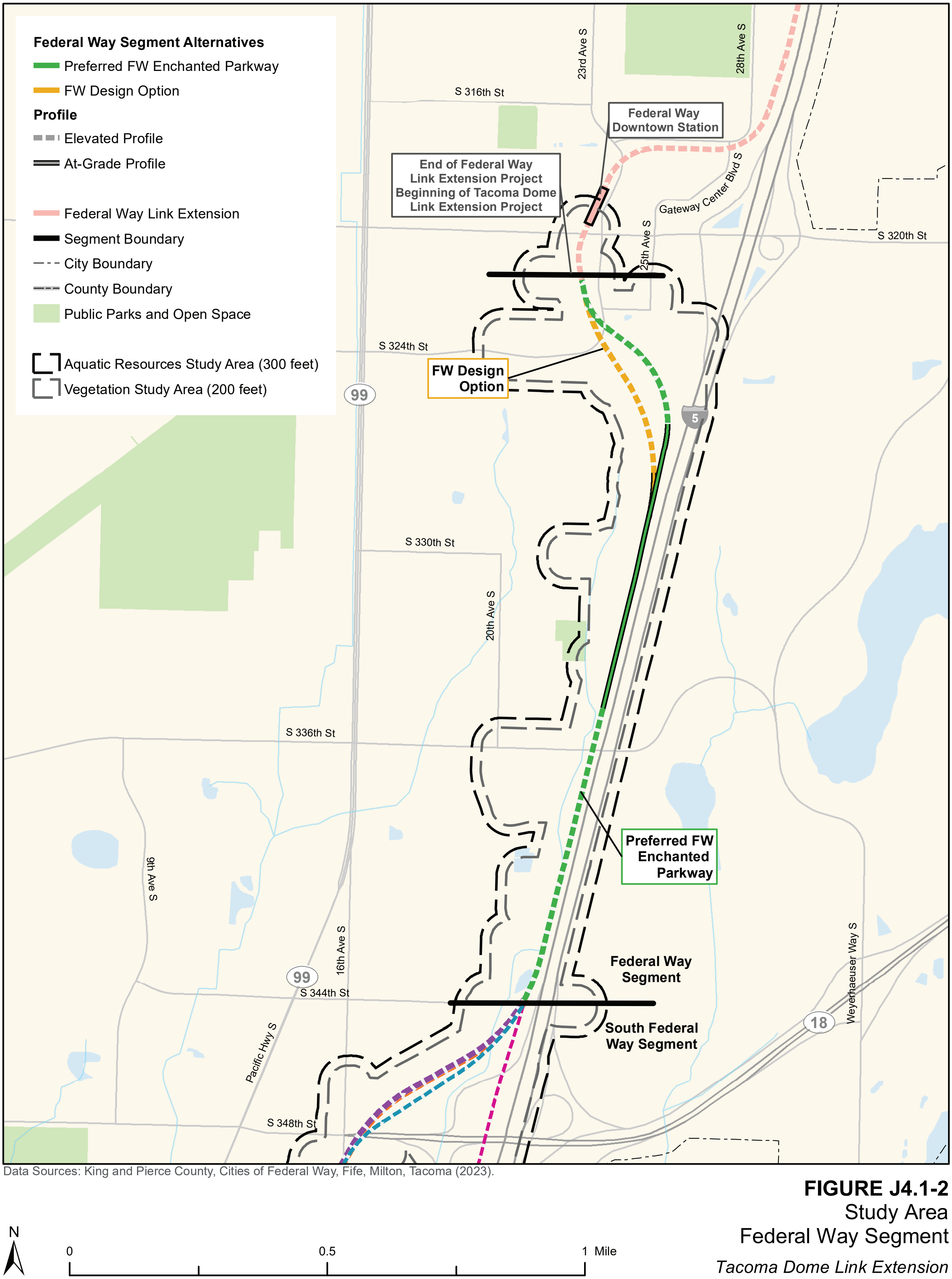
The study area for vegetation, terrestrial wildlife, and wildlife habitat (including ESA-listed species and areas protected under local critical areas ordinances or shoreline regulations) consists of the project footprint, plus the areas within 200 feet of the project footprint. This represents a conservative estimate of the area in which project construction and operation could affect vegetation cover and habitat quality for terrestrial wildlife. To address wildlife potentially affected by project-related noise and human activity, resource analysts also reviewed documented occurrences of sensitive wildlife species within 0.25 mile of project construction areas.

The study area for wetlands consists of the project footprint, plus the areas within 300 feet of the project footprint. This distance was selected to match the largest potential buffer width for wetlands in the area. Wetlands evaluated include those features that are wholly or partly within the study area.

1.5 Summary of Key Findings

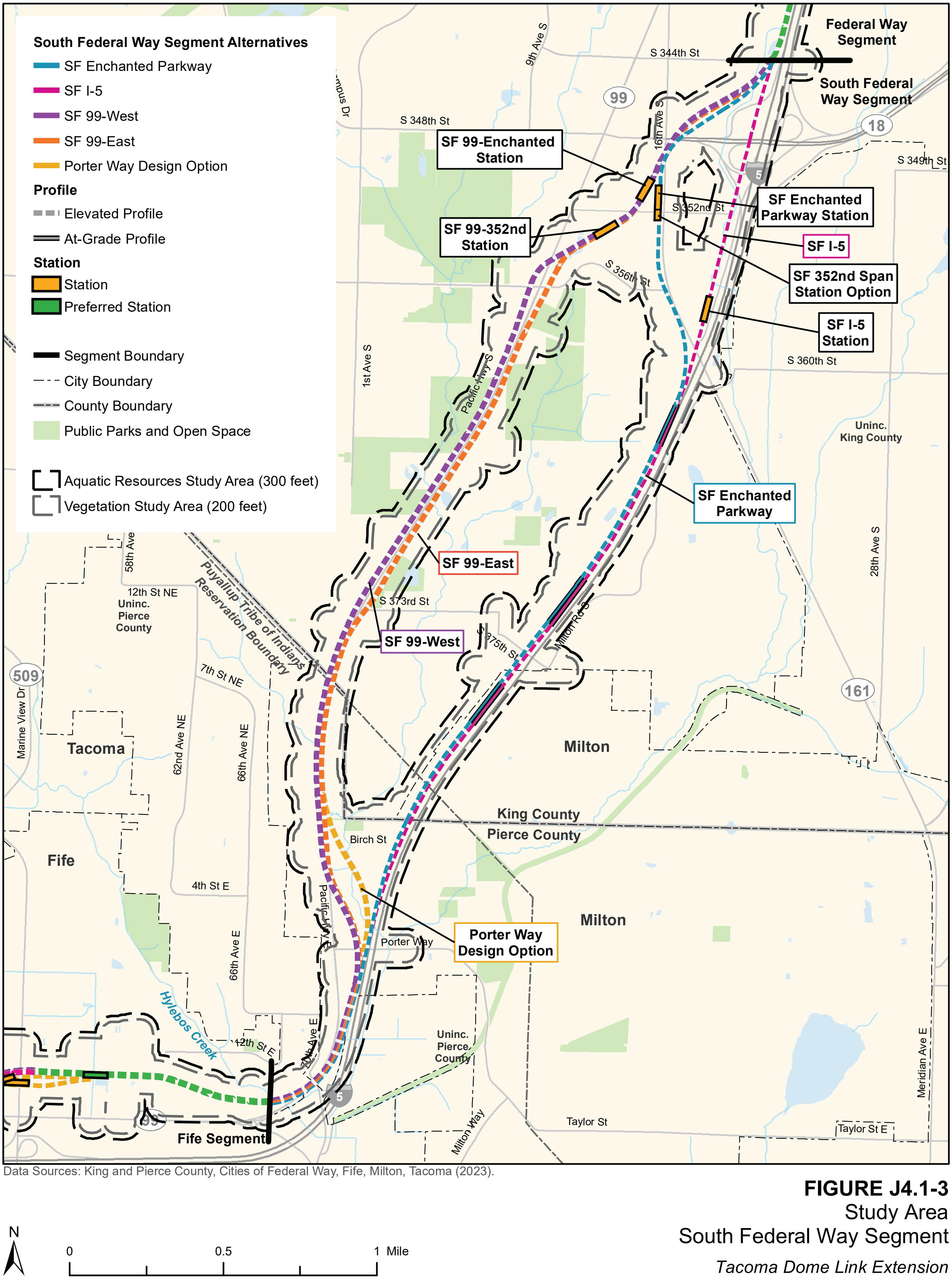
Streams, wetlands, and vegetation cover provide ecosystem functions to varying degrees throughout the study area. Under any of the project alternatives, direct long-term impacts on ecosystem resources would occur where permanent features such as project facilities overlap features such as streams, stream buffers, structurally complex vegetation, wetlands, or wetland buffers. Temporary, construction-related impacts would occur where such features are affected by clearing and ground-disturbing work but are revegetated following construction.

The following subsections summarize key findings about the potential impacts of the alternatives on ecosystem resources, as well as plans and commitments for avoiding, minimizing, and mitigating adverse impacts.



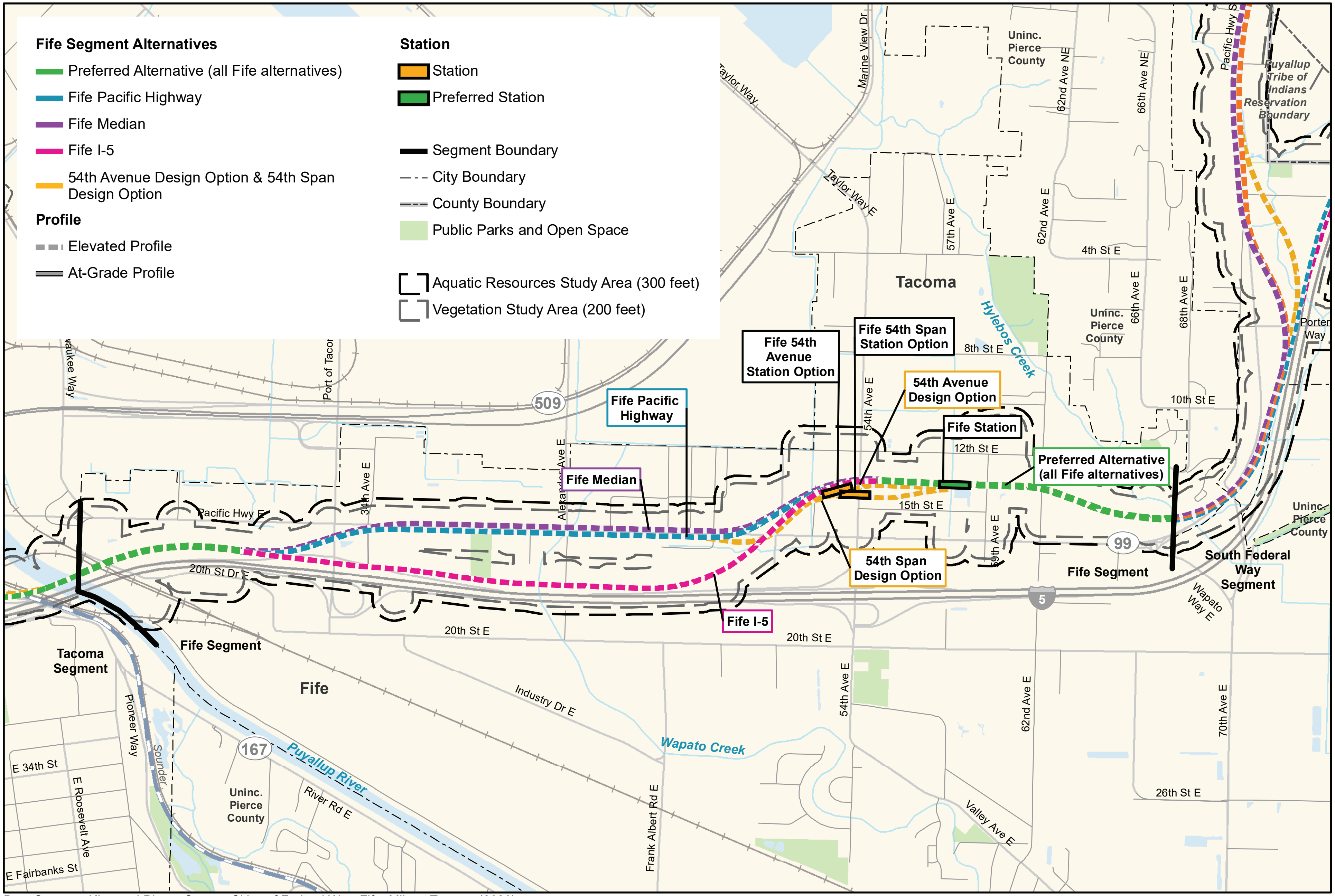
Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE J4.1-2
Study Area
Federal Way Segment
Tacoma Dome Link Extension



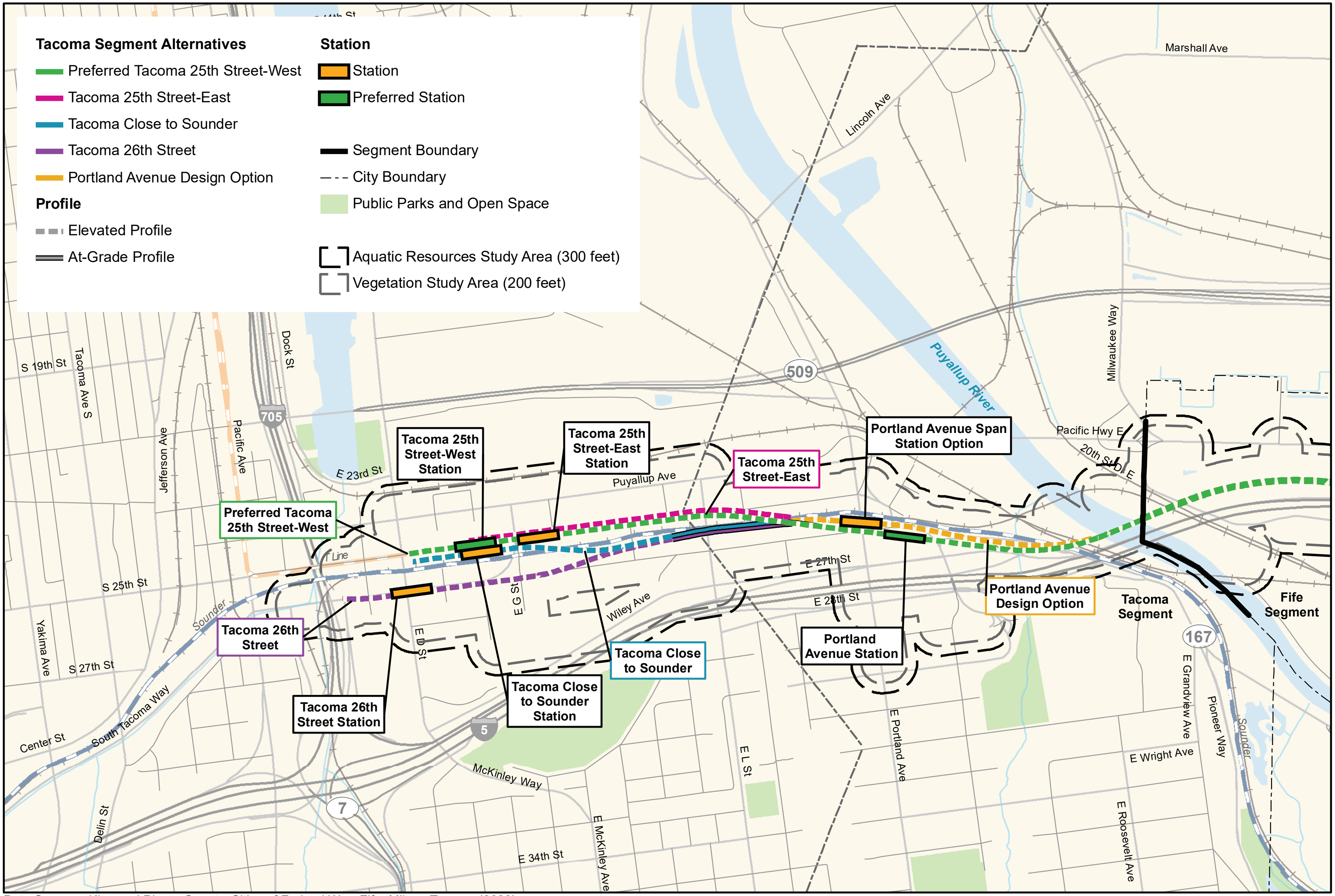
Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE J4.1-3
Study Area
South Federal Way Segment
Tacoma Dome Link Extension



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE J4.1-4
Study Area
Fife Segment
Tacoma Dome Link Extension



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

FIGURE J4.1-5
Study Area
Tacoma Segment
Tacoma Dome Link Extension

1.5.1 Aquatic Species and Habitats

The TDLE alternatives would cross or otherwise affect 16 streams and associated riparian habitat in the study area. The construction of light rail guideways and other facilities could permanently alter in-stream and riparian habitat in areas where such structures run close to or cross streams. Stormwater runoff from impervious surfaces may degrade water quality and modify flow regimes in some streams. In addition, shade from structures placed over streams may affect the behavior of fish in affected stream segments. Temporary impacts would include an elevated risk of delivering sediment or contaminants to streams during construction activities, as well as reduced riparian function in areas that are cleared for construction and subsequently restored.

Sound Transit has committed to minimizing the need to place existing streams in new culverts and has designed the TDLE alternatives to avoid new stream piping whenever possible. In most areas near streams, the guideway would be on elevated structures that would not require any permanent modifications to the streambed or bank. If any culverts on fish-bearing or potentially fish-bearing streams must be replaced, or if any new culverts need to be installed, the new or replacement structures would be designed and installed in accordance with WDFW's Water Crossing Design Guidelines.

Unavoidable impacts on streams and riparian habitat would occur in several locations. In the Federal Way Segment, the alignment of the Preferred FW Enchanted Parkway Alternative would parallel East Fork Hylebos Creek Tributary 0016A for approximately 0.5 mile, requiring the stream to be realigned and relocated. Construction of this alternative would also entail the clearing of a stand of mature forest that provides high-quality riparian habitat for the stream.

In the South Federal Way Segment, the alignment of the SF I-5 Alternative would parallel East Fork Hylebos Creek Tributary 0016A south of the I-5/SR 18 interchange. Approximately 1,500 linear feet of the stream would likely need to be realigned in this area. The other alternatives in the South Federal Way Segment would not require realignment of that stream. Relocated stream channels would be reconfigured to include meanders and other features that enhance the availability and diversity of aquatic habitats. By turning westward and following Enchanted Parkway S or SR 99 south of S 348th Street, the other South Federal Way Segment alternatives would avoid most impacts on East Fork Hylebos Creek Tributary 0016A.

As a result of stream crossings along SR 99, the SF 99-West and SF 99-East alternatives would affect more stream and stream buffer habitat than the SF Enchanted Parkway Alternative. The Porter Way Design Option for the SF 99-West and SF 99-East alternatives would parallel West Fork Hylebos Creek for approximately 1,700 feet and would add a stream crossing, resulting in greater impacts on streams and stream buffers.

In the Fife Segment, under all three alternatives, construction and operation of the elevated preferred Fife Station and associated ground-level facilities would require approximately 150 linear feet of Fife Ditch Tributary 1 to be relocated and/or placed in a new culvert. These impacts would not occur if either of the station design options at 54th Avenue E is implemented. The Pacific Highway alternatives would not cross Fife Ditch or any surface-flowing segments of Wapato Creek. The Fife I-5 Alternative would cross a surface-flowing segment of Fife Ditch, as well as a surface-flowing segment of Wapato Creek adjacent to I-5. As a result, the Fife I-5 Alternative would have a greater potential for adverse temporary and permanent effects on aquatic resources than the other Fife Segment alternatives.

The long-term effects on aquatic resources would be identical for each of the Tacoma Segment alternatives and would include shading associated with overwater structures and placement of permanent in-water structures. Under all alternatives, one option for crossing the Puyallup River would require placing one or more support piers within the river.

In-water work for pier installation would have adverse effects on fish (including ESA-listed species) and marine mammals. Potential construction-related impacts would include the following:

- Mortality or injury of fish and/or harassment of marine mammals during implementation of in-water work area isolation measures (e.g., installation of coffer dams and steel casings around drilled shafts for support piers).
- Mortality or injury of fish and/or harassment of marine mammals exposed to potentially injurious underwater sound pressure levels associated with in-water pile driving.
- Shade from overwater work trestles.
- Temporary, localized increases in turbidity and suspended sediment during installation and removal of in-water structures.

1.5.2 Vegetation, Wildlife, and Wildlife Habitat

Land use in the study area is dominated by urban development, including industrial, commercial, institutional, and residential areas. These areas provide habitat for plant and animal species adapted to relatively high levels of noise and human disturbance. Some patches of native forest and other habitat types with higher value as wildlife habitat are present along stream corridors in South Federal Way and Fife segments.

Biologists identified and delineated 11 vegetation cover types in the study area (commercial, residential, grassland, invasive brush, native brush, non-native forest, mature native forest, other native forest, wetland/stream, river channel, and stormwater pond) and evaluated their relative habitat value. Relative habitat value is based on habitat structure, scarcity in the study area, disturbance types and frequency, and time required for ecosystem functions to recover following clearing and site restoration.

Impacts on terrestrial resources would occur where project construction converts vegetation or other habitat features to constructed project facilities. Clearing for project construction would also increase the risk of contributing to the spread of noxious or invasive weed species. Noise, light, and human activity associated with operation of TDLE may also have long-term impacts on wildlife. Construction-related impacts would include temporary loss or degradation of terrestrial habitats due to increased noise, light, and human activity. None of the project alternatives is within 0.25 mile of a documented breeding area or other sensitive site for any special-status wildlife species.

The severity of impacts on plants and animals would be greater in areas where cover types dominated by native or structurally complex vegetation (i.e., the mature native forest, other native forest, or wetland/stream cover types, including forested wetlands) are directly affected. Removing trees, snags, and understory vegetation would eliminate nesting and foraging sites for birds, roosting sites for bats, and hiding cover for small mammals. Alternatives that affect a greater area of forested habitat types would have a higher likelihood of adverse effects on vegetation and wildlife.

The Preferred FW Enchanted Parkway Alternative would have long-term impacts on approximately 2 acres of mature native forest habitat along I-5 south of S 336th Street, and an additional 4 acres of this habitat type would fall within the temporary (construction-related) impact footprint of that alternative. Approximately 1 acre of mature native forest habitat along West Fork Hylebos Creek would fall within the permanent impact footprints of both the SF Enchanted Parkway Alternative and the SF I-5 Alternative. The SF 99-West and SF 99-East alternatives would avoid this mature forest, but the permanent impact footprint of the Porter Way Design Option for either of those alternatives would overlap approximately 0.5 acre of this habitat. While mature forest is available in areas farther from I-5 and other sources of disturbance, the loss of mature forest would decrease the amount of this habitat type in the study area.

In the Fife and Tacoma segments, the long-term and construction related impacts of the alternatives on these habitat types would be similar. In all segments, none of the alternatives would be expected to impede the movement of wildlife through the landscape, because guideways would be on elevated structures or immediately adjacent to existing barriers, such as I-5.

1.5.3 Wetlands

Of the 106 wetlands identified and described in this report, 54 were fully or partially accessed during field delineation surveys to assess wetland hydrology, soils, and vegetation. The boundaries of 52 wetlands were fully estimated using remote sensing and best professional judgment where access was limited.

In general, wetlands were delineated if they and/or their buffers intersect with the project footprint on public rights-of-way or on private parcels for which rights of entry had been obtained. Wetlands that were not accessible were mapped using remote sensing methods. Buffers that do not function as habitat because they extend into developed areas, such as roadways or parking lots, were not included as part of this analysis.

In the Federal Way Segment, the Preferred FW Enchanted Parkway Alternative would have fewer long-term impacts on wetlands without the FW Design Option. In the South Federal Way Segment, the SF Enchanted Parkway Alternative would have substantially fewer long-term impacts on wetlands compared to all other alternatives, especially in comparison to the four SR 99 alternatives. In the Fife Segment, the Fife Pacific Highway Alternative, Fife Pacific Highway Median (Fife Median) Alternative, Fife Pacific Highway with 54th Avenue Design Option, and Fife Median with 54th Avenue Design Option all have the same impacts and would have fewer long-term impacts than the Fife I-5 Alternative, I-5 Alternative with 54th Avenue Design Option, and any alternative paired with 54th Span Design Option. The Tacoma alternatives would result in minimal long-term impacts on wetlands. The comparative temporary (construction-related) impacts of the alternatives would be similar to those described for long-term impacts.

1.5.4 Special-Status Species and Habitats

Special-status species and habitats include those addressed by statutes, regulations, plans, and policies that have been established to protect ecosystem resources. These include species listed or proposed for listing under the ESA, as well as critical habitat that has been designated or proposed for designation for ESA-listed species; marine mammals that are protected under the MMPA; and natural resource areas protected under local critical areas ordinances, shoreline master programs, and/or Tribal resource regulations. Many of these regulations require approval procedures, such as the issuance of environmental permits before project implementation; others require agency consultation.

1.5.4.1 Threatened and Endangered Species

Federally listed fish and critical habitat are known or expected to be present in the following river/streams in the study area:

- West Fork Hylebos Creek – Chinook salmon (*Oncorhynchus tshawytscha*), steelhead (*O. mykiss*), and bull trout (*Salvelinus confluentus*); critical habitat for Chinook salmon and steelhead.
- North Fork Hylebos Creek – steelhead and bull trout; critical habitat for steelhead.
- Hylebos Creek – Chinook salmon, steelhead, and bull trout; critical habitat for Chinook salmon and steelhead.
- Federal Way Stream 3 – steelhead and bull trout.
- Federal Way Stream 4 – steelhead and bull trout.
- Milton Stream 1 – Chinook salmon, steelhead, and bull trout.
- Milton Stream 2 – Chinook salmon, steelhead, and bull trout.
- Fife Ditch – steelhead; critical habitat for steelhead.
- Wapato Creek – steelhead; critical habitat for steelhead.
- Puyallup River – Chinook salmon, steelhead, and bull trout.

No plant or wildlife species that are listed or proposed for listing under the ESA are known or expected to use habitats in the study area.

Potential impacts on aquatic resources (see Section 1.5.1) would be expected to adversely affect ESA-listed fish and critical habitat in the streams listed above. In the Tacoma Segment, construction of in-water piers would have the greatest potential for mortality or injury of ESA-listed species if a low bridge over the Puyallup River is selected. Following the selection of a Preferred Alternative, a biological assessment would be prepared to document compliance with the ESA and to support consultation with USFWS and NMFS. The biological assessment would evaluate the potential for direct and indirect effects on ESA-listed species and critical habitat. The assessment would also include a review of potential effects on essential fish habitat, as required by the Magnuson-Stevens Fishery Conservation and Management Act.

1.5.4.2 Marine Mammals

Construction of in-water piers for a bridge over the Puyallup River would have the potential for adverse effects on marine mammals if they were present in the area during construction. Harbor seals (*Phoca vitulina*), California sea lions (*Zalophus californianus*), and Steller sea lions (*Eumetopias jubatus*) often congregate in Commencement Bay and are known to enter the Puyallup River in the study area to forage. If a pier-supported bridge is selected, compliance with the MMPA may require coordination with and possibly the issuance of an incidental harassment authorization by NMFS.

1.5.4.3 Natural Resource Areas Protected Under Local Critical Areas Ordinances

Potential impacts on natural resource areas protected under local critical areas ordinances would occur where the project footprint overlaps wetlands, wetland buffers, streams, stream buffers, or mature forest. In addition, forested areas where special-status wildlife species have a primary association are also protected under some local critical areas ordinances. Impacts on these areas are summarized in the discussions of aquatic resources, terrestrial resources, and wetlands.

1.5.4.4 Areas Within the Shoreline Jurisdiction

Two streams in the ecosystems study area fall under the jurisdiction of the Shoreline Management Act. These are Hylebos Creek and the Puyallup River. Portions of the study area near Hylebos Creek fall within the shoreline jurisdictions of Milton, Fife, and Pierce County. Portions of the study area near the Puyallup River fall within the shoreline jurisdictions of Fife and Tacoma. The shoreline master programs of all these governments include provisions to ensure no net loss of ecological function in shoreline areas. These programs also include provisions for the protection of critical areas, including wetlands.

1.5.4.5 Areas Protected by Tribal Regulations

Portions of the study area lie within the boundaries of the Puyallup Reservation. The Puyallup Tribal Code (Section 15.12 et seq.) establishes district classifications, in substantial compliance with the Puyallup Tribe of Indians Comprehensive Land Use Plan, for all lands within the boundaries of the Reservation. In addition, certain activities on Tribal trust lands may be undertaken only after development permits and construction permits have been issued by the Tribe. These activities include the construction of buildings or structures within 200 feet of shorelines or wetlands and dredging or filling of watercourses or wetlands (including pile driving).

1.5.5 Potential Mitigation

The avoidance and minimization of impacts was a guiding principle in the preliminary design of the project alternatives. Following mitigation sequencing requirements, Sound Transit would first avoid and then minimize potential impacts on ecosystem resources during development of the project alternatives whenever practicable. Sound Transit would comply with standard specifications, best management practices (BMPs), and applicable Tribal, federal, state, and local mitigation requirements during design, construction, and post construction activities. Sound Transit would meet or exceed all regulatory requirements and continue to implement proactive avoidance and minimization measures related to these BMPs in adherence with Tribal, federal, state, and local regulations.

These strategies, along with others designed to avoid or minimize effects on other resources, would be implemented to effectively minimize the potential impacts on sensitive ecosystem resources. Examples of additional strategies include minimizing vegetation clearing, restoring soils in temporarily affected areas, and preparing and implementing a revegetation plan.

Wetland and stream impacts have been avoided and minimized during the conceptual design process, using elevated guideways, moving staging areas, and relocating project features wherever feasible. For unavoidable long-term impacts on wetlands, streams, and their buffers, Sound Transit would develop a compensatory mitigation plan during the permitting phase, in accordance with applicable federal, Tribal, state, and local requirements and guidelines. These include the federal Final Compensatory Mitigation Rule (40 Code of Federal Regulations [CFR] Part 230); interagency guidance (Wetland Mitigation in Washington State; Ecology et al. 2021); and the applicable local critical areas ordinances and shoreline regulations. Mitigation would be coordinated with regulatory agencies, employing a watershed approach and the mitigation tools available to the project. Use of the King County In-Lieu Fee Program (Mitigation Reserves Program) and/or approved mitigation banks would be considered as an option for compensatory mitigation if credits are available.

Compensatory wetland mitigation would be provided for construction impacts lasting more than one growing season, for permanent conversion of wetlands from one vegetation type to another (e.g., forested wetland to emergent or scrub-shrub wetland), for shading from elevated structures, as well as for indirect impacts on wetlands. In areas where stream buffers and wetland buffers overlap, mitigation for impacts would be based on the local jurisdiction's requirements for mitigating impacts either on wetland buffers or stream buffers, whichever requirements are more stringent.

2 METHODOLOGY

This section describes the methods used to study and evaluate potential impacts on aquatic resources, terrestrial resources, wetlands, threatened and endangered species, and areas protected under local critical areas ordinances. Discussions in this section summarize the approach defined in the TDLE environmental methodology report (Sound Transit 2020).

2.1 Aquatic Species and Habitat

Biologists reviewed existing maps and documentation to identify known streams and water bodies in the study area and vicinity (see Section 1.1). When applicable, documentation of aquatic species and habitat was analyzed from the Water Resource Inventory Area (WRIA), county, and subbasin reports. Geographic information system (GIS) data from state and local jurisdictions were gathered, evaluated, and used to create a comprehensive map of the network of surface-flowing and piped streams in and near the study area. Background information about riparian vegetation, in-stream habitat, biological connectivity, water quality and quantity, stream typing, and fish presence and habitat use was collected during the pre-field review phase. Streams and water bodies in the study area were then verified and evaluated in the field.

Sound Transit's Stream Habitat Assessment Guidelines (Attachment B) were used to determine the level of information that should be collected for each identified stream. In accordance with the guidelines, research and field surveys were conducted to identify, map, and describe aquatic species and the condition of in-stream and riparian habitats within the study area. Because it is currently undergoing initial environmental review and preliminary engineering, TDLE is classified as a Phase 1 (planning-level) project.

Sound Transit's Stream Habitat Assessment Guidelines identify two levels of data collection options ("tracks") for Phase 1 projects: Track A is typically used where access is limited or impacts are not anticipated; Track B is typically used where access is possible and impacts are anticipated (Sound Transit 2016c). For TDLE, biologists used Track B methods to assess stream habitat in Hylebos Creek and its tributaries and Track A methods for other streams.

The assessment of aquatic species and habitat focused on features that may be affected by the project and that are directly related to ecological functions that support aquatic ecosystems. After collecting and reviewing existing information, biologists conducted detailed field reconnaissance and delineation surveys on legally accessible parcels within the study area in the fall of 2019 through the fall of 2023 to identify and confirm ecosystem resources that could be affected. Based on the anticipated high level of interest from agencies, Tribes, and the public — and to aid design work — biologists conducted formal delineations (flagging and professional land surveying or handheld global positioning system [GPS], where feasible) of the ordinary high water mark (OHWM) of Hylebos Creek and its tributaries. The OHWM of other streams were documented through reconnaissance-level surveys. Assessments of the OHWM were based on guidance from Ecology (Anderson et al. 2016) and the Corps (Mersel and Lichvar 2014).

In the figures that accompany this report, streams or stream segments are shown in four different ways, reflecting the methods by which their locations were determined.

- Delineated OHWM – The lateral limits of the stream were identified and delineated in the field.
- Estimated OHWM – The lateral limits of the stream were estimated, based on reconnaissance-level surveys and/or lidar data.

- Stream (as a line) – Only the centerline of the stream channel is shown. Streams mapped this way include those with narrow channels (generally, less than 10 feet wide), those outside the study area, and those in areas where access was not possible. The locations of these stream lines are based on publicly available mapping data, supplemented by in-field observations and lidar data, as needed.
- Stream (piped) – Stream segments that are enclosed in culverts.

In addition to the impacts of urbanization, fish and fish habitat in the study area also face stressors associated with climate change (Puyallup Tribe of Indians 2016). For example, increasing air temperatures are expected to contribute to elevated water temperatures in streams, with resultant impacts on salmonid migration timing, growth rates, and vulnerability to toxins, diseases, and parasites (Katinić et al. 2015; McCullough 1999). Shifting precipitation regimes may also affect stream flows, leading to reduced availability of spawning and rearing habitat and an increased risk that eggs and juveniles will be destroyed by severe flood flows during winter (Bisson 2008).

Habitat was assessed with the assumption that anadromous fish may one day be able to enter stream reaches where no natural barriers exist, even if human-created barriers prevent access under current conditions. Using information gathered during field reconnaissance and from other sources (e.g., WDFW fish passage barrier maps), biologists evaluated the accessibility of streams in the study area, identifying downstream impediments to fish passage.

Biologists classified streams according to the interim water typing definitions in WAC 222-16-031 and the applicable stream classification systems in local jurisdictions' critical areas regulations. The biologists then identified regulatory buffers based on each stream's classification.

2.2 Vegetation, Wildlife, and Wildlife Habitat

To establish the basis for the analysis of effects on vegetation, wildlife, and wildlife habitat, biologists delineated and classified land cover on aerial photographs and visited a sample of these areas during the field reconnaissance surveys. Land cover types were identified and classified based on study area-specific refinements of the structural categories defined by Johnson and O'Neil (2001). Forest composition, relative age, native species cover, and habitat features were key attributes in determining vegetation types. Vegetation data, including dominant plant species composition, were compiled and classified by habitat type using field observation, aerial photographs, and pertinent literature.

To support the analysis of effects on wildlife, the biologists identified wildlife species associated with the land cover types in the study area, as well as specific habitat elements within each cover type. Biologists used geospatial data from the WDFW PHS Program and the WDNR Natural Heritage Program to identify documented locations of priority species, priority habitats, rare plant populations, and high-quality ecosystems in the study area. Biologists also reviewed site-specific wildlife data, including bird surveys (e.g., eBird 2023 and Opperman et al. 2006), supplemented with data gathered during field visits.

Wildlife habitat values were not evaluated for each occurrence of each land cover type along the project corridor but instead were assigned to the cover type. Habitat value within a cover type at a specific location can vary and depend on several factors, such as size of the area; degree of fragmentation or isolation; presence of (or proximity to) other valuable habitat; potential role as a travel corridor; level and type of human disturbance; diversity of plant species; presence of multiple cover layers (i.e., tree, shrub, and herbaceous layers); presence of threatened, endangered, or sensitive species; and extent of invasive weeds.

Species known to use habitats in the study area are those whose presence is documented by the information sources identified in Section 1.1, as well as species observed during site visits conducted for this analysis. Species for which known or expected distribution encompasses the study area and that are associated with habitat types in the study area are considered potentially present.

2.3 Wetlands

Wetland assessments are based on background research and analysis of existing information and datasets (see Section 1.1), combined with field surveys to document current conditions. Wetland assessments include both delineated and estimated extents for all wetlands in the study area.

Biologists conducted wetland assessments throughout the study area to identify, map, and describe wetlands in legally accessible areas (e.g., in public rights-of-way or on parcels where landowners had granted rights of entry). Wetland delineations were conducted to provide comprehensive information in areas with an anticipated high level of interest from agencies, Tribes, and the public (specifically, areas associated with tributaries to Hylebos Creek). These delineated boundaries were surveyed by professional land surveyors or located using a GPS unit with submeter accuracy.

The extents of wetlands on properties lacking access or that were otherwise inaccessible were estimated by using remote sensing and best professional judgment. Vegetation and potential wetlands in areas where rights of entry had not been obtained were identified based on field reconnaissance from public areas; current local, state, and federal habitat maps and reports; the examination of aerial photographs and lidar topography. Wetlands associated with Wapato Creek were remotely identified and mapped. Wetland determination forms were not completed for most remotely identified wetlands.

Information about wetlands identified for other projects was evaluated and, where appropriate, included in the wetland findings for this analysis. The TDLE study area partially overlaps the study area for the WSDOT SR 167 Completion Project. More information on these areas is in reports prepared for that project (WSDOT 2019, 2020).

Wetland boundaries were estimated or delineated using methods outlined in the Corps Wetland Delineation Manual (Environmental Laboratory 1987) and indicators defined in the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region Version 2.0 (Corps 2010). The detailed methodology for wetland assessments is included in Attachment A. Observations of existing conditions and characteristics were recorded for each wetland and associated buffer.

Wetlands were classified according to the USFWS (Cowardin et al. 1979; FGDC 2013) and hydrogeomorphic (Brinson 1993) classification systems. Wetlands were rated and wetland functions were assessed according to local critical area ordinances and the Washington State Wetland Rating System for Western Washington, 2014 Update – Version 2 (Hruby and Yahnke 2023). Biologists determined the width of each wetland's standard regulatory buffer based on the wetland's rating and the critical area requirements of the local jurisdiction. All wetland ratings and buffer widths are preliminary and are subject to change based upon agency review.

Wetland background research is presented in Attachment C. Determination forms are provided in Attachment D, and rating forms are included in Attachment E. Representative photographs of wetlands and streams in the study area are in Attachment F. Scientific names of plants and animals are presented in Attachment G.

2.4 Special-Status Species and Habitats

2.4.1 Threatened and Endangered Species

Biologists reviewed information provided by NMFS and USFWS to identify species listed or proposed for listing as threatened or endangered under the ESA that may be present in the study area, as well as critical habitat that has been designated or proposed for designation for those species. To determine the potential presence of terrestrial species in the study area, biologists evaluated the quality and distribution of habitat for each species, as well as any documented sightings.

2.4.2 Areas Protected Under Local Critical Areas Ordinances

Local critical areas ordinances specify requirements for the protection of two kinds of ecosystem components addressed in this report: 1) wetlands and 2) fish and wildlife habitat conservation areas (FWHCAs), including streams and rivers. The methods used to study and evaluate potential impacts on wetlands are described in Section 2.3. Wetlands are defined at the federal and state levels. However, the identification of FWHCAs varies slightly from jurisdiction to jurisdiction, as described below. FWHCAs include aquatic resources and terrestrial resources; the methods used to study and evaluate potential impacts on those ecosystem components are described in Section 2.1 and Section 2.2, respectively.

The Federal Way Revised Code (Section 19.145.260) identifies the following as FWHCAs:

- Areas where federally listed endangered or threatened species or state-listed endangered, threatened, or sensitive species have a primary association.
- State priority habitats and areas associated with state priority species (as identified by WDFW).
- Habitats and species of local importance (the City of Federal Way has not identified any habitats or species of local importance).
- Streams.
- Regulated lakes.

The Milton Municipal Code (Section 18.16.610) identifies the following as FWHCAs:

- Areas where federally or state-designated endangered, threatened, and sensitive species have a primary association.
- Habitats and species of local importance (the City of Milton has not identified any habitats or species of local importance).
- Waters of the state (including streams and lakes).

The Fife Municipal Code (Section 17.15.040) identifies the following as FWHCAs:

- Areas where federally or state-designated endangered, threatened, and sensitive species have a primary association and that, if altered, may reduce the likelihood that the species will maintain and reproduce over the long term.
- State priority habitats and areas associated with state priority species, as identified by WDFW.
- Waters of the state, including rivers, streams, inland waters, underground waters, and all other surface waters and watercourses within the jurisdiction of the state of Washington, as classified in WAC 222-16-031.
- Areas where state-listed monitor or candidate species or federally listed candidate species have a primary association and that, if altered, may reduce the likelihood that the species will maintain and reproduce over the long term.
- Special habitat areas, including oak woodlands, prairies, aspen stands, meadows; as well as riparian areas and Category I or II wetland areas.
- Naturally occurring ponds under 20 acres and their submerged aquatic beds that provide fish and animal habitat.
- Lakes, ponds, streams, and river planted with game fish by a governmental or Tribal entity.
- State natural area preserves and natural resource conservation areas.
- Areas established by the Puyallup Tribe of Indians Tribal government as habitat areas of Tribal importance for economic, social, cultural, and ceremonial reasons.
- Areas where city policy supports the reestablishment of historical fisheries.

The Tacoma Municipal Code (Section 13.11.510) identifies the following as FWHCAs:

- Areas where state or federally designated endangered, threatened, and sensitive species have a primary association.
- Lands and waters containing state priority habitat and species (as classified by WDFW).
- Areas critical for habitat connectivity, including open space corridors designated in the City's comprehensive plan.
- Habitats and species of local importance that have been identified as sensitive to habitat manipulation.
- State natural area preserves and natural resource conservation areas.
- Waters of the state (including streams and lakes).
- Natural ponds smaller than 20 acres and their submerged aquatic beds that provide critical fish or wildlife habitat.
- Lakes, ponds, streams, and rivers planted with game fish.

The Pierce County Code (Section 18E.40.020) identifies the following as FWHCAs:

- Federally and state-listed species and their associated habitats – Includes areas that have a primary association with federally listed endangered, threatened, or candidate species of fish or wildlife or state-listed endangered, threatened, sensitive, candidate, and monitor species that, if altered, may reduce the likelihood that the species will survive and reproduce over the long term.

- Species of local importance and their associated habitats – Includes salmonids, osprey (*Pandion haliaetus*), and vulnerable aggregations of fish and wildlife species as defined by the WDFW Priority Habitats and Species Program.
- Habitats of local importance – Includes natural waters and adjacent riparian-shoreline areas, old-growth/mature forests, areas with abundant and well-distributed snags and logs, heron rookeries, and cavity-nesting duck habitat.

2.4.3 Areas Within the Shoreline Jurisdiction

The Shoreline Management Act is intended to protect shoreline natural resources — including the land, vegetation, wildlife, and aquatic habitats — against adverse environmental effects. Local governments develop master programs and administer shoreline substantial development permits, shoreline conditional use permits, and shoreline variance permits. All developments within the shoreline jurisdiction must be consistent with the policies of the Shoreline Management Act and the requirements of the local shoreline master program. The shoreline jurisdiction includes segments of streams with a mean annual flow exceeding 20 cubic feet per second, associated wetlands, an area extending 200 feet from the water's edge, the regulated floodway, and the 100-year floodplain.

Biologists identified areas that fall within the shoreline jurisdiction and reviewed the pertinent sections of the applicable local governments' shoreline master programs. Where the widths of buffers on streams or wetlands established in the shoreline master program differ from those established under local critical areas codes, these differences are identified in this report.

2.4.4 Areas Protected by Tribal Regulations

Sound Transit has been and will continue to coordinate and collaborate with Tribal governments to ensure the project complies with applicable Tribal regulations. Both the Muckleshoot Tribe and the Puyallup Tribe of Indians are active in salmonid habitat restoration within the Hylebos Creek drainage and the Puyallup River watershed. Any proposed project work within the OHWM of the Puyallup River would be regulated by the Puyallup Tribe of Indians, as would work on Tribal properties held in trust or on other designated Tribal lands.

2.5 Impact Assessment Methods and Assumptions

Resource analysts evaluated temporary (construction-related) and long-term (permanent) impacts on ecosystem resources. The following subsections describe the process by which direct, indirect, and cumulative impacts on each ecosystem component were identified, as well as the supporting assumptions for the impact analyses. Impact values in this report are estimates based on 10 percent conceptual designs for the alternatives. More-detailed analyses to support permitting and other reviews will take place following further design refinement and identification of the Preferred Alternative.

For this analysis, the design team identified a permanent impact footprint that includes guideways, station footprints, bridges, pedestrian and vehicular access routes, stormwater management facilities, and other constructed project features that would result in long-term impacts on ecosystem resources. The design team also defined a construction footprint adjacent to the permanent impact footprint, including areas where vegetation clearing and ground-disturbing work are likely to be required for project construction. Temporary (construction-related) impacts would occur outside the permanent impact footprint but within the construction footprint; such areas would be expected to be restored to pre-project conditions, or better, following construction. These footprints were overlain on mapped locations of streams, wetlands, and vegetation cover types to determine the extent of the potential impacts of the alternatives on ecosystem resources.

2.5.1 Direct Impacts

Direct impacts on aquatic resources were determined by evaluating the extent of each water body and riparian buffer that would be directly altered or eliminated under each alternative. In many areas, the functional extent of buffers is compromised by existing high-intensity land uses and development (e.g., buildings, parking lots, roads). In such cases, the standard buffer width was drawn to the edge of the developed areas (i.e., the buffer did not include or extend across buildings, parking lots or roads) to denote the extent of the functional buffer.

Direct impacts on aquatic species, including ESA-listed species, were assessed qualitatively by considering the regional significance of the resident and anadromous fish species resource, fish habitat value (such as its role as a migration corridor, rearing, refugia, or spawning area), degree of connectivity and loss of habitat following project implementation, overall habitat quality, and potential for enhancing or restoring aquatic habitat or connectivity. Construction and operational impacts on aquatic species from water quality degradation and loss or degradation of habitat were also assessed.

Potential impacts of each alternative on terrestrial resources were determined by evaluating the acreage of major vegetation types that would be temporarily or permanently affected by project construction and operation. Impacts on rare plant populations were determined by evaluating the acreage of any mapped populations that would be affected by construction or operation of each alternative. The potential for the introduction or removal of noxious or invasive plant species was also evaluated.

Potential impacts on wildlife were also assessed qualitatively by considering the regional significance of the resource, wildlife habitat value of affected areas (such as its role as a wildlife movement corridor), degree of fragmentation and loss of the habitat following project implementation, overall habitat quality, and the potential for enhancing or restoring unique plant communities or wildlife habitat or connectivity. Evaluations of the potential for increased human access, noise, and light to affect sensitive wildlife species were based on the proximity of project features and work sites to known locations of sensitive sites such as breeding areas or communal roosts.

Impacts on wetlands and buffers were based on an analysis of direct impacts from both long-term effects (filling or other permanent displacement) and short-term, construction-related effects (vegetation clearing or ground disturbance). As with riparian buffers, standard regulatory buffers for wetlands were trimmed at the edge of developed areas to denote the extent of the functional buffer.

Evaluations of potential impacts on threatened and endangered species are based on the impacts on aquatic and terrestrial habitats where such species are known or expected to be present. Evaluations of potential impacts on areas protected under local critical areas ordinances are based on impacts on FHWCAs and wetlands.

2.5.2 Indirect Impacts

Indirect impacts are project-related effects that are reasonably foreseeable but separated from project implementation by distance or time. Examples may include changes in land use patterns, population density, or water quality in the areas affected by the project. Indirect impacts may also occur through the implementation of mitigation measures for other environmental impacts, or through supporting projects that are not yet defined or considered part of the project alternatives. Indirect impacts on ecosystem resources were analyzed qualitatively in this document.

2.5.3 Cumulative Impacts

Cumulative impacts are the effects of the project when combined with other past, present, and reasonably foreseeable future actions. The total effects of the project on ecosystem resources will be determined qualitatively. The analysis of cumulative impacts incorporated the effects of the Federal Way Link Extension project, which is assumed to be part of the No-Build Alternative, and the planned OMF South project, which is a reasonably foreseeable future project. Other reasonably foreseeable projects include the WSDOT SR 167 Completion Project and the Federal Way City Center Access project.

2.5.4 Analysis Assumptions

The process of analyzing and estimating project impacts requires a series of assumptions regarding the physical extent of impacts, the duration of impacts, site restoration following construction, and measures that would be implemented to avoid or minimize potential impacts. This analysis also includes temporary construction impacts and permanent operational impacts within the project right-of-way.

For the impact analysis, Sound Transit assumes that all ecosystem resources within the limits of the project footprint under each alternative, including areas within stormwater facilities, utility upgrades, and other similar features, would be permanently modified. In most areas, the ecosystem functions of such areas would be permanently degraded or eliminated. However, streams within the project footprint would be relocated and reestablished within an open channel. No new culverts on fish-bearing streams are proposed, as shown in Appendix F Conceptual Design Plans. Sound Transit has committed to minimizing the need to place existing streams in new culverts and has designed the TDLE alternatives to avoid new stream piping whenever possible.

Ecosystem resources within temporarily disturbed areas (e.g., in construction access areas and related rights-of-way) would be restored to existing conditions or better after construction is complete. Site restoration would include replanting disturbed areas with appropriate native vegetation immediately following construction. The length of time required for recovery of ecological functions would vary depending upon the intensity of the temporary impact (e.g., vegetation clearing versus temporary fill), as well as the type, age, and diversity of the existing plant community in the affected areas.

TDLE would be designed and constructed in compliance with all applicable Tribal, federal, state, and local regulations. Sound Transit assumes the overall extent and magnitude of potential temporary construction impacts would be controlled by the types of construction activities and by the implementation of BMPs (see Section 5.1.1, Avoidance and Minimization During Design Development). These BMPs would be designed to accommodate site-specific characteristics, such as the widths of wetlands and stream buffers.

Adverse effects on ecosystem resources would be avoided or minimized through the project design process once a preferred alternative has been selected. In addition, Sound Transit will carefully implement, monitor, and maintain BMPs during project construction and operation. Compensatory mitigation for unavoidable adverse effects would be implemented in accordance with permit requirements and Tribal, federal, state, and local regulations (see Section 5, Potential Mitigation Measures).

3 AFFECTED ENVIRONMENT

The proposed TDLE alignment is divided into four segments, arranged from north to south: the Federal Way Segment, South Federal Way Segment, the Fife Segment, and the Tacoma Segment. Descriptions of existing conditions of ecosystem components are arranged similarly; for each component, areas in the northern portion of the study area are described first, and those in the southern portions are described last.

3.1 Aquatic Species and Habitat

This section identifies aquatic species and habitats that may be affected by the construction and operation of TDLE. The study area is in an urban area where aquatic habitats have been highly modified by past development. The proposed facilities lie within areas that were disturbed by the construction of I-5 as well as within the highly developed urban areas of Federal Way, Milton, Fife, unincorporated Pierce County, and Tacoma. Much of the low-elevation areas surrounding Fife were part of the greater Puyallup River floodplain and estuary, which contained extensive areas of floodplain wetlands and vital rearing habitat for salmonids[1]. Over the last 100 years, the lower portion of the Puyallup River was straightened and placed behind a series of dikes and levees for flood control, wetlands were drained to support agriculture, and the lower tidelands were filled to support the development of a deepwater port. Much former agricultural land use has since been converted to a mixture of commercial, light industrial, industrial, and residential land uses. Much of the land within and surrounding the study area is dominated by commercial, residential, and light industrial development with extensive areas of impervious surface.

Within the study area, high-intensity land use and associated disturbance has reduced the size, composition, complexity, and function of the vegetated riparian corridor that protects and supports aquatic habitats within the study area. Of particular concern is the establishment of invasive plant species within riparian habitats, including wetlands. Several invasive species, including Himalayan blackberry (*Rubus armeniacus*), reed canarygrass (*Phalaris arundinacea*), spotted jewelweed (*Impatiens capensis*), English ivy (*Hedera helix*), invasive knotweeds (*Fallopia* species and *Persicaria wallichii*), and bittersweet nightshade (*Solanum dulcamara*), were documented and are commonly found in riparian habitats in the study area. All invasive species are a nuisance because they outcompete native vegetation, which reduces species diversity and complexity in riparian areas. Himalayan blackberry competes with native species, forming dense monotypic stands and often inhibits wildlife movements by presenting a physical barrier. Knotweeds contribute to streambank erosion, interfere with the successional trajectory of riparian forests, and alter nutrient cycling. English ivy damages mature trees and affects timing of LWD recruitment to streams. Reed canarygrass and bittersweet nightshade can both form dense mats that extend into the channel, which can accelerate fine sediment deposition, create barriers to fish migration, and cause widening and shallowing of channels that can result in increased stream temperatures. Jewelweed outcompetes and dominates native plant communities.

[1] Salmonids include the five species of Pacific salmon (Chinook, chum, coho, pink, and sockeye), as well as steelhead, cutthroat trout, and bull trout. Anadromous salmonids begin their life in freshwater, migrate to marine waters to reach maturity, and then return to freshwater as adults to spawn.

Streams in the study area are in WRIA 10, the Puyallup-White watershed. Many species of fish, both native and introduced, inhabit WRIA 10. Discussions in this document focus on salmonids in particular because these species are a management concern due to habitat degradation and population declines. Salmonids in WRIA 10 are a mix of native and introduced stocks. For example, sockeye salmon (*Oncorhynchus nerka*) that spawn in some areas appear to be descendants of introduced fish, while those in other areas may be native fish (Hendry et al. 1996). The Puyallup River supports native spring-run Chinook salmon stock, an unknown origin White River summer/fall-run Chinook salmon stock, unknown origin Puyallup River summer/fall-run Chinook salmon stock, mixed stock of fall-run chum salmon (*Oncorhynchus keta*), mixed Puyallup and White River coho salmon (*Oncorhynchus kisutch*) stocks, native pink salmon (*Oncorhynchus gorbuscha*) stock, native Puyallup and White River winter-run steelhead stocks, and three native stocks of bull trout (WDFW and WWTT 1994). Little genetic information is available for salmon originating from smaller independent tributaries to Puget Sound, such as Wapato Creek and Hylebos Creek. No unique stocks have been identified in Hylebos Creek or Wapato Creek (WDFW and WWTT 1994). However, LeClair (1999) determined that fall chum salmon stocks occurring in Hylebos Creek are of an unknown stock origin.

The following subsections briefly describe the general life history of the salmonid species that are known or expected to use habitats in the study area, followed by detailed descriptions of the streams in the study area, including habitat conditions and fish distribution.

3.1.1 Relevant Species Life History Descriptions

3.1.1.1 Bull Trout

The Puyallup River in the study area provides foraging, migration, and overwintering habitat for bull trout. It may also provide a migratory corridor for bull trout that spawn in cool-water habitats at higher elevations (Marks et al. 2018; Puyallup and Chambers Watersheds Salmon Recovery Lead Entity 2018). Bull trout in the Puyallup River system exhibit anadromous, fluvial, and resident life history strategies. Most bull trout in the system are resident or fluvial fish, which generally remain in upper portions of the watershed, outside of the study area (USFWS 2017). However, the Puyallup River in the study area is the key migratory corridor for numerous anadromous bull trout entering and leaving spawning areas in the upper watershed.

Bull trout are not documented in the Hylebos watershed (NWIFC 2023) due to the lack of suitable habitat in the Hylebos Creek basin (see below); however, there was one report of a single sub-adult bull trout captured near the S 373rd Street crossing of West Fork Hylebos Creek in August 2018 (Heltzel 2018 pers. comm.). This single observation should be considered in the context of decades of fish monitoring studies in the Hylebos Creek watershed conducted by Puyallup Tribal Fisheries, which have not encountered bull trout in the watershed (Marks et al. 2021). Nevertheless, for this analysis, it is assumed that individual bull trout could venture into accessible segments of Hylebos Creek and its tributaries in the future. Based on the lack of high-quality habitat for bull trout in those streams (as described below), the presence of any such fish would likely be brief and transitory in nature.

Bull trout are strongly associated with snowmelt-dominated streams that maintain cold water temperatures in headwater tributaries year-round. Streams supporting bull trout have clean gravel substrates and cold water temperatures (less than 9ºC/48ºF) (USFWS 1998). Hylebos Creek is a rainfall-dominated stream, and stream temperatures are regularly higher than the temperatures this species requires. Stream substrates in the Hylebos Creek watershed are dominated by fines, particularly near the project footprint. Water temperatures often exceed those preferred by bull trout. A 2001 water quality study of East Fork Hylebos Creek (east of I-5) indicated that temperatures frequently exceeded 14ºC/57ºF in summer months at one of the stations (King County 2002). West

Fork Hylebos Creek and portions of its tributaries are included on the 303(d) list of impaired waters, based on temperatures exceeding 17ºC/63ºF (Ecology 2023). Such temperatures are likely to limit the presence of bull trout. Other 303(d) water quality impairments identified in the watershed include dissolved oxygen, heavy metals, copper, and bacteria, which may also limit the potential presence of bull trout (Ecology 2023). Bull trout could use habitats at the mouth of the Hylebos Creek, more than 1 mile downstream of the study area (WSDOT 2019); however, the Hylebos Waterway has 303(d) listings for chlorinated pesticides, DDT and metabolites, high molecular weight polycyclic aromatic hydrocarbons, and polychlorinated biphenyls, all which detrimentally affect various life history stages of fish.

3.1.1.2 Chinook Salmon

The Puyallup River system contains both fall-run population and spring-run populations that enter the river as early as April (Kerwin 1999). Chinook in the Hylebos watershed are classified as fall-run (NWIFC 2023) and generally return to freshwater for their spawning migrations in August through September, with spawning occurring from mid-September through October. Chinook salmon have been documented in Hylebos Creek and the lower reaches of West Fork Hylebos Creek (downstream of barriers), and they are presumed to be present in the lower 700 feet of East Fork Hylebos Creek (NWIFC 2023). Fisheries biologists from the Puyallup Tribe of Indians have documented Chinook salmon in West Fork Hylebos Creek as far upstream as S 356th Street, approximately 1.4 miles upstream of the upstream extent of the documented distribution of Chinook salmon in that stream, as mapped by NWIFC (NWIFC 2023).

Juvenile Chinook have variability in when they become smolts and migrate to saltwater. Some can migrate as subyearlings in their first year of life, and others will remain in freshwater for their first year and migrate out at age 1 (Wydoski and Whitney 2003). Juvenile Chinook salmon in the Puyallup River system exhibit four different rearing trajectories, which include fry that migrate to the estuary immediately following emergence; fry/fingerlings that spend several weeks rearing in freshwater before migrating to the estuary; fingerlings that can spend several months rearing in freshwater before migrating to estuary; and yearlings that can spend up to a year in freshwater before migrating to the estuary (Hayman et al. 1996). Regardless of life history strategy, the juveniles make their downstream migrations in the spring and early summer.

3.1.1.3 Chum Salmon

Chum salmon typically spawn in the lowermost reaches of rivers and streams. Fry begin to migrate downstream immediately following emergence to rear in the nearshore estuarine areas of Puget Sound from late January through June, peaking in April (Salo 1991; Wydoski and Whitney 2003). In Washington, most chum populations, including those occupying stream habitats in the study area, are fall-run fish that return to natal[2] streams between October and November and typically spawn within a month of their migration (Wydoski and Whitney 2003). One of the advantages of the late fall/early winter spawn timing is that streams typically contain enough flow and sufficient depths to allow easy migration to upstream spawning areas. Chum salmon excavate redds (spawning sites) in small to medium-sized gravels in shallow, low-velocity areas at the heads of riffles.

[2] Natal in the context of streams and salmon refers to the stream where eggs were deposited and the life history of the species begins (birthplace).

3.1.1.4 Coastal Cutthroat Trout

Coastal cutthroat trout (*Oncorhynchus clarki clarki*) in the study area may exhibit anadromous or resident life history forms. Coastal cutthroat trout spawn in the smallest headwater streams and tributaries of coastal rivers (Wydoski and Whitney 2003). Cutthroat trout surveyed from the upper reaches of the Hylebos Creek in Federal Way were found to be predominantly resident fish (HDR 2014). Coastal cutthroat trout are also found throughout the Puyallup River drainage, but not much is known of the anadromous life history forms that may occur there (Kerwin 1999). Anadromous coastal cutthroat trout are voracious predators of juvenile salmonids in the nearshore areas of Puget Sound.

3.1.1.5 Coho Salmon

Coho salmon are the most adaptable of the Pacific salmon species and are known to spawn in a variety of stream types, including small coastal streams, large rivers, and remote tributaries where suitable gravel (6 inches or smaller in diameter) is present. Like those of most salmon, coho redds are located at the heads of riffles, which ensures good oxygen circulation around the newly laid eggs. Coho are highly tolerant of degraded habitat and are commonly found in residential areas and streams channeled through ditches (Wydoski and Whitney 2003). Coho salmon thrive in streams with complex in-stream habitat composed of large rocks, large woody debris (LWD), and adequate vegetative cover. In particular, juvenile coho typically rear and seek out pools with dense overhanging cover. Backwaters, side channels, and small streams are preferred areas, particularly in shaded areas with overhead cover (Bjornn and Reiser 1991; Smith and Wenger 2001). In winter, coho juveniles can move both upstream and downstream into pools and off-channel areas. Fingerlings move into off-channel habitat when fall freshets begin. In-stream cover, side channels, small intermittent streams, and ponds provide shelter from winter storms that could sweep the fish out of the system (Smith and Wenger 2001). Coho typically spend 1 to 2 years rearing in freshwater before migrating out to the ocean in the spring between March and June (Wydoski and Whitney 2003).

3.1.1.6 Pink Salmon

In Washington, pink salmon generally have a 2-year life cycle, meaning they return to spawn during odd-numbered years. Pink salmon, like chum salmon, typically spawn in the lower reaches of rivers. Upon hatching, juveniles move immediately to estuarine and the marine nearshore areas to rear. In Washington, pink salmon spawn from August to October, excavating redds in small to medium gravels located at pool tail-outs or heads of riffles in fast-flowing streams (Wydoski and Whitney 2003). Juvenile pink salmon typically migrate out of streams shortly after emergence between March and April. Within the study area, pink salmon are documented in the lower reaches of Hylebos Creek during their odd-year spawning cycle. Also, the East and West Forks of Hylebos Creek are presumed to support pink salmon. In addition, the Puyallup River typically supports healthy runs of pink salmon.

3.1.1.7 Sockeye Salmon

Sockeye salmon are different from other Pacific salmon in that they require a period of rearing in a lake environment. In Washington, mature sockeye salmon enter streams between June and late September and spawn between mid-September through October. Shortly after emergence, juvenile sockeye salmon move either upstream or downstream to a lake where they rear for up to 2 years (Wydoski and Whitney 2003). Outmigration of juveniles to the ocean usually occurs between mid-April and late June. Sockeye are considered indigenous to the Puyallup River drainage; however, they are only occasionally observed spawning in South Prairie Creek, a small tributary to the Puyallup River (Shared Strategy for Puget Sound 2023).

3.1.1.8 Steelhead

Steelhead in the study area are a winter-run population, typically spawning from late winter through early spring. Adult winter-run steelhead enter the Puyallup River from January to June. The portion of the lower Puyallup River in the study area is primarily a migratory corridor for the winter-run steelhead populations that spawn and rear higher in the river system. Spawning sites are typically located near the head of a riffle in small to medium gravel (Smith and Wenger 2001). During the fall and winter months, steelhead take shelter in backwaters and eddies to avoid being swept downstream in floodwaters.

Juvenile steelhead exhibit diverse life history strategies. Fish may migrate downstream during their natal year, or they may remain in freshwater habitats for up to 4 years. However, most juveniles from the Puyallup River system emigrate during the spring of their second year (NMFS 2017), with most downstream migration occurring in the spring and summer. Because steelhead can spend several years in freshwater before migrating to the ocean, steelhead do not need to remain in estuaries and nearshore environments for additional rearing like most Pacific salmon, but rather move offshore quickly after leaving freshwater habitats.

3.1.2 Streams in the Study Area

Consistent with Sound Transit's stream habitat assessment guidelines (Sound Transit 2016c), this subsection describes the streams in the study area and provides information about the following key aquatic habitat elements:

- Riparian vegetation.
- Physical in-stream habitat.
- Biological connectivity.
- Water quality and quantity.
- Fish presence and habitat use
- Stream typing.

The stream descriptions are organized geographically, starting at the northern end of the proposed alignment in Federal Way and ending in Tacoma.

The study area for aquatic resources includes 20 streams (Table J4.3-1), most of which are in the Hylebos Creek watershed. Hylebos Creek is an independent tributary that discharges to the Hylebos Waterway along the eastern shore of Puget Sound's Commencement Bay in Tacoma. The other streams in the study area are Wapato Creek (another independent tributary that discharges to the Blair Waterway in Commencement Bay), the Puyallup River, First Creek (a small tributary to the Puyallup River), and two artificially created drainage systems that convey surface water runoff to the Blair Waterway. Figures J4.3-1 through J4.3-13 show stream locations, conditions (surface-flowing or piped), and fish passage barriers, as well as wetlands (discussed in Section 3.3). Table J4.3-1 (Summary of Streams in the Study Area) summarizes regulatory information for the streams in the study area.

Table J4.3-1 Summary of Streams in the Study Area

Stream Name	Stream Index No.[1]	State Interim Water Type[2]	Local Jurisdiction	Local Jurisdiction Stream Classification[3]	Local Jurisdiction Buffer Width[3]
Federal Way Segment					
East Fork Hylebos Creek Tributary 0016A	10.0016A	3	Federal Way	F	100
West Fork Hylebos Creek Tributary 0014C	10.0014C	3	Federal Way	F	100
South Federal Way Segment					
East Fork Hylebos Creek Tributary 0016A	10.0016A	3	Federal Way	F	100
Federal Way Stream 1 (SFW-01)	N/A	5	Federal Way/ Milton	Ns	30/65
Federal Way Stream 2 (SFW-02)	N/A	5	Federal Way	Ns	30
Federal Way Stream 3 (SFW-03)	N/A	3	Federal Way	F	100
Federal Way Stream 4 (SFW-04)	N/A	3	Federal Way	F	100
West Fork Hylebos Creek	10.0014	2	Milton/Federal Way	F	150/100
North Fork Hylebos Creek	10.0013	2	Federal Way	F	100
Milton Stream 1 (SMI-01)	N/A	3	Milton/ Pierce County	F/F_1	150/150
Milton Stream 2 (SMI-02)	N/A	2	Milton	F	150
Milton Stream 3 (SMI-03)	N/A	5	Milton	Ns	65
Hylebos Creek[4]	10.0006	1	Pierce County/ Milton/Fife	F_1/S/1	150/165/ Case-by-Case[5]
Surprise Lake Creek	10.0009	3	Fife	3	Case-by-Case
Fife Segment					
Fife Ditch Tributary 1[6]	N/A	4	Fife	N/A	N/A
Fife Ditch[6]	N/A	4	Fife	N/A	N/A
Wapato Creek	10.0017	2	Fife	2	Case-by-Case
Erdahl Ditch Tributary 1[6]	N/A	4	Fife	N/A	N/A
Erdahl Ditch Tributary 2[6]	N/A	4	Fife	N/A	N/A

Table J4.3-1 Summary of Streams in the Study Area (continued)

Stream Name	Stream Index No.[1]	State Interim Water Type[2]	Local Jurisdiction	Local Jurisdiction Stream Classification[3]	Local Jurisdiction Buffer Width[3]
Tacoma Segment					
Puyallup River[4]	10.0021	1	Tacoma/Fife	S/1	150/ Case-by-Case
First Creek	N/A	3	Tacoma	F_1	150

Notes:

(1) WRIA identification numbers according to Williams et al. (1975) and King County (1990); N/A indicates the stream is not identified in either of those sources.

(2) Per WAC 222-16-031, Type 1 waters are shorelines of the state; Type 2 waters have a have a high fish, wildlife, or human use; Type 3 waters have a moderate to slight fish, wildlife, or human use; Type 4 waters are perennial, non-fish-bearing streams; Type 5 waters are seasonal, non-fish-bearing streams.

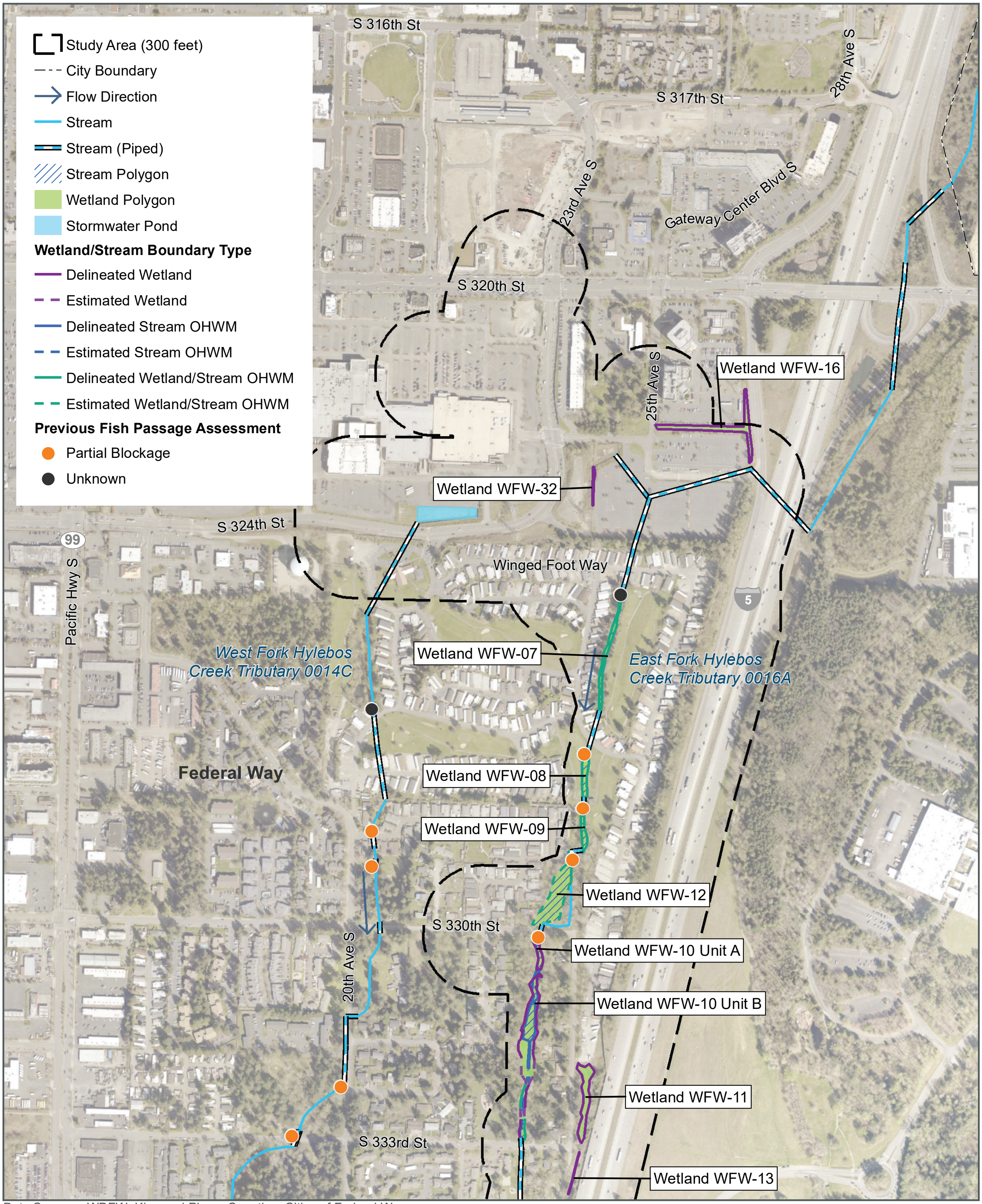
(3) Per Federal Way Municipal Code 19.145.270 (revised October 15, 2019), Milton Municipal Code 18.16.640(D), Tacoma Municipal Code 13.11.420, Fife Municipal Code 17.15.050, and/or Pierce County Code 18E.40.60, as applicable. Numeric classifications are as described under WAC 222-16-031 (see preceding footnote). Other classifications: F = streams with fish habitat; F_1 = natural waters containing salmonid fishes; Ns = seasonal, non-fish-habitat streams; S = shorelines of the state.

(4) Hylebos Creek and the Puyallup River are classified as shorelines of the state. Despite this classification, the Pierce County Code does not classify Hylebos Creek as a Type S stream, instead assigning it a classification of F_1. The Puyallup Tribe of Indians has jurisdiction over the Puyallup River as well.

(5) Per Fife Municipal Code 17.15.050, the widths of buffers on streams are to be determined by the community development director on a case-by-case basis. To evaluate the potential impacts of the alternatives on riparian areas, the following buffer widths were used for streams in Fife: Type 1 – 165 feet; Type 2 – 150 feet; Type 3 – 150 feet. These widths are based on the buffers for corresponding stream types in the Milton Municipal Code

(6) Fife Ditch, Erdahl Ditch, and their tributaries serve primarily as stormwater conveyance ditches with pump stations at the outlets. Based upon WDFW surveys, WDFW has determined that they are non-fish bearing ditches and will therefore not be regulated as streams by WDFW or City of Fife.

Note that two streams, Tacoma Gulch and Tacoma Eastern Gulch, are mapped at the western end of the study area. Both streams are contained in pipes through the study area, and neither of them would be crossed by any of the alternatives. Similarly, the study area overlaps a short segment of East Fork Hylebos Creek but would not have temporary or permanent impacts to the aquatic habitat; riparian habitat impacts in that area are addressed in the analysis of potential impacts on the main stem of Hylebos Creek. For these reasons, Tacoma Gulch, Tacoma Eastern Gulch, and East Fork Hylebos Creek are not addressed in this document.

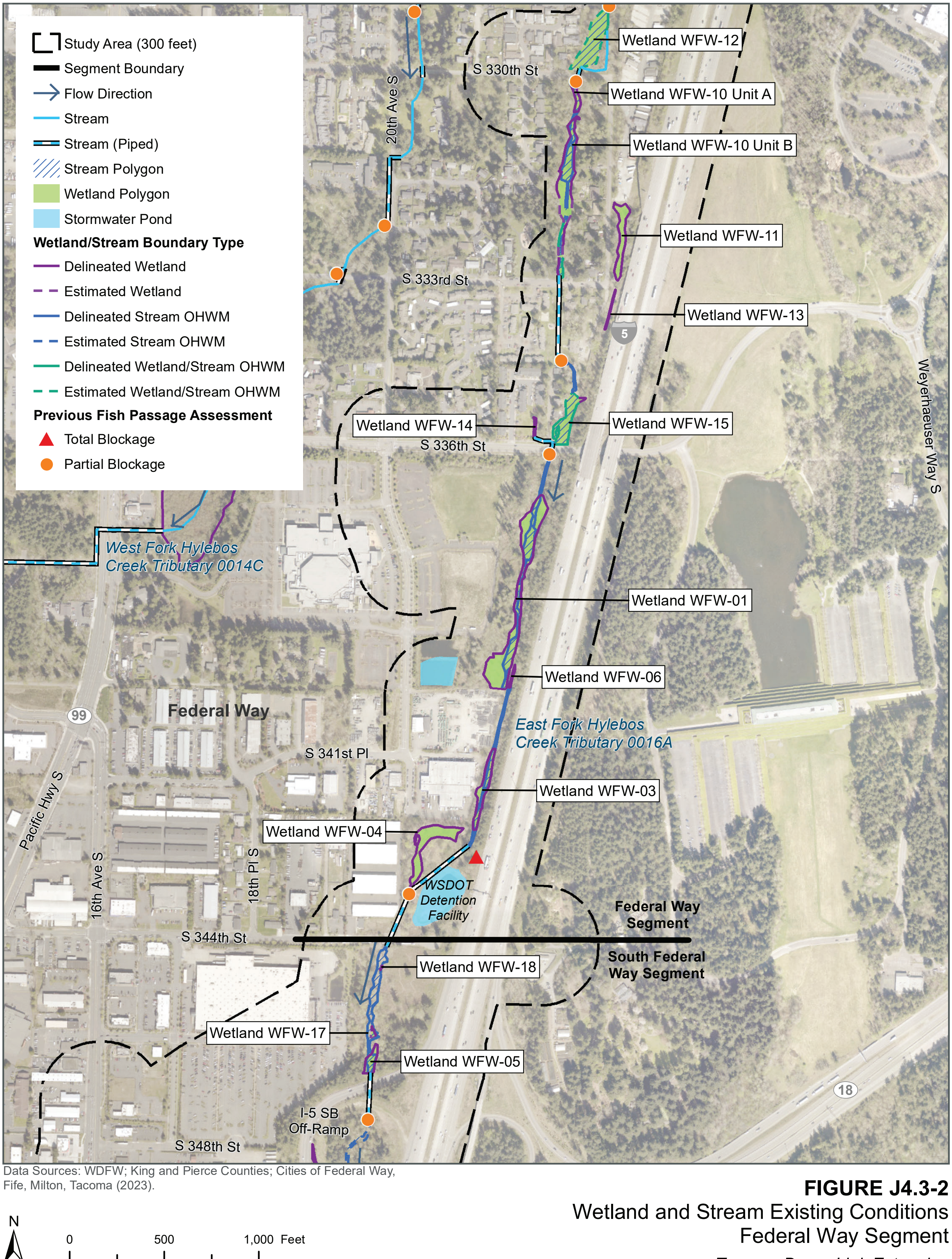


Data Sources: WDFW; King and Pierce Counties; Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

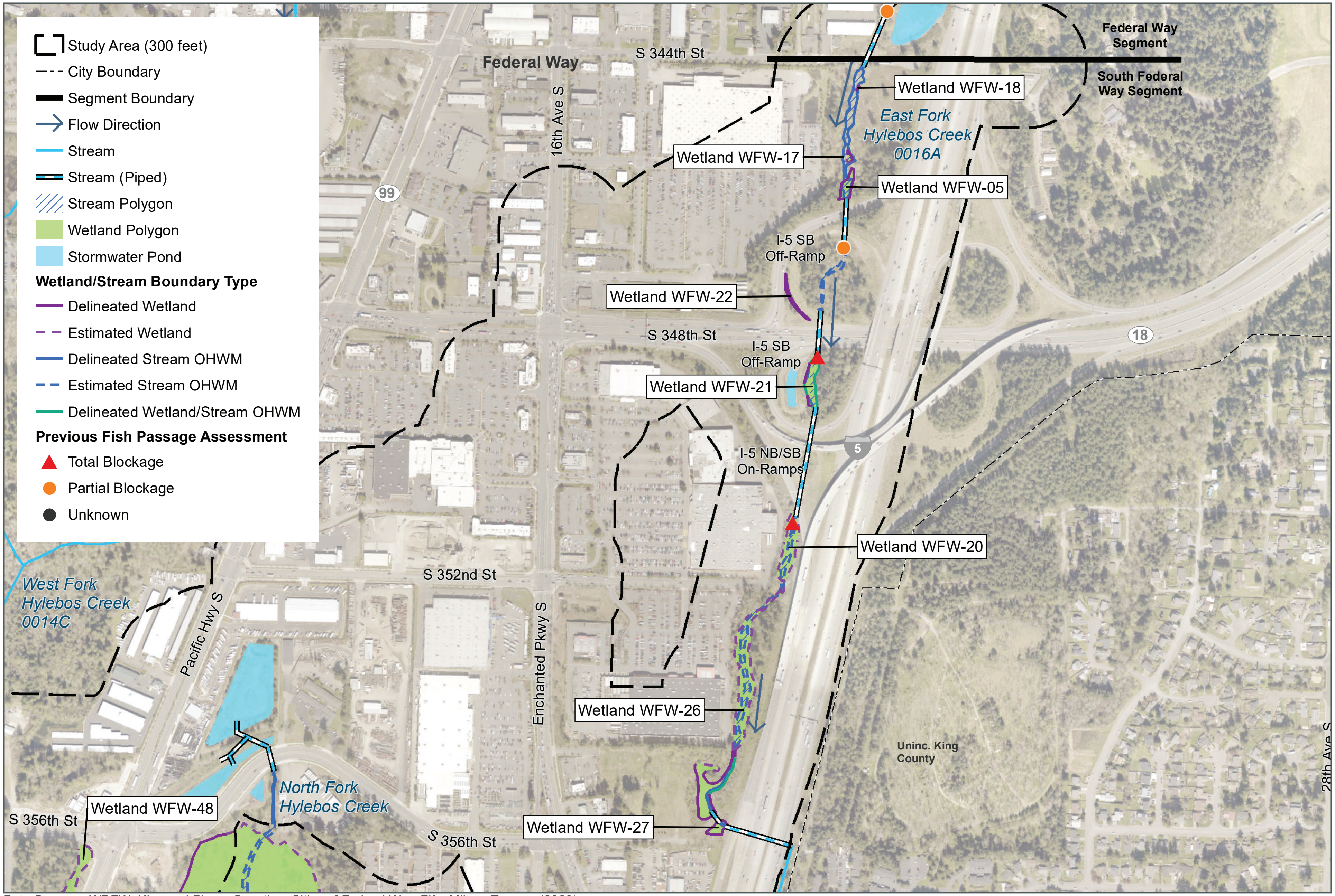
0 500 1,000 Feet

FIGURE J4.3-1
Wetland and Stream Existing Conditions
Federal Way Segment
Tacoma Dome Link Extension



Data Sources: WDFW; King and Pierce Counties; Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE J4.3-2
Wetland and Stream Existing Conditions
Federal Way Segment
Tacoma Dome Link Extension

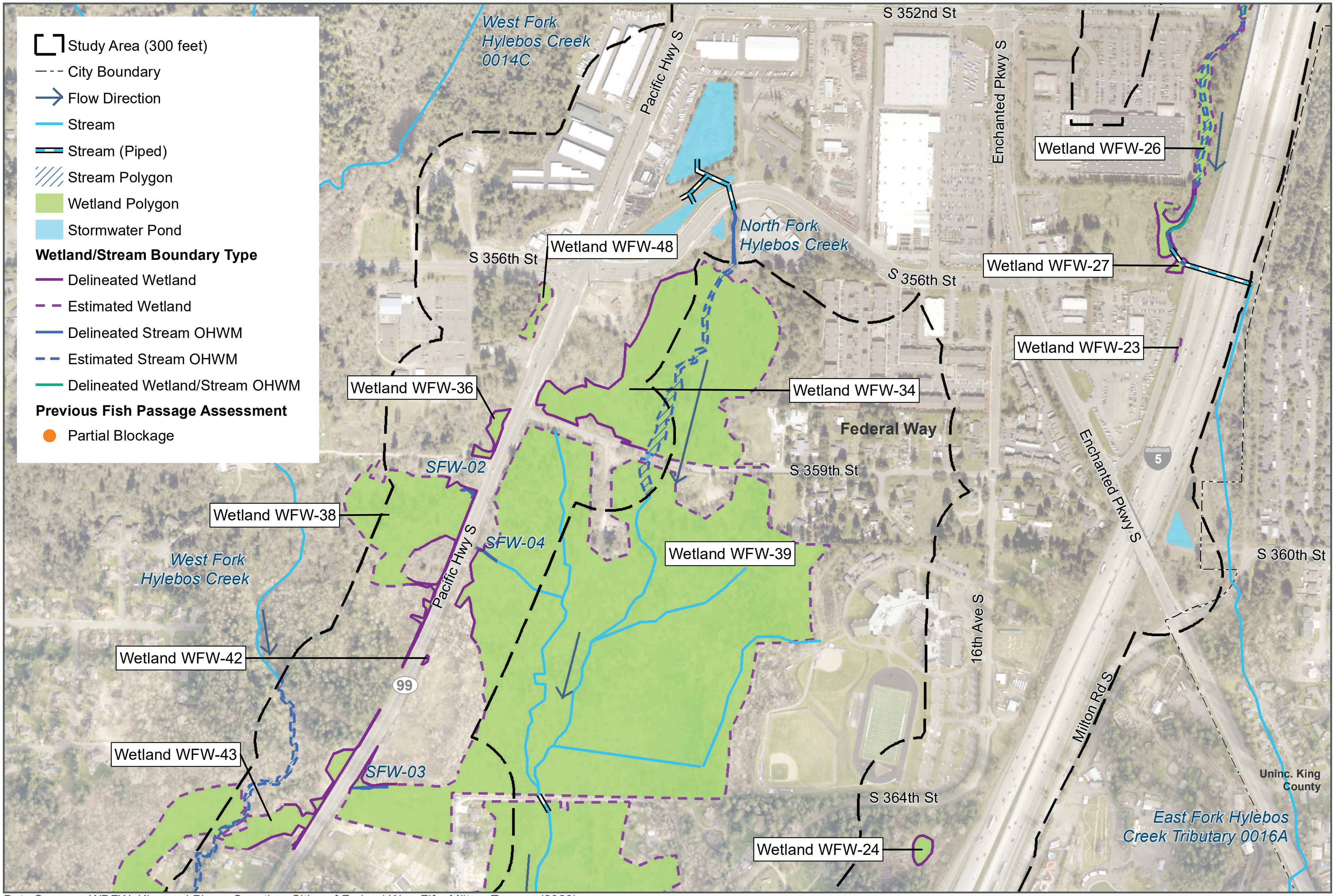


Data Sources: WDFW; King and Pierce Counties; Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

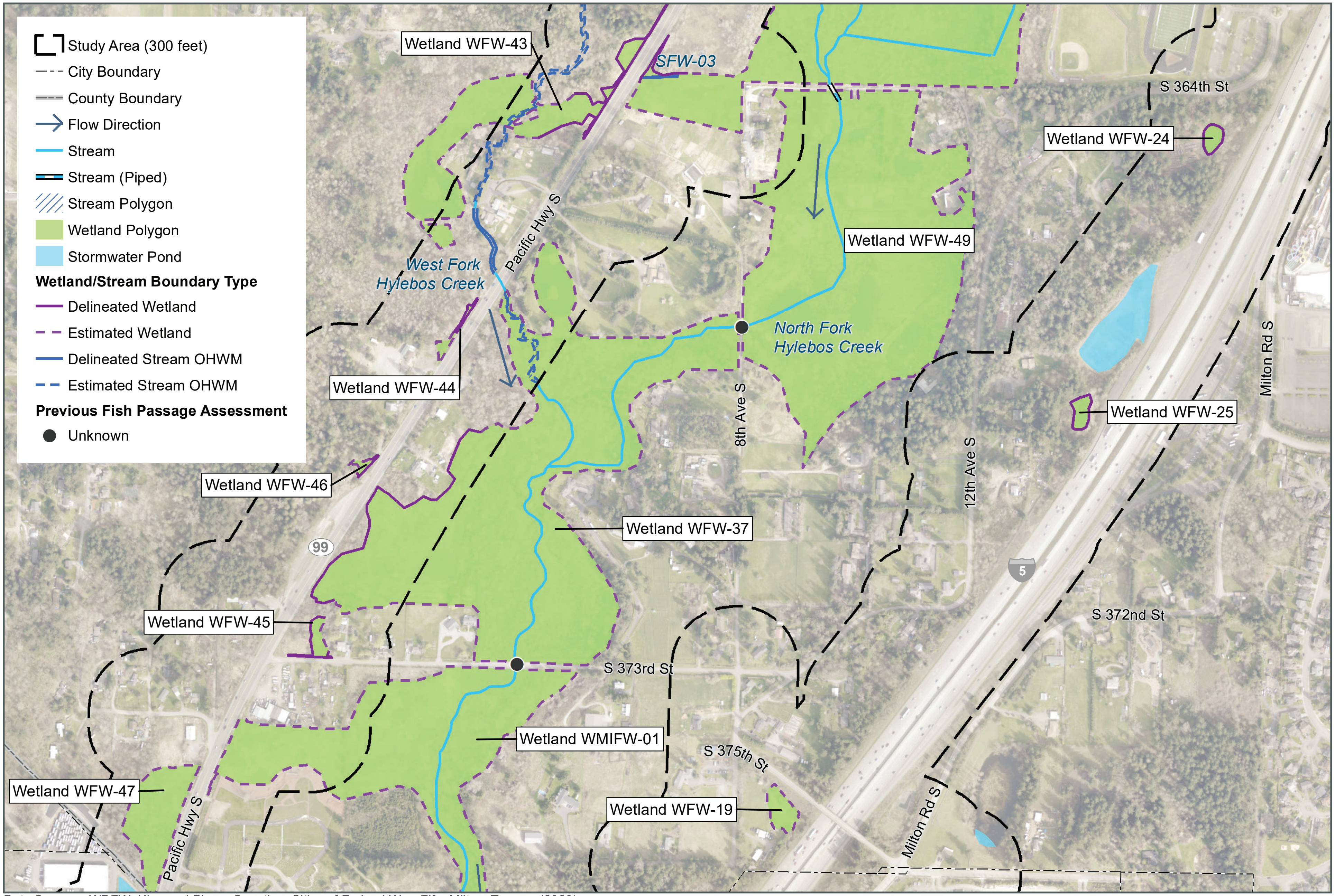
0 500 1,000 Feet

FIGURE J4.3-3
Wetland and Stream Existing Conditions
South Federal Way Segment
Tacoma Dome Link Extension



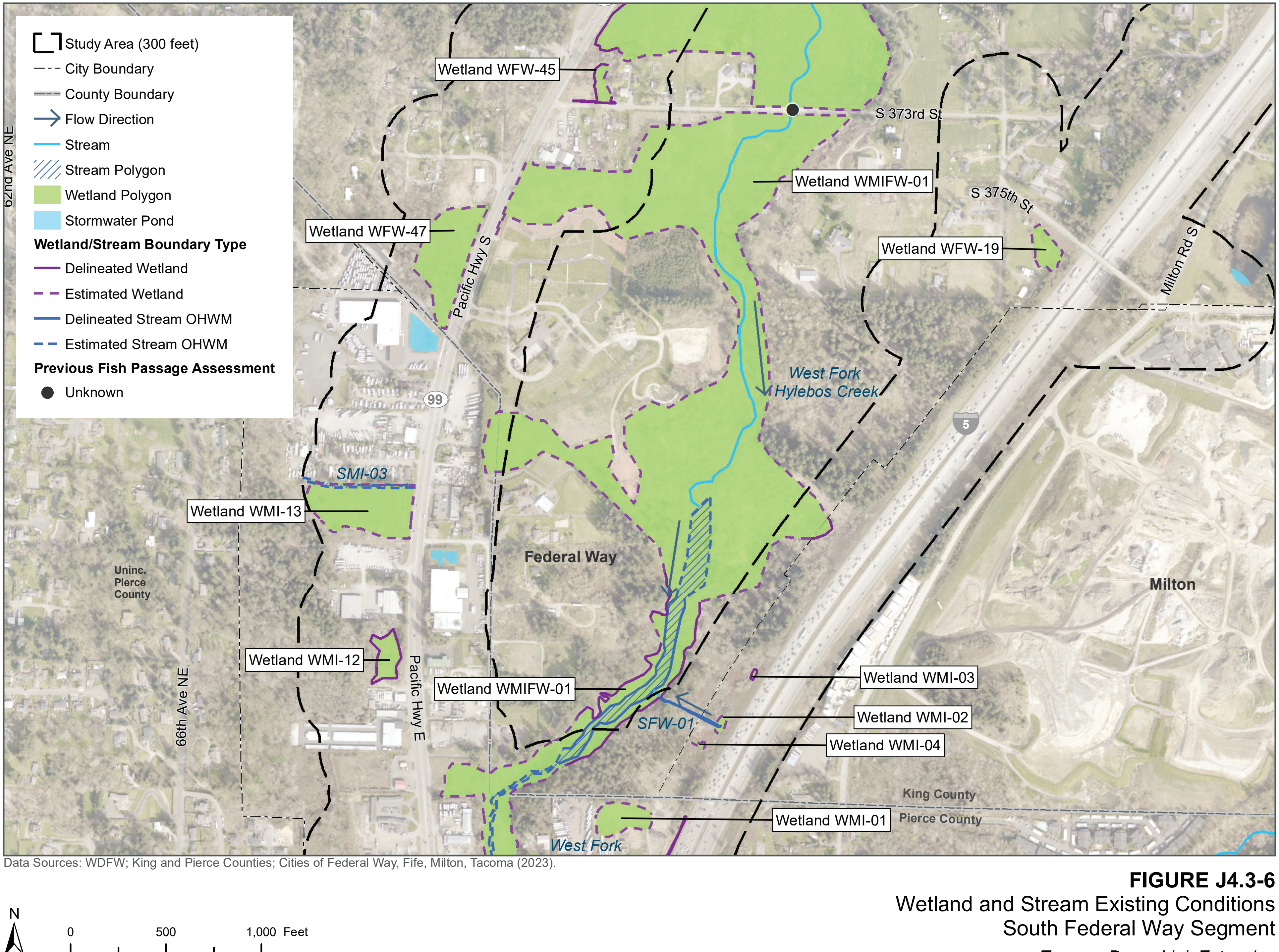
Data Sources: WDFW; King and Pierce Counties; Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE J4.3-4
Wetland and Stream Existing Conditions
South Federal Way Segment
Tacoma Dome Link Extension



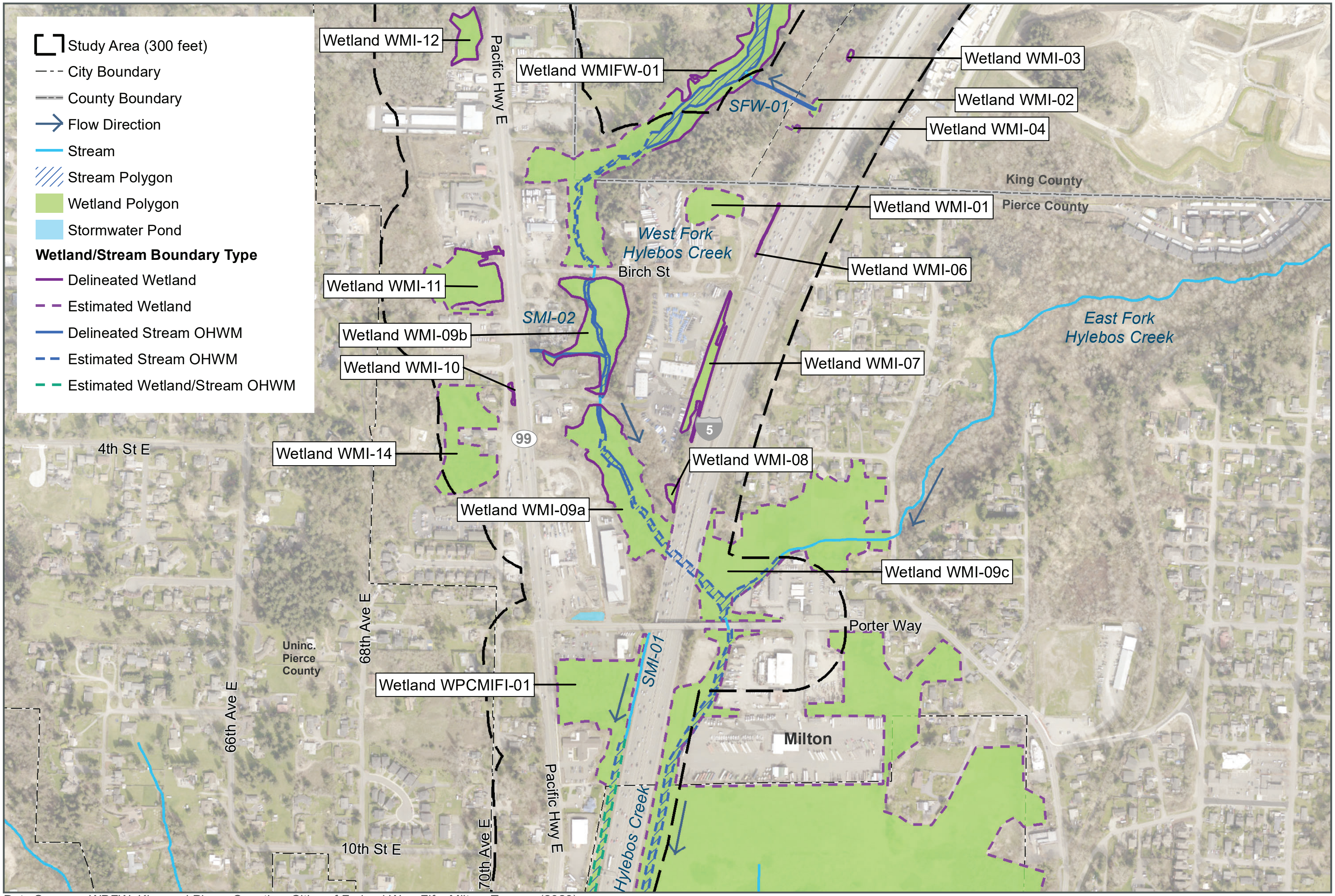
Data Sources: WDFW; King and Pierce Counties; Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE J4.3-5
Wetland and Stream Existing Conditions
South Federal Way Segment
Tacoma Dome Link Extension



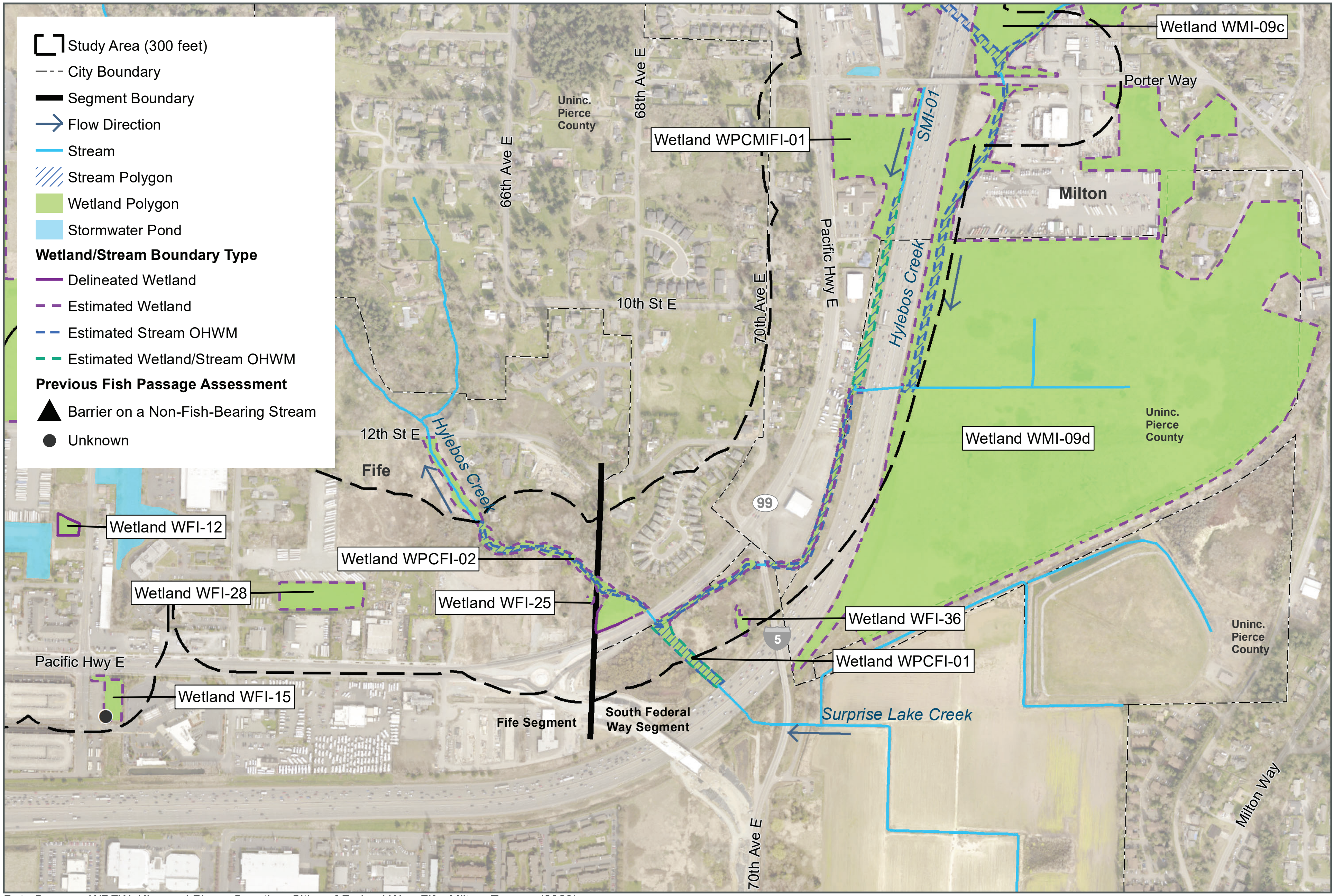
Data Sources: WDFW; King and Pierce Counties; Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE J4.3-6
Wetland and Stream Existing Conditions
South Federal Way Segment
Tacoma Dome Link Extension



Data Sources: WDFW; King and Pierce Counties; Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE J4.3-7
Wetland and Stream Existing Conditions
South Federal Way Segment
Tacoma Dome Link Extension



Data Sources: WDFW; King and Pierce Counties; Cities of Federal Way, Fife, Milton, Tacoma (2023).

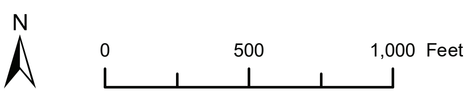
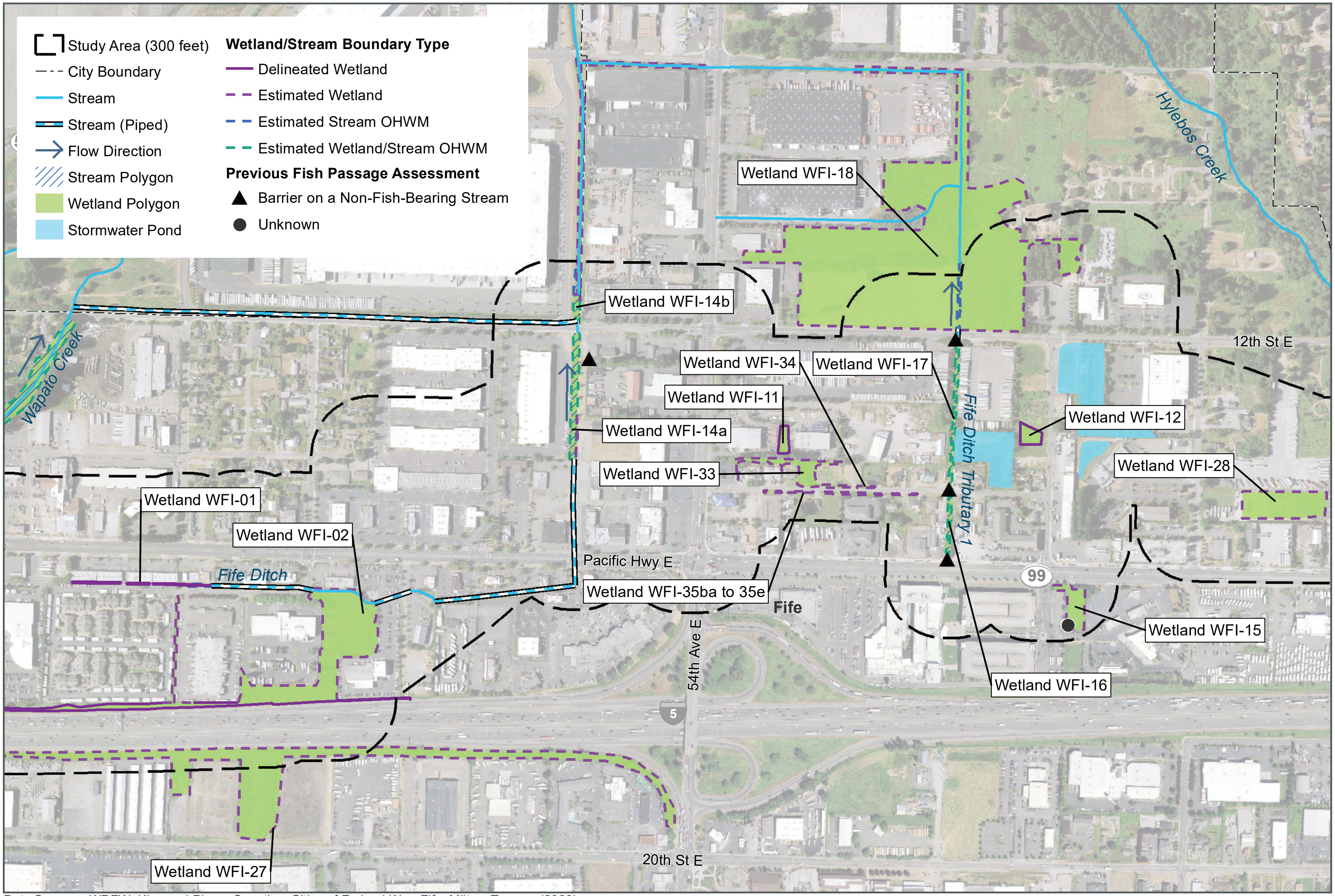


FIGURE J4.3-8
Wetland and Stream Existing Conditions
South Federal Way and Fife Segments
Tacoma Dome Link Extension



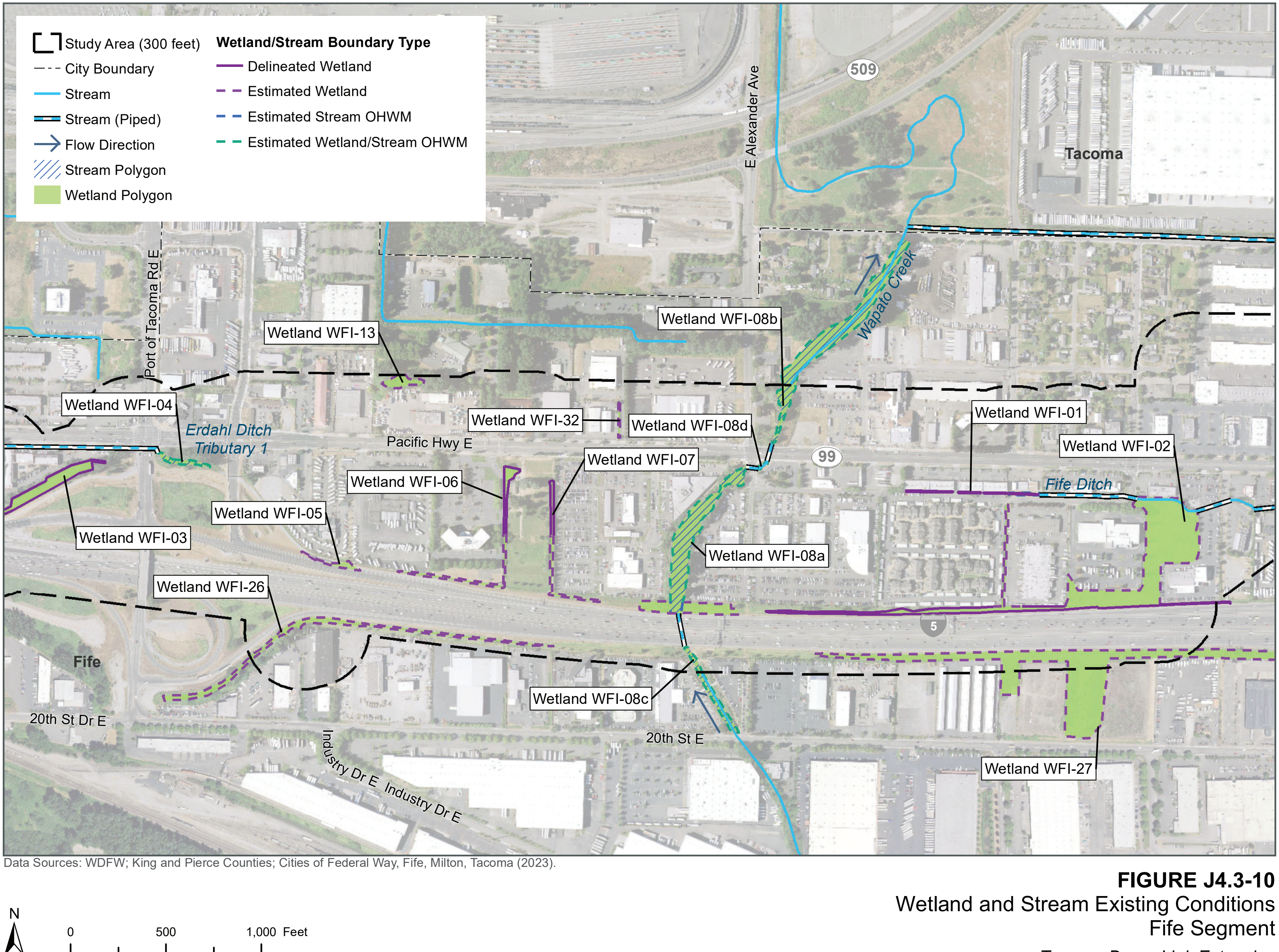
Data Sources: WDFW; King and Pierce Counties; Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 500 1,000 Feet

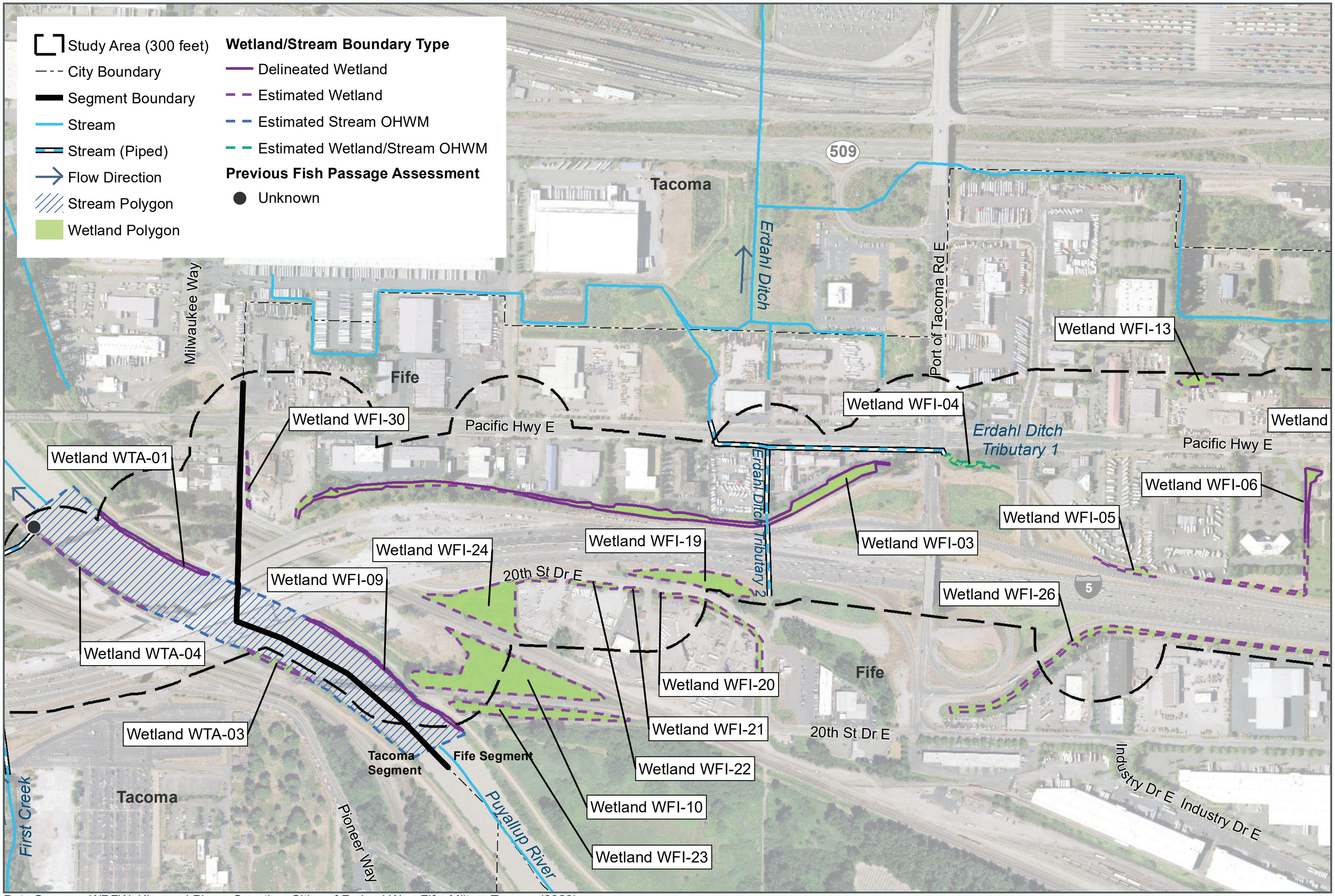
FIGURE J4.3-9
Wetland and Stream Existing Conditions
Fife Segment

Tacoma Dome Link Extension



Data Sources: WDFW; King and Pierce Counties; Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE J4.3-10
Wetland and Stream Existing Conditions
Fife Segment
Tacoma Dome Link Extension



Data Sources: WDFW; King and Pierce Counties; Cities of Federal Way, Fife, Milton, Tacoma (2023).

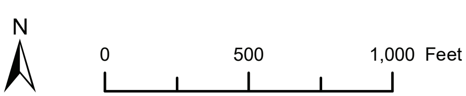
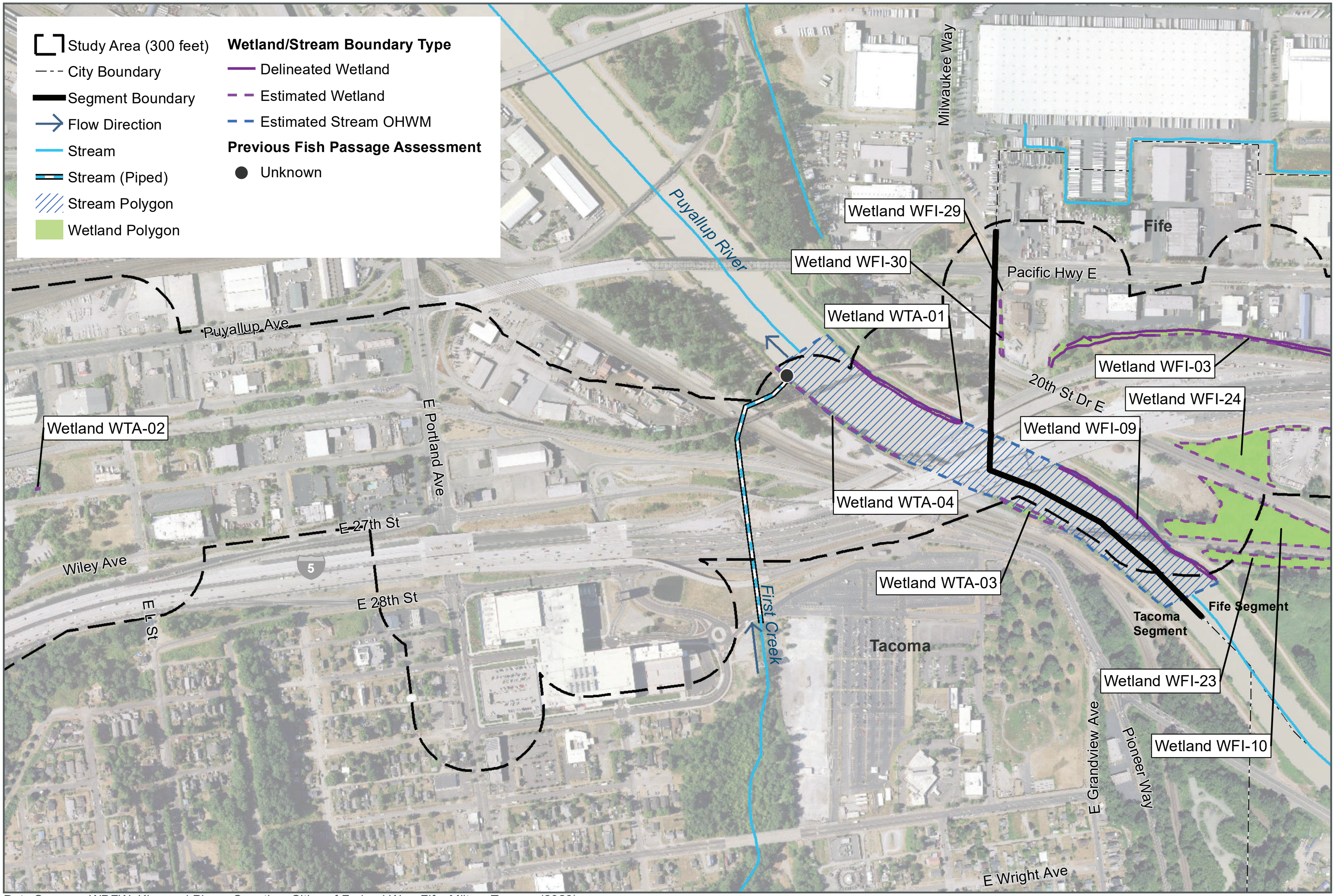
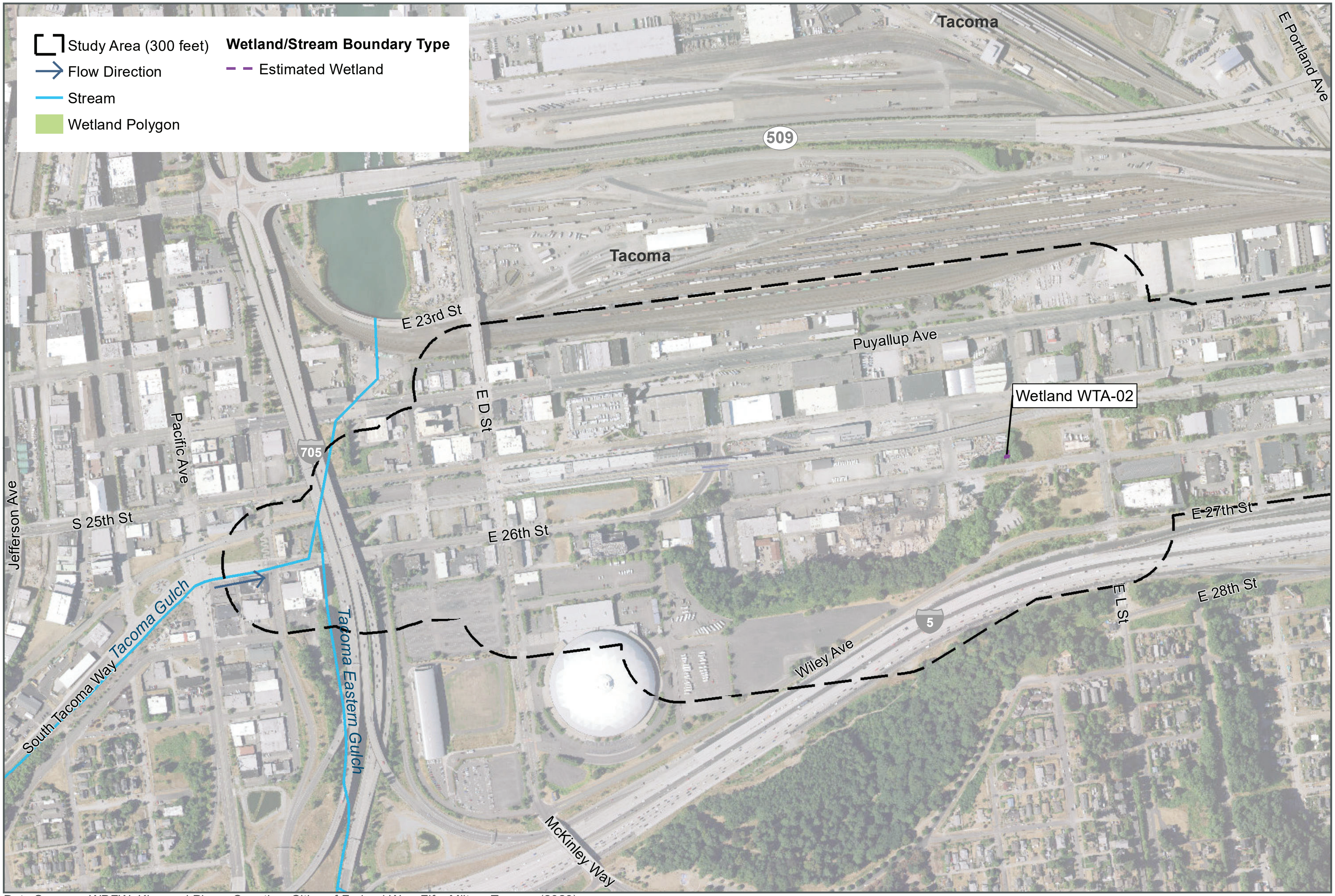


FIGURE J4.3-11
Wetland and Stream Existing Conditions
Fife Segment
Tacoma Dome Link Extension



Data Sources: WDFW; King and Pierce Counties; Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE J4.3-12
Wetland and Stream Existing Conditions
Tacoma Segment
Tacoma Dome Link Extension



Data Sources: WDFW; King and Pierce Counties; Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE J4.3-13
Wetland and Stream Existing Conditions
Tacoma Segment
Tacoma Dome Link Extension

3.1.2.1 East Fork Hylebos Creek Tributary 0016A

East Fork Hylebos Creek Tributary 0016A flows southward along the western side of I-5, through the Federal Way Segment and South Federal Way Segment. The portion of the stream in the study area is entirely within Federal Way. Before the construction of I-5 in 1965, the reaches of this stream that flow through the study area were the headwaters of Tributary 0013 in the West Fork Hylebos Creek subbasin. Construction of the I-5 system created a drainage catchment that permanently diverted Tributary 0016A into the East Fork Hylebos Creek subbasin (WSDOT and FHWA 2009).

East Fork Hylebos Creek Tributary 0016A originates east of I-5, north of S 320th Street in Federal Way. The stream is piped under the freeway, emerging near the northern end of the study area (Figure J4.3-1). The stream flows south for approximately 2.1 miles before turning east near S 356th Street and crossing I-5 to join other tributaries to form East Fork Hylebos Creek downstream of SR 161. The stream channel in the study area is low-gradient, straight, and confined between I-5 and residential, commercial, institutional, and light industrial developments.

East Fork Hylebos Creek continues on the east side of I-5 and converges with West Fork Hylebos Creek near the Porter Way crossing of I-5. From this point, the stream continues as Hylebos Creek, crossing back across to the west side of I-5 and discharging to the Hylebos Waterway in Tacoma.

Most of East Fork Hylebos Creek Tributary 0016A is in Federal Way, where land is largely developed. Most remaining undeveloped lands are in environmentally sensitive areas such as streams, wetlands, and their regulatory buffers. Continuing population growth and associated development threaten to place additional strain on the remaining natural resources, including East Fork Hylebos Creek Tributary 0016A.

The following subsections describe key habitats and stream features that are directly related to ecological functions supporting stream ecosystems and may be affected by the project, consistent with the stream habitat assessment guidelines established by Sound Transit (2016c).

Riparian Vegetation

Riparian vegetation along some portions of East Fork Hylebos Creek Tributary 0016A in the study area is dominated by native forest and wetlands. In other areas, native riparian vegetation has been replaced with landscaping, mowed grasses, or invasive shrubs.

Between approximately S 336th Street and S 356th Street, riparian vegetation along much of the stream is characterized as a mixed deciduous and coniferous forest. The mature forested canopy consists of bigleaf maple (*Acer macrophyllum*), black cottonwood (*Populus trichocarpa*), Oregon ash (*Fraxinus latifolia*), Douglas -fir (*Pseudotsuga menziesii*), red alder (*Alnus rubra*), Sitka willow (*Salix sitchensis*), and western redcedar (*Thuja plicata*). Understory species include cascara, vine maple (*Acer circinatum*), salmonberry (*Rubus spectabilis*), beaked hazelnut (*Corylus cornuta*), sword fern (*Polystichum munitum*), osoberry (*Oemleria cerasiformis*), red-twig dogwood (*Cornus sericea*), skunk cabbage (*Lysichiton americanus*), lady fern (*Athyrium filix-femina ssp. cyclosorum*), stink currant, red elderberry (*Sambucus racemosa*), Himalayan blackberry, trailing blackberry, stinging nettle (*Urtica dioica*), and reed canarygrass. Himalayan blackberry and reed canarygrass are commonly observed invasive species along streams in developed/developing areas. The left bank riparian zone in this area includes the fill slope for I-5 and is dominated by upland-associated vegetation, such as Douglas-fir. The right bank riparian zone is dominated by more typical riparian species, as described above.

Areas such as those described above, that are dominated by native forest and wetlands, are considered high-quality riparian habitat because they support functions such as fish and wildlife habitat provision; food chain support; water temperature maintenance; infiltration; groundwater recharge and discharge; sediment delivery, transport, and storage; organic matter input; nutrient and pathogen removal; and stream channel formation and maintenance. The presence of invasive plant species in these areas may reduce their capacity to support some functions, such as habitat provision. However, the presence of a diverse vegetation community dominated by native species allows these areas to continue to provide high-quality riparian habitat. In other parts of the study area, riparian habitat along East Fork Hylebos Creek Tributary 0016A has been degraded through the conversion of native and structurally complex habitats into landscaping, mowed grasses, or invasive shrubs.

The width of the vegetated riparian area south of S 336th Street ranges from 130 feet on the right bank to 150 feet on the left bank. Near S 341st Street, the vegetated riparian area narrows to 30 feet on the right bank and to 50 feet on the left bank. The stream then enters a culvert upstream of the WSDOT stormwater facility, north of S 344th Street. Where the stream resurfaces in the cloverleaf interchange between southbound I-5 and SR 18, the vegetated riparian area varies between 100 and 150 feet, narrowing as the stream approaches culverts on the upstream and downstream ends.

Riparian widths near the downstream end of East Fork Hylebos Creek Tributary 0016A, before it passes under I-5, are somewhat narrower than those upstream. The vegetated riparian area on the right (west) bank is 50 to 75 feet wide, and that on the left bank is approximately 25 feet wide. The final 480 feet of the stream in the study area (before it flows eastward under I-5) is a developed WSDOT mitigation site. The mitigation site planting includes salmonberry, immature Oregon ash, Pacific ninebark (*Physocarpus capitatus*), immature western redcedar, cascara saplings, red-twig dogwood, red alder saplings (volunteers), and black cottonwood saplings (volunteers). Invasive species, including reed canarygrass and Himalayan blackberry, are present in low densities. A large portion of the riparian corridor is dominated by wetland habitats and associated vegetation (Attachment E).

Canopy cover was measured every 150 feet along the surveyed stream length. The average stream canopy cover between S 336th Street and S 344th Street is 75 percent. Stream canopy cover in the onramp from southbound I-5 to westbound SR 18 is 79 percent; stream canopy cover in the onramp from southbound I-5 to eastbound SR 18 is 41 percent. The stream canopy cover in the WSDOT stream restoration area immediately upstream of the I-5 crossing is approximately 60 percent. The WSDOT restoration area has yet to reach full maturity, so the canopy cover in this area is expected to increase.

Physical In-stream Habitat

In general, habitat in East Fork Hylebos Creek Tributary 0016A is degraded. Glides (one of the least desirable habitat types for salmonids) make up 50.3 percent of the stream length between S 336th Street and the I-5 crossing of stream. Riffles constitute 30 percent of stream habitat, followed by pools (15.3 percent) and wetlands (3.9 percent).

The gradient of the stream is low, typically 1 percent or less. As a result, fine sediments have accumulated over time, resulting in the shallowing and widening of the streambed. Dense patches of reed canarygrass have become established in some low-energy areas, exacerbating the deposition of fine sediment and covering any usable spawning gravels. Fine sediment, including sand and silt, dominate the substrate composition in the study area. Patches of gravel are present, primarily in riffle areas; however, these gravels are typically 30 to 40 percent embedded with fine sediments. Pebble count data collected from representative riffle habitats indicate that medium- to coarse-sized gravels (0.3 inch to 2.5 inches) are dominant, and small gravel and small cobble are subdominant.

Channel sinuosity in the study area is low. Much of the channel is confined within a straight and uniform (ditch-like) channel profile; reaches with a more natural, meandering profile are rare and short. Fine sediment deposition throughout the reach in the study area is raising the streambed elevation, resulting in frequent channel overtopping and the formation of backwaters and high-flow channels adjacent to the primary channel. During higher flows, the stream overtops its banks quickly and engages the floodplain and riparian wetlands.

LWD plays an important role in maintaining complex in-stream habitat and contributes to this by creating pools, sorting streambed sediment, providing in-stream cover, and contributing to food-web interactions, among other functions. Healthy stream function relies on LWD and its recruitment from the streams riparian zone. Large conifers provide the highest-quality LWD because they take longer to decompose and therefore contribute more to the stream over a longer period in comparison to deciduous species. With respect to East Fork Hylebos Creek Tributary 0016A, the number of pieces of LWD per mile of stream is good; however, the size and type of LWD reduces the ability of the LWD to function at a higher level. LWD is dominated by deciduous species and the length and diameter is less than that you would see in a properly functioning stream system (> 24-inch diameter and >50 feet in length).

Key restoration opportunities in East Fork Hylebos Creek Tributary 0016A in the study area include removal of fish passage barriers, debris, and garbage; removal and control of invasive plant species; LWD installation; and possible channel reconfigurations to increase pool quantity and quality, stream sinuosity, and overall habitat complexity.

Table J4.3-2 summarizes the characteristics of physical in-stream habitat of East Fork Hylebos Creek Tributary 0016A in the study area, using the metrics and measurements recommended by Sound Transit (2016c).

Table J4.3-2 Characteristics of Physical In-Stream Habitat for East Fork Hylebos Creek Tributary 0016A in the Study Area

Parameter	Metric/Measurement	Condition in Study Area
Channel Form and Profile	Macrohabitat – habitat type	Habitats in the study area were dominated by glide habitat (50%), followed by low gradient riffle habitat (30%), pools (15%), and wetlands (3%).
	Macrohabitat – pool characteristics	No pools in the project area exceeded 2 feet in depth, with average residual pool depths of 0.71 feet throughout the corridor. The intermittent nature of the stream, combined with moderately infiltrative soils, indicates that while pools may have some moderate ability to retain water, this water quickly dries up.
	Stream Slope	East Fork Hylebos Creek Tributary 0016A is a low-gradient stream within the project area. Stream slopes ranged from 0.4 percent to 1.1 percent.
	Stream Patterns	Straight.
	Confinement	The entrenchment ratio for all measurements was less than 2.2, indicating that the East Fork Hylebos Creek Tributary 0016A is only slightly entrenched with good connectivity to the adjacent floodplain.
	Channel Dimension/Shape	East Fork Hylebos Creek Tributary 0016A is characterized by a shallow U-shaped channel with an average bankfull width of 10.5 feet and an average bankfull depth of approximately 1.2 feet.
Streambank Condition	Stability	Streambanks are typically stable with some areas of low scour.
	Bank Hardening/ Revetments	Shoreline armoring is largely absent from the streambanks, except for riprap armoring at many of the culvert crossings.

Table J4.3-2 Characteristics of Physical In-Stream Habitat for East Fork Hylebos Creek Tributary 0016A in the Study Area (continued)

Parameter	Metric/Measurement	Condition in Study Area
Substrate/ Sediment	Particle Frequency	Representative pebble counts were conducted at several riffles and pool tail-out locations throughout the assessed reaches. In general gravels (particles ranging from 0.3 to 2.5 inches) were dominant; small gravel (0.08 to 0.3 inches) and small cobble (2.5 to 5 inches) were subdominant.
	Percentage of Fine Sediments/ Embeddedness	Gravels, where present, are typically between 30 and 40 percent embedded with fines.
Large Woody Debris (LWD)	LWD Presence, Frequency, and Location	Approximately 71 pieces of LWD were observed over the 3,234 feet of assessed stream length. This equates to a density of 115 pieces per mile. Of the 71 pieces observed, 66 percent were in the water, 31 percent spanned the channel, and 2 percent were not in the water but were below the bankfull elevation.
	Debris Jams	No debris jams were observed throughout the assessed reach.
	LWD Size	Coniferous logs averaged 28 feet in length and 12.2 inches in diameter, Deciduous logs averaged 23 feet in length and 8.1 inches in diameter.
	Age and Type	31 percent coniferous logs, 18 percent coniferous root wads, and 51 percent deciduous logs. The coniferous logs were typically in better condition with an average decay class of 2, which indicates the bark was typically still intact and the log maintained its original color. The majority of deciduous logs had a decay class between 3 and 4, meaning that most of the bark had gone and deterioration was advanced or advancing.
Cover and Refuge	Pool Quality	Pools in the project area have pool quality index values ranging from 2 to 4, with the majority being between 2 and 3. Pools, where present, were small, lacked sufficient depth, and had low to moderate cover.
	Undercut Banks	Undercut banks were rare throughout the reach. Undercut banks, where present, were shallow and provided little to no cover.
	Off-channel/ Side-channel Habitat	The surveyed reach was devoid of off-channel habitat such as side channels and beaver dams.
	In-stream Cover/Protection	Other than LWD, no boulders or aquatic macrophytes were present that would provide any type of cover. The intermittent nature of the stream prevents the colonization of the stream channel by aquatic macrophytes. Reed canarygrass is present in some areas; however, where present, this material tends to choke the channel and divert water around the channel and is effectively inaccessible to rearing fish.

Biological Connectivity

Numerous barriers to fish passage exist downstream of the study area and south of S 344th Street, including four partial barriers, four complete passage barriers, and one unknown barrier or crossing that has not been evaluated for fish passage (WDFW 2023c). Table J4.3-3 summarizes the status of known fish passage barriers in East Fork Hylebos Creek Tributary 0016A downstream of the uppermost surface-flowing segment in study area.

Table J4.3-3 Fish Passage Barrier Assessment for East Fork Hylebos Creek Tributary 0016A in the Study Area

Approximate Road Crossing	Unique Site I.D.	Distance Downstream (miles) [1]	Barrier Status	Assessment Year	Ownership
Winged Foot Way	992364	0.00	Unknown	2015	Public
Burning Tree Boulevard	935279	0.10	Partial	2020	Private
Golf Course Path	935278	0.20	Partial	2020	Private
Abandoned Utility Corridor	935277	0.30	Partial	2020	Public
S 330th Street	935276	0.40	Partial	2020	Public

Table J4.3-3 Fish Passage Barrier Assessment for East Fork Hylebos Creek Tributary 0016A in the Study Area (continued)

Approximate Road Crossing	Unique Site I.D.	Distance Downstream (miles) [1]	Barrier Status	Assessment Year	Ownership
S 333rd Street	935275	0.60	Partial	2020	Public
S 336th Street	935274	0.80	Partial	2020	Public
WSDOT Detention Facility near S 344th Street	935271	1.20	Partial	2020	Public
I-5 SB off-ramp at Exit 142B	995293	1.33	Partial	2015	Public
SR 18 at Exit 142B	995298	1.45	Complete	2019	Public
I-5 SB on-ramp at Exit 142B	995297	1.55	Complete	2015	Public
I-5	995292	1.96	Partial	2007	Public
WSDOT NB right-of-way Access Road	995295	2.31	Partial	2015	Public
20th Avenue S	995296	2.34	Partial	2019	Public
20th Place S	932946	2.49	Unknown	2014	Private
S 363rd Place	932945	2.53	Complete	2021	Public
South of 1st Street E	936030	4.33	Complete	2022	Private

Source: WDFW Fish Passage and Diversion Screening Inventory Database (WDFW 2023c)
Notes:
(1) Measured from Winged Foot Way in Federal Way.

Water Quality and Quantity

East Fork Hylebos Creek Tributary 0016A is not on the most recent (2018) 303(d) list of impaired waters (Ecology 2023). The nearest listed segment is approximately 2 miles downstream, where East Fork Hylebos Creek is listed as impaired due to elevated levels of bacteria. Refer to Attachment C, Figure C-3 for locations of all 303(d) listed waterbodies in the study area.

East Fork Hylebos Creek Tributary 0016A flows intermittently in the study area. The streambed in this area is typically dry during summer and early fall. The stream channel was completely dry during the October 9, 2019, reconnaissance survey, and a soil pit excavated to a depth of 20 inches below the ground surface elevation in the stream failed to reach the groundwater table. Two weeks later (October 22, 2019), after several days of consistent rainfall, flows were reestablished in the stream channel. Several culverted and un-culverted discharges to East Fork Hylebos Creek Tributary 0016A were observed during site surveys. On the left bank, a culvert discharges to the stream directly from S 336th Street, which was assumed to be stormwater from the roadway. Another 12-inch-diameter corrugated plastic pipe discharges to the stream along the left bank at Station 1,530 and appears to originate from the adjacent commercial property. A quarry spall-lined channel, originating from a small culvert adjacent to I-5 and presumably conveying stormwater runoff from I-5, enters the right bank at Station 2,042.

Fish and Habitat Use

There is no documented or presumed[3] fish use in East Fork Hylebos Creek Tributary 0016A within the project area (NWIFC 2023). Under current conditions, human-created barriers to fish passage prevent anadromous salmonids from entering stream reaches in the study area (NWIFC 2023; WDFW 2023c). The presence of resident fish is unlikely, given the intermittent flow of the stream and the presence of barriers between the study area and potential population sources downstream. However, the basin size, channel width, and gradient of the stream

[3] Presumed use means reliable documentation of fish use is lacking, but available data and consensus indicate that fish are likely to be present.

indicate the potential to support fish in the future. For this reason, the stream is classified as a Type F stream, in accordance with Federal Way Municipal Code section 19.145.260.

The documented distribution of Chinook salmon distribution in the Hylebos Creek watershed does not extend into East Fork Hylebos Creek or its tributaries (NWIFC 2023). Chinook salmon are presumed to be present in East Fork Hylebos Creek only in the lowest 730 feet of the stream (NWIFC 2023), approximately 2.9 miles downstream of the study area. Chinook salmon are not presumed to use habitats in East Fork Hylebos Creek or its tributaries upstream of that point, but there are no gradient barriers that preclude access to East Fork Hylebos Creek Tributary 0016A in the study area (NWIFC 2023).

Coho salmon and winter-run steelhead have been documented in East Fork Hylebos Creek approximately 1.1 miles downstream of the study area (NWIFC 2023). Chum salmon have been documented in East Fork Hylebos Creek approximately 1.6 miles downstream of the study area. Pink salmon have not been documented in the Hylebos Creek system but are presumed to occur in East Fork Hylebos Creek as far upstream as 2.9 miles downstream of the study area (NWIFC 2023). As noted above, the basin size, channel width, and gradient of East Fork Hylebos Creek Tributary 0016A in the study area indicate the potential to support these species in the future. NWIFC (2023) classifies stream reaches in the study area as potentially accessible to coho salmon and steelhead.

3.1.2.2 West Fork Hylebos Creek Tributary 0014C

There are no surface-flowing segments of West Fork Hylebos Creek Tributary 0014C in the study area. All flow through the study area is contained in a pipe. As a result, no functional riparian vegetation or in-stream habitat is present in the study area, and these habitat elements are not described in this report.

West Fork Hylebos Creek Tributary 0014C originates west of I-5 near the northern end of the study area. After leaving the study area, the stream flows south through residential development to S 336th Street, where it enters a series of stormwater detention ponds. The stream then turns west and crosses SR 99 in a long, piped segment, before joining several other tributaries to form West Fork Hylebos Creek just north of S 356th Street. West Fork Hylebos Creek continues southeast and joins East Fork Hylebos Creek on the east side of I-5 near the Porter Way crossing of I-5. From this point, the stream continues as Hylebos Creek, crossing back across to the west side of I-5 and discharging to the Hylebos Waterway in Tacoma. The total stream length from the headwaters of West Fork Hylebos Creek Tributary 0014C to the confluence of Hylebos Creek with the marine waters of the Hylebos Waterway is approximately 6.6 miles.

The development history of the area is similar to that of East Fork Hylebos Creek Tributary 0016A; however, the intensity of development and the associated amount of impervious surface area are higher. As a result, West Fork Hylebos Creek Tributary 0014C has experienced substantial flooding and water quality problems as compared to East Fork Hylebos Creek Tributary 0016A. The City of Federal Way has constructed numerous stormwater facilities across the basin to address the flooding issues, including the stormwater facilities through which West Fork Hylebos Creek Tributary 0014C flows near S 324th Street and near S 336th Street.

Biological Connectivity

Numerous barriers to fish passage exist within and downstream of the study areas, including seven partial barriers, four complete passage barriers, and numerous unknown barriers or crossings that have not been evaluated for fish passage (WDFW 2023c). Table J4.3-4 summarizes the status of fish passage barriers within and downstream of the study area.

Table J4.3-4 Fish Passage Barrier Assessment for West Fork Hylebos Creek Tributary 0014C

Approximate Road Crossing	Unique Site I.D.	Distance Downstream (miles) [1]	Barrier Status	Assessment Year	Ownership
The Dunes Court	995301	0.10 mi	Unknown	2015	Public
S 328th Place	995302	0.20 mi	Partial	2019	Private
Private Property	995303	0.23 mi	Partial	2015	Private
S 330th Street	995304	0.28 mi	Complete	2015	Public
20th Avenue S	933222	0.44 mi	Partial	2015	Public
S 333rd Street	933223	0.52 mi	Partial	2019	Public
S 336th Street	933224	0.72 mi	Partial	2015	Public
SR 99	933225	0.84 mi	Complete	2015	Public
S 340th Street	933226	1.11 mi	Unknown	2015	Private
Private Property	933227	1.25 mi	Complete	2015	Private
Private Property	933229	1.29 mi	Partial	2015	Private
Private Property	933061	1.36 mi	Unknown	2019	Private
Private Property	933060	1.63 mi	Unknown	2015	Public
S 348th Street	933058	1.74 mi	Complete	2015	Public
S 356th Street	992011	2.44 mi	Partial	2019	Public
S 373rd Place	921135	3.81 mi	Unknown	2018	Public

Source: WDFW Fish Passage and Diversion Screening Inventory Database (WDFW 2023c)
Notes:
(1) Measured from the furthest upstream surface-flowing segment in the study area.

Water Quality and Quantity

The segments of West Fork Hylebos Creek Tributary 0014C in and immediately downstream of the study area flow only intermittently. Reaches of the stream in the South Federal Way Segment are on the most recent (2018) 303(d) list of impaired waters, based on violations of state standards for copper, lead, zinc, dibenzo(a,h)anthracene, and benzo(a)pyrene (Ecology 2023). Large amounts of impervious surface area in the upper watershed have likely contributed to elevated levels of pollutants associated with vehicle use, including metals such as copper, lead, and zinc. Refer to Attachment C, Figure C-3 for locations of all 303(d) listed waterbodies in the study area.

The high level of development and associated impervious surface have over the years resulted in severe flooding in the West Fork Hylebos Creek basin. This urbanization has also contributed to altered peak and base flows in West Fork Hylebos Creek Tributary 0014C (King County 1990). As a result, Federal Way has initiated and completed numerous flood control projects including large stormwater facilities throughout the basin.

Fish and Habitat Use

Based on the presence of human-created barriers to fish passage, no anadromous fish are documented or presumed to use West Fork Hylebos Creek Tributary 0014C in the study area (WDFW 2023a, 2023c; NWIFC 2023). However, the basin size, channel width, and gradient of the stream indicate the potential to support fish in the future. For this reason, the stream is classified as a Type F stream, in accordance with Federal Way Municipal Code section 19.145.260. According to NWIFC (2023), salmonid species potentially present in West Fork Hylebos Creek Tributary 0014C near the study area are Chinook salmon, coho salmon, steelhead, pink salmon, chum salmon, and cutthroat trout.

3.1.2.3 West Fork Hylebos Creek

West Fork Hylebos Creek originates in West Hylebos Wetlands Park near S 348th Street in Federal Way and flows south through forested habitats west of SR 99 (HDR 2014). The stream is joined by several tributaries before it crosses beneath I-5 in the City of Milton and joins the East Fork Hylebos Creek to form the main stem of Hylebos Creek. Assessed portions of West Fork Hylebos Creek include approximately 300 feet on the west side of SR 99 extending downstream and to the west side of SR 99 to the I-5 crossing. Some small segments of habitat on the east side of SR 99 were not evaluated due to lack of access; however, the habitat that was assessed was a significant contiguous block.

West Fork Hylebos Creek is considered to contain the highest-quality habitat within the entire Hylebos Creek watershed, which can be attributed in part to the large riparian wetland complexes that buffer the stream from some of the adverse impacts associated with the highly developed watershed (EarthCorps 2016; HDR 2014; King County 1990).

The City of Federal Way has identified the lower reaches of West Fork Hylebos Creek (near the southern end of the South Federal Way Segment) as a top priority for conservation within their jurisdiction. The city has undertaken a substantial effort to acquire properties and to begin restoration of degraded habitat in those areas (EarthCorps 2016). The Puyallup Tribe of Indians is also focused on restoration of salmon habitat in Hylebos Creek and its tributaries.

Riparian Vegetation

Within the assessed portion of the study area and on the east side of SR 99, West Fork Hylebos Creek has relatively good access to the floodplain, and riparian wetlands are common along the shallow benches above the active channel. These wetlands typically extend beyond the OHWM to the base of slopes that delineate the boundary between upland and riparian habitats. The riparian overstory is dominated by red alder with lesser amounts of Oregon ash, black cottonwood, Sitka willow, and Pacific willow (*Salix lasiandra*). The understory is dominated by salmonberry, Himalayan blackberry, red-twig dogwood, reed canarygrass, sword fern, lady fern, skunk cabbage and pockets of cattail (*Typha latifolia*). Conifers are found along the margins but are effectively outside of the riparian corridor and contribute little in the way to improving cover and in-stream habitat conditions within the lower creek. Restoration efforts in the basin should focus on installation of key pieces of coniferous LWD into the active channel and adjacent floodplain as well as including supplemental plantings in the riparian buffer. Reed canarygrass, bittersweet nightshade, and spotted jewelweed are common and dense in areas throughout the lower section of West Fork Hylebos Creek.

Within the assessed portions of study area and on the west side of SR 99, the riparian vegetation shifts slightly as the channel becomes confined, with little access to floodplain habitats. Dominant overstory vegetation includes big leaf maple, Sitka willow, western redcedar, and red alder with an understory dominated by salmonberry, sword fern, vine maple, and red-twig dogwood. Spotted jewelweed and bittersweet nightshade, both of which are invasive species, are common along the banks.

Physical In-Stream Habitat

Within the study area, West Fork Hylebos Creek exhibits different characteristics on either side of SR 99. On the east side of SR 99, the channel is lower in gradient and has better access to floodplain, while on the west side of SR 99, the channel is steeper, more confined, and has little access to the floodplain.

The width of West Fork Hylebos Creek's channel on the east side of SR 99 ranges between 13 and 18 feet, has a gradient between 0.5 and 2 percent, has fair sinuosity, and has good access to the floodplain downstream of SR 99. There is a higher percentage of pool and glide habitat throughout with lesser amounts of riffle habitat. Substrate within the evaluated reaches are dominated by fine materials including sand and silts, which has degraded available gravel spawning and reduced pool quality by decreasing pool volume. LWD is present in fair quantities; however, this material is typically small-diameter deciduous material. Streambanks consist primarily of fine sediment and are vertical and raw in most places. Bank undercutting is common, especially in areas where undercutting is accelerated by the combination of fine sediment and tree roots. The riparian corridor width is typically greater than 100 feet on both banks; however, the quality of the riparian vegetation is reduced by the lack of conifers and prevalence of invasive species such as reed canarygrass and Himalayan blackberry.

The width of West Fork Hylebos Creek on the west side of SR 99 ranges between 13 and 14 feet, and the gradient is steeper than those observed east of SR 99. Riffle/pool habitat complexes are more characteristic within this reach, and substrates are dominated more by gravels, making this area more suitable for spawning. Almost the entire reach evaluated on the west side of SR 99 has been manipulated as part of WSDOT's replacement of the SR 99 culvert in 2015/2016 and the included channel grading, installation of LWD along the right bank and the construction of a step-pool complex Due to its proximity to existing development, the riparian corridor along the left bank is narrower, and riprap has been used to provide bank stability and protect adjacent infrastructure.

Table J4.3-5 summarizes the characteristics of physical in-stream habitat of West Fork Hylebos Creek in the study area, using the metrics and measurements recommended by Sound Transit (2016c).

Table J4.3-5 Characteristics of Physical In-Stream Habitat for West Fork Hylebos Creek in the Study Area

Parameter	Metric/Measurement	Condition in Study Area
Channel Form and Profile	Macrohabitat – habitat type	Habitats on the east side of SR 99 habitats are dominated by pools (54%), followed by glide habitat (32%), runs (8%) and low gradient riffle habitat (6%). On the immediate west side of SR 99, historic restoration actions have altered the channel morphology with inclusion of placed LWD and constructed step pools. In this area, low- to moderate-gradient riffle habitats are dominant (49%), followed by pocket water (28%) and plunge pools (23%) that are associated with the constructed step pool design (notched, channel spanning weirs).
	Macrohabitat – pool characteristics	In general, pools on both sides of SR 99 were of fair to good quality, many with depths exceeding 1 meter. While most pools had adequate depth, cover was limited in most instances, and where cover was present, it was mostly provided by dense reed canarygrass.
	Stream Slope	West Fork Hylebos Creek is a low-gradient stream within the project area. Stream slopes ranged from 0.5% to 1% on the east side of SR 99, while channel gradients increased to 2% to 6% on the west side of SR 99.
	Stream Patterns	Moderately sinuous downstream of SR 99 and less so above.

Table J4.3-5 Characteristics of Physical In-Stream Habitat for West Fork Hylebos Creek in the Study Area (continued)

Parameter	Metric/Measurement	Condition in Study Area
	Confinement	Confined upstream of SR 99 and generally unconfined, with good access to the floodplain downstream of SR 99.
	Channel Dimension/Shape	West Fork Hylebos Creek downstream of SR 99 is characterized by a deep U-shaped channel with an average bankfull width of 14.6 feet and an average bankfull depth of approximately 3.1 feet. Upstream of SR 99, the channel shape is a narrower and shallower U-shaped channel with a bankfull width of 13 feet and the bankfull depth also decreases to 2.1 feet.
Streambank Condition	Stability	Streambanks are typically stable with some areas of low scour.
	Bank Hardening/ Revetments	Shoreline armoring is largely absent from the streambanks on the downstream side of SR 99; however, upstream of SR 99, one or both banks are armored with angular rock throughout the assessed reach.
Substrate/ Sediment	Particle Frequency	Downstream of SR 99, fines including sand and silt were the dominant substrate. Upstream of SR 99, the substrates were dominated by gravel with cobble/small boulders being subdominant.
	Percentage of Fine Sediments/ Embeddedness	Upstream of SR 99, gravels were estimated to be 15% embedded with fines in pool tailouts and riffles providing fair spawning habitat for salmonids. Downstream of SR 99, gravels, where present, were heavily embedded with fines (greater than 40%), which reduces their effectiveness as a spawning substrate for salmonids
Large Woody Debris (LWD)	LWD Presence, Frequency, and Location	Approximately 39 pieces of LWD were observed over the 1,090 feet of assessed stream length downstream of SR 99. This equates to a density of 189 pieces per mile. Of the 39 pieces observed, 62% were in the water, 20% spanned the channel, and 18% were not in the water but were below the bankfull elevation. Upstream of SR 99, the only pieces of LWD documented were 10 pieces of 18- to 24-inch diameter pieces of LWD installed along the right bank and 5 sets of channel-spanning log weirs (notched). No natural LWD recruitment was observed upstream of SR 99.
	Debris Jams	No debris jams were observed throughout the assessed reach.
	LWD Size	Coniferous logs averaged 25 feet in length and 18.2 inches in diameter, Deciduous logs averaged 13 feet in length and 9 inches in diameter.
	Age and Type	15% coniferous logs, 3% unknown root wads, and 82% deciduous logs. The coniferous logs were typically in better condition with an average decay class of 3, which indicates the bark was typically still intact and the log maintained its original color or was darkening. The majority of deciduous logs had a decay class between 4 and 5, meaning that most of the bark was gone and deterioration was advanced or advancing.
Cover and Refuge	Pool Quality	The majority of pools assessed were between 2 and 3 feet in depth and typically had fair to good cover, so associated pool quality index values typically ranged between 3 and 4.
	Undercut Banks	Undercut banks were common throughout the reach. Undercut banks, where present, provided good cover.
	Off-channel/ Side-channel Habitat	Off-channel and side-channel habitats are limited within the assessed reaches. Some evidence of beaver presence was observed, but no active dams were documented within the assessed reaches.
	In-stream Cover/Protection	Other than LWD, reed canarygrass is present and likely provides some form of in-stream cover; however, this aquatic macrophyte also tends to obstruct flow and retain fine sediment, which often poses a barrier to fish movement, depending on flow conditions.

Biological Connectivity

There are no known barriers to fish passage downstream of the study area (WDFW 2023c).

Water Quality and Quantity

West Fork Hylebos Creek within the study area is a perennial stream and is identified on the most recent (2018) 303(d) list of impaired waters for exceeding surface water quality standards for temperature, dissolved oxygen, bacteria, and benthic macroinvertebrate bioassessment (Ecology 2023). Upstream reaches outside the study area have also been identified on the 303(d) list of impaired waterbodies for exceeding surface water quality standards for temperature, dissolved oxygen, bacteria, copper, lead, zinc, benzo(a)pyrene, and dibenzo(a,h)anthracene (Ecology 2023) Refer to Attachment C, Figure C-3 for locations of all 303(d)-listed waterbodies in the study area.

Good water quality is a common characteristic of all healthy streams. Benthic index of biotic integrity (B-IBI) is a measure of stream health based on the abundance and type of stream macroinvertebrates (e.g., insects, worms, snails) present at a site (SSI 2020). Stream macroinvertebrates vary in their sensitivity to environmental stressors, such as poor water quality, and are therefore excellent indicators of stream health. Highly degraded streams tend to support only the most tolerant types of macroinvertebrates and result in low B-IBI scores. Streams that support a diverse group of sensitive macroinvertebrates produce higher scores. B-IBI scores decline predictably along a gradient of land use intensity (SSI 2020). B-IBI samples have been collected in multiple locations along the West Fork Hylebos Creek by several different entities (Ecology, City of Federal Way, Puyallup Tribe), and, in general, B-IBI scores indicate poor to fair stream health extending from approximately S 356th Street to the confluence with the mainstem Hylebos Creek (PSSB 2024). Given intense land use in the contributing basin and multiple 303(d) listings for impaired water quality within this reach (discussed above) and in upstream contributing streams (see Section 3.1.2.2 – West Fork Hylebos Creek Tributary 0014C), the resulting low B-IBI scores reported for West Fork Hylebos Creek appear to be supported.

Development conditions in the contributing basin for West Fork Hylebos Creek are similar to that discussed above in Sections 3.1.2.1 and 3.1.2.2 for East Fork Hylebos Creek Tributary 0016A and West Fork Hylebos Creek Tributary 0014C, respectively. However, unlike the smaller tributaries, the hydrologic conditions in West Fork Hylebos Creek are supported by large riparian wetland complexes that help maintain base flow conditions and attenuate peak flows. Hydrologic conditions are still not optimal and flood storage is still an issue, Federal Way has implemented numerous flood control projects throughout the watershed to improve these conditions.

Fish and Habitat Use

Salmonid species with documented presence in West Fork Hylebos Creek in or near the study area include bull trout, Chinook salmon, coho salmon, steelhead, chum salmon, and cutthroat trout (Heltzel 2018 pers. comm.; NWIFC 2023; WDFW 2023a). Coho salmon have been documented spawning within the study area, and pink salmon are presumed to occur in West Fork Hylebos Creek (NWIFC 2023). The Puyallup Tribal Fisheries Department has documented Chinook salmon, chum salmon, coho salmon, pink salmon, and steelhead spawning in West Fork Hylebos Creek between SR 99 and the confluence with the East Fork Hylebos Creek (Marks et al. 2018).

Despite the lack of suitable habitat in the Hylebos Creek basin, there was one report of a single sub-adult bull trout captured near the S 373rd Street crossing of West Fork Hylebos Creek in August 2018 (Heltzel 2018 pers. comm.). This is considered a rare encounter, and bull trout are not expected to be present in the system, yet their presence cannot be discounted. Other fish species documented in West Fork Hylebos Creek include threespine stickleback (*Gasterosteus aculeatus*), western brook lamprey (*Lampetra richardsoni*), yellow perch (*Perca flavescens*), bass (*Micropterus* spp.), and sculpin (*Cottus* spp.) (HDR 2014; Marks et al. 2018). Several of these species have special regulatory status, which is described in more detail in Section 3.4.

Chinook salmon typically enter and spawn in Hylebos Creek and all accessible tributaries between October and December of each year. Chinook emerge from gravels in March and April and rear in the system between 2 months and a year before migrating to Puget Sound. Coho typically enter in the fall and spawn in late fall to early winter (September to January). Fry emerge in the spring and juveniles typically rear in the stream between 1 and 2 years before outmigrating to Puget Sound in the spring. Pink salmon and chum salmon typically migrate to the sea shortly following emergence; therefore, they spend little time rearing in their natal streams but move quickly to the marine nearshore to complete their juvenile rearing. Adult winter-run steelhead typically spawn in late winter and continue through early spring.

West Fork Hylebos Creek in the study area is a migration corridor for all salmonid species and provides rearing habitat for juvenile cutthroat trout, coho salmon, Chinook salmon, and steelhead. Sediments in the lower portion of West Fork Hylebos Creek are dominated by sand and silt, but some small and isolated patches of suitable spawning habitat are available. Spawning habitat is more prevalent in upstream reaches, outside the study area.

3.1.2.4 North Fork Hylebos Creek

North Fork Hylebos Creek originates in regional stormwater facilities immediately north of S 356th Street, is conveyed beneath S 356th Street, and then flows south to its confluence with West Fork Hylebos Creek approximately 1.1 miles downstream. Approximately 250 linear feet of stream channel was evaluated south of S 356th Street.

North Fork Hylebos Creek, a significant tributary to West Fork Hylebos, contains moderate-quality habitat, which can be attributed in part to the large riparian wetland complexes that contribute groundwater flow to the stream and buffer it from development in the watershed.

Riparian Vegetation

Riparian vegetation within the study area is limited to a narrow band (50 feet) of immature mixed coniferous and deciduous forest that includes red alder, western hemlock (*Tsuga heterophylla*), and western redcedar, with an understory consisting mainly of sword fern, osoberry, red-twig dogwood, Himalayan blackberry, and reed canarygrass. Downstream of the study area, riparian conditions improve as the stream flows into a broad floodplain dominated by large wetland complexes south of S 356th Street.

Physical In-Stream Habitat

The portion of stream evaluated south of S 356th Street is confined within a straight, ditch-like channel. Bankfull width ranges from 4 to 7 feet. The channel is degrading, with evidence of minor channel incision (2 to 3 feet below ground surface elevation) in the reach. Substrates were dominated by cobble and fines, with some scattered boulders, likely bank armoring as there is also some scattered armoring along both banks.

No LWD was documented within the reach. LWD input will be limited until forested riparian habitat reaches maturity. The channel was mostly dry during site investigations in May of 2023; however, there were areas of standing water. Under wetted conditions, the channel would likely contain small riffle/run/pool complexes.

Biological Connectivity

Numerous barriers to fish passage exist within and downstream of the study area, including one partial barrier and three unknown barriers that have not been evaluated for fish passage (WDFW 2023c). Table J4.3-6 summarizes the status of fish passage barriers within and downstream of the study area.

Table J4.3-6 Fish Passage Barrier Assessment for North Fork Hylebos Creek

Approximate Road Crossing	Unique Site I.D.	Distance Downstream (miles)[1]	Barrier Status	Assessment Year	Ownership
S 356th Street	105 R122912A	0.00 mi	Unknown	1999	Public
S 359th Street	105 R121619A	0.26 mi	Partial	2023	Public
S 364th Street	105 R121618B	0.46 mi	Unknown	1999	Private
8th Avenue S	922012	0.76 mi	Unknown	2021	Public

Source: WDFW Fish Passage and Diversion Screening Inventory Database (WDFW 2023c)
Notes:
(1) Measured from the furthest upstream surface-flowing segment in the study area.

Water Quality and Quantity

There is currently one 303(d) listing for impaired water quality for North Fork Hylebos Creek for the benthic macroinvertebrate bioassessment parameter (Ecology 2023). Current (2022) and historic (2013–2014) B-IBI sampling and associated scoring indicates fair to poor stream health within the sampled areas upstream and downstream of S 359th Street (PSSB 2024). The largest contributors to streamflow in this stream are groundwater and stormwater. Downstream of the study area, groundwater interaction plays more of a dominant role in determining flows as the channel transitions into a broader floodplain dominated by extensive wetlands. No flow was observed in the channel within the study area during the May 9, 2023, site evaluation; only standing water in some residual pool areas was observed. Based on these observations, this headwater area supports an intermittent flow regime. Refer to Attachment C, Figure C-3 for locations of all 303(d)-listed waterbodies in the study area.

Fish and Habitat Use

Salmonid species with documented presence in North Fork Hylebos Creek in or near the study area include coho salmon and steelhead (NWIFC 2023; WDFW 2023a). Chum salmon have been documented spawning downstream of 8th Avenue S (NWIFC 2023), and there are historic accounts of large numbers of chum salmon spawning upstream of S 364th Street (WDFW 2021). Reaches in the study area are upstream of reaches classified by NWIFC (2023) as gradient-accessible[4] for chum salmon (NWIFC 2023); therefore, this species is not expected to be present in the study area.

[4] Stream reaches classified as gradient-accessible are those to which access is not precluded by stream channel gradients that pose a barrier to upstream migration.

Chinook salmon are presumed to occur in the very lowest reach of North Fork Hylebos Creek (approximately 1 mile downstream of the study area), but stream reaches in the study area are classified as gradient-accessible to Chinook salmon (NWIFC 2023). Based on the intermittent flow regime and poor habitat quality, Chinook salmon are not expected to be present in stream reaches in the study area.

Pink salmon are presumed to occur in West Fork Hylebos Creek as far upstream as the confluence of North Fork Hylebos Creek. North Fork Hylebos Creek is only considered gradient-accessible to pink salmon extending upstream through the study area. The Hylebos Creek drainage also supports a thriving coastal cutthroat trout population (Marks et al. 2021); therefore, it is highly likely that coastal cutthroat trout could be present in the study area when flows are present.

As indicated above for West Hylebos Creek, a single bull trout was captured near the S 373rd Street crossing of West Fork Hylebos Creek; therefore, it is possible, although extremely unlikely, that bull trout could access the study area under certain flow conditions.

Based on their documented presence in West Fork Hylebos Creek, three-spine stickleback, western brook lamprey, yellow perch, bass, and sculpin could be present in this stream reach (HDR 2014; Marks et al. 2018, 2021). Several of these species have special regulatory status, which is described in more detail in Section 3.4.

3.1.2.5 Federal Way Stream 1 (SFW-01)

Stream SFW-01 originates on the east side of I-5, approximately 400 feet north of the Pierce/King County boundary and is conveyed beneath I-5 in an approximately 36-inch-diameter round concrete culvert. This stream flows from east to west. From the culvert outlet on the west side of I-5, the stream flows approximately 400 feet due west to its confluence with the left bank of West Fork Hylebos Creek in the south end of Federal Way.

Riparian Vegetation

Riparian vegetation within the WSDOT right-of-way is limited to reed canarygrass and Himalayan blackberry. Once out of the right-of-way, the vegetation is characterized by a narrow band of mature red alder with an understory of salmonberry, red elderberry, and sword fern before dropping down to the West Fork Hylebos Creek floodplain. Here the overstory continues to be dominated by red alder but the understory shifts to salmonberry and vine maple with some skunk cabbage and patchy Himalayan blackberry.

Physical In-Stream Habitat

Upon exiting the culvert beneath I-5, the channel is straight, with a fine silty substrate for the first 150 feet and an average wetted width of approximately 4 feet. The banks on either side of the stream are steep but stable in that reach. From that point, the channel profile remains straight but narrows considerably, with some severe channel incision (downcutting). In spots, the channel is approximately 1.5 to 2 feet wide with vertical 7-foot-high banks on either side. Farther downstream, the channel slope increases to approximately 20 percent, with a 40-foot stretch of cascades over a dense hardpan substrate. Once over the cascade, the stream washes out onto the West Fork Hylebos Creek floodplain in multiple diffuse channels. These channels are poorly defined in areas and are generally less than 2 feet wide. Clay and fine sediments characterize the substrate throughout the lower 50 feet of channel and before the confluence with West Fork Hylebos Creek.

Woody debris (predominantly red alder) is present within the upper reach near I-5, but the LWD typically spans the channel and does not contribute to the formation of complex habitats. The upper 150 feet is characterized by shallow glide habitat, which quickly changes to higher-gradient riffle and cascade habitats with water depths generally less than 2 inches.

Biological Connectivity

Currently, there are no documented barriers to fish passage downstream of the study area (WDFW 2023c). The stream is conveyed beneath I-5 in a 36-inch-diameter pre-cast concrete pipe. Upstream and east of I-5, Stream SFW-01 is less than 2 feet wide and is therefore not considered fish habitat. Downstream and west of I-5, some segments of the stream channel are greater than 2 feet wide. However, there are some very narrow segments (approximately 1 foot wide) that plunge over steep cascades with a slope greater than 20 percent that are likely impassable under any flow conditions and thus present a natural barrier to fish passage. Once the stream spills into the West Hylebos floodplain, the channel braids and its definition are lost in some areas. In general, the channel is less than 2 feet wide, and the potential for this stream to support fish use is considered extremely unlikely.

Water Quality and Quantity

There are currently no 303(d) listings for Stream SFW-01 (Ecology 2023); however, it is likely the stream has never been assessed for water quality. The largest contributor to stream flow is runoff from I-5, with minimal input from groundwater. As such, this small stream is ephemeral, flowing only during and following rainfall. Refer to Attachment C, Figure C-3 for locations of all 303(d)-listed waterbodies in the study area.

Fish and Habitat Use

Currently, there is no documented fish use of Stream SFW-01. The narrow channel width and segment of steep gradient likely limit fish use or access into the stream within the study area.

3.1.2.6 Federal Way Stream 2 (SFW-02)

Stream SFW-02 originates in a wetland (WFW-38) approximately 450 feet south of the intersection of SR 99 and S 359th Street. No culvert was located that would convey the stream across SR 99 to the east; however, it is possible that Stream SFW-02 and Federal Way Stream 4 (SFW-04), discussed below, are the same stream. It is assumed that the stream is conveyed beneath SR 99 and eventually converges with North Fork Hylebos Creek.

Riparian Vegetation

Riparian vegetation outside of the right-of-way includes an overstory of red alder with an understory composed of salmonberry, osoberry, dogwood, skunk cabbage, and giant horsetail (*Equisetum telmateia*). The stream channel as it parallels the roadway is primarily vegetated with Himalayan blackberry and reed canarygrass.

Physical In-Stream Habitat

Stream SFW-02 has a bankfull width between 2 and 3 feet wide and moderate sinuosity outside of the right-of-way. Once along the roadway, the stream takes on the shape and characteristics of a typical trapezoidal ditch. Habitat types observed include low-gradient riffles, runs, and cascades. Streambanks appeared to be relatively stable and vegetated with little or no scour observed.

Biological Connectivity

It is assumed that Stream SFW-02 is conveyed beneath SR 99 and likely joins North Fork Hylebos Creek several hundred feet east of SR 99. The exact location of the stream's crossing of SR 99 could not be found. Therefore, at this time, it is unclear whether the SR 99 crossing of Stream SFW-02 is a barrier to fish passage.

Water Quality and Quantity

There are currently no 303(d) listings for Stream SFW-02 (Ecology 2023); however, it is likely the stream has never been assessed for water quality. The largest contributor to stream flow is groundwater and runoff from SR 99. It is likely that the stream is intermittent, with the stream channel drying up during the late summer months. Refer to Attachment C, Figure C-3 for locations of all 303(d)-listed waterbodies in the study area.

Fish and Habitat Use

Currently, there is no documented fish use of Stream SFW-02 (NWIFC 2023; WDFW 2023a). Since there was no apparent downstream connection to North Fork Hylebos Creek, the stream is considered a non-fish-bearing stream. If the stream is determined to be connected to Stream SFW-04, the stream rating may be upgraded to fish-bearing.

3.1.2.7 Federal Way Stream 3 (SFW-03)

Stream SFW-03 originates in a large wetland (WFW-43) on the west side of SR 99 and is conveyed beneath SR 99 in an approximately 24-inch-diameter round concrete culvert. This stream flows from west to east. From the culvert outlet on the east side of SR 99, the stream flows due east for approximately 200 feet before the channel loses definition in a large wetland (WFW-39). It is unclear where or if the downstream channel ever reappears; however, it is assumed that the stream is connected to North Fork Hylebos Creek to the east and outside of the study area.

Riparian Vegetation

The riparian zone surrounding Stream SFW-03 is forested, with an overstory composed of red alder and black cottonwood and an understory composed of salmonberry, lady fern, Douglas spirea (*Spiraea douglasii*), stinging nettle, giant horsetail, reed canarygrass, and small-fruited bulrush (*Scirpus microcarpus*). The riparian corridor is more than 150 feet wide on either side of the stream within the assessed area.

Physical In-Stream Habitat

Upon exiting the culvert beneath SR 99, the channel is straight, with a fine silty substrate and a bankfull width between 3 and 5 feet. The lack of coarser-grained substrates indicates that this is a low-energy system. Streamflow appears to be supported by stormwater inputs from SR 99 as well as groundwater.

Woody debris in and adjacent to the channel is generally small and deciduous. The low energy flow and lack of woody material results in a simplified and straight channel that is characterized mainly as shallow glide habitat.

Biological Connectivity

Currently, there are no documented barriers between Stream SFW-04 and North Fork Hylebos Creek (WDFW 2023c); however, the culvert beneath SR 99 has not been evaluated for fish passage.

Water Quality and Quantity

There are currently no 303(d) listings for Stream SFW-03 (Ecology 2023); however, it is likely the stream has never been assessed for water quality. The largest contributor to stream flow is runoff from SR 99 and input from groundwater. Streamflow is anticipated to be intermittent, with low-flow and dry-channel conditions occurring in late summer and early fall. Refer to Attachment C, Figure C-3 for locations of all 303(d)-listed waterbodies in the study area.

Fish and Habitat Use

Currently, there is no documented fish use of Stream SFW-03 (NWIFC 2023; WDFW 2023a). The stream is anticipated to support fish use similar to that observed in the upper portion of North Fork Hylebos Creek (see above).

3.1.2.8 Federal Way Stream 4 (SFW-04)

Stream SFW-04 is conveyed beneath SR 99 in an approximately 18-inch-diameter, round, concrete culvert. It is likely that Stream SFW-02 is the upstream continuation of Stream SFW- 04, but this has yet to be verified. From the culvert outlet on the east side of I-5, the stream flows approximately 1,400 feet east and then southeast to its confluence with the right bank of North Fork Hylebos Creek in the southern portion of Federal Way. The study area includes only the portion of stream extending from the culvert outlet on the east side of SR 99 eastward for approximately 380 feet.

Riparian Vegetation

The riparian zone surrounding Stream SFW-04 is forested, with an overstory composed of red alder and black cottonwood and an understory composed of salmonberry, giant horsetail, lady fern, and sword fern. The riparian corridor is more than 150 feet wide on either side of the stream within the assessed area.

Physical In-Stream Habitat

Upon exiting the culvert beneath SR 99, the channel is straight, with a small gravel dominated substrate and a bankfull width that ranges between 2 and 4 feet. In general, the gravels are heavily embedded with fines. Habitats include low-gradient riffle and glide habitat.

Woody debris is present, but the LWD typically spans the channel and does not contribute to the formation of complex habitats. Downstream of the study area, the channel gradient steepens before the stream enters the wide floodplain habitats associated with North Fork Hylebos Creek.

Biological Connectivity

Currently, there are no documented barriers between Stream SFW-04 and North Fork Hylebos Creek (WDFW 2023c); however, the culvert beneath SR 99 has not been evaluated for fish passage.

Water Quality and Quantity

There are currently no 303(d) listings for Stream SFW-04 (Ecology 2023); however, it is likely the stream has never been assessed for water quality. The largest contributor to stream flow is runoff from SR 99 and input from groundwater. Streamflow is anticipated to be intermittent, with low-flow and dry-channel conditions occurring in late summer and early fall. Refer to Attachment C, Figure C-3 for locations of all 303(d)-listed waterbodies in the study area.

Fish and Habitat Use

Currently, there is no documented fish use of Stream SFW-04 (NWIFC 2023; WDFW 2023a). The stream is anticipated to support fish use similar to that observed in the upper portion of North Fork Hylebos Creek (see above).

3.1.2.9 Milton Stream 1 (SMI-01)

Milton Stream 1 (SMI-01) originates within a roadside ditch on the west side of I-5 immediately south of the Porter Way crossing of I-5 and flows 0.3 mile south to its confluence with the right bank of Hylebos Creek where it passes from the east side of I-5 to the west side of I-5.

Riparian Vegetation

Within the study area, riparian vegetation bordering Stream SMI-01 is dominated by reed canarygrass, Himalayan blackberry, giant horsetail, bedstraw (*Galium sp.*), and common cattail. Closer to the confluence with Hylebos Creek, there is some interspersion with native shrubs including twinberry (*Lonicera involucrata*), Scouler's willow (*Salix scouleriana*), Pacific willow, vine maple, serviceberry (*Amelanchier alnifolia*), and snowberry (*Symphoricarpos albus*). However, the majority (90 percent) of the stream's riparian zone is choked with reed canarygrass. The riparian corridor is generally narrow and limited by fill slopes associated with I-5 to the east and commercial development to the west. The narrow corridor and adjacent development results in relatively low-quality riparian habitat. Canopy cover is estimated to be less than 5 percent in the reach, and most of that coverage is from reed canarygrass and common cattail.

Physical In-Stream Habitat

The stream channel is occupied by dense reed canarygrass with less than 50 feet of defined channel bed. Substrates are dominated by fine silt with no areas of suitable spawning gravels. No LWD was observed along the entire reach during field reconnaissance surveys. Because the channel is largely choked with reed canarygrass, there are no discernable habitat types (pool/riffle/glide) within the reach. This surface water feature primarily appears to convey runoff from I-5, with some shallow groundwater/wetland contributions to stream flow. The stream has an average bankfull width of approximately 5 feet in the upper 500 feet of channel. The channel gradually widens as it approaches the confluence with Hylebos Creek, with an average bankfull width of approximately 20 feet in the lower 1,000 feet of channel.

Biological Connectivity

There are no documented barriers to fish passage downstream of the study area (WDFW 2023c).

Water Quality and Quantity

Within the study area, Stream SMI-01 contains segments of both intermittent and perennial flow. There are currently no 303(d) listings for Stream SMI-01 (Ecology 2023); however, it is likely the stream has never been assessed for water quality. Refer to Attachment C, Figure C-3 for locations of all 303(d)-listed waterbodies in the study area.

Fish and Habitat Use

Currently, there is no documented fish use of Stream SMI-01. However, there are no barriers that would prevent fish from entering the stream from Hylebos Creek. The major limitation to fish movements within the channel is the presence of dense reed canarygrass. However, during high flow events, this stream may provide refugia for juvenile salmonids from Hylebos Creek.

3.1.2.10 Milton Stream 2 (SMI-02)

Milton Stream 2 (SMI-02) originates on the west side of SR 99, although the exact location of its origin is unknown due to the extensive piping network along the roadway. Stream SMI-02 crosses SR 99 in a 24-inch diameter pipe near the intersection of 70th Avenue E and SR 99. The stream flows approximately 400 feet east to its confluence with the right bank of West Fork Hylebos Creek.

Riparian Vegetation

The riparian corridor ranges from 50 to 75 feet on either side of the stream extending from SR 99 to approximately 175 feet downstream where the riparian corridor width increases to several hundred feet wide as it joins the riparian corridor of West Fork Hylebos Creek. Within the study area, riparian vegetation bordering Stream SMI-02 is dominated by red alder, stinging nettle, red-twig dogwood, lady fern, and sword fern. Closer to SR 99, the riparian corridor is dominated more by invasive species, including English ivy and Himalayan blackberry. Riparian quality adjacent to the roadway and associated commercial development is generally poor; however, as the stream nears West Fork Hylebos Creek, the quality of the adjacent riparian habitat increases to a good to fair quality with some degradation by invasive species. Overall, canopy cover is fair to good, ranging between an estimated 60 to 80 percent canopy cover.

Physical In-Stream Habitat

The stream channel is straight and narrow with low sinuosity and a bankfull width ranging between 2 and 3 feet. The stream channel is dominated by fines substrates, with some patchy areas of gravel and cobble. In some areas, the channel loses definition as it joins with streamside wetlands choked with reed canarygrass.

Biological Connectivity

Currently, there are no barriers to fish passage for Stream SMI-02 downstream of SR 99; however, the barrier status of the culvert beneath SR 99 and any additional barriers upstream is largely unknown.

Water Quality and Quantity

Within the study area, Stream SMI-02 likely has an intermittent flow regime. There are currently no 303(d) listings for SMI-02 (Ecology 2023); however, it is likely the stream has never been assessed for water quality, and West Fork Hylebos Creek (discussed above) has numerous

303(d) listings along its length through the study area. Refer to Attachment C, Figure C-3 for locations of all 303(d)-listed waterbodies in the study area.

Fish and Habitat Use

Currently, there is no documented fish use of Stream SMI-02. However, there are no barriers that would prevent fish from entering the stream from West Fork Hylebos Creek. The major limitation to fish movements within the channel is the presence of dense reed canarygrass and intermittent flow. However, during high flow events, this stream may provide refugia for juvenile salmonids from West Fork Hylebos Creek.

3.1.2.11 Milton Stream 3 (SMI-03)

The stream has yet to be assessed due to access restrictions. A description of this stream will be added to subsequent versions of this document if property access is granted. At this time, the stream is assumed to enter the right bank of West Fork Hylebos Creek approximately 500 feet north of Birch Street and on the east side of SR 99. It is unknown whether fish from West Fork Hylebos Creek have access to reaches of SMI-03 in the study area.

3.1.2.12 Hylebos Creek

West Fork Hylebos Creek and East Fork Hylebos Creek join to form the main stem of Hylebos Creek east of I-5 and immediately north of Porter Way in the City of Milton. Hylebos Creek then flows approximately 2.3 miles south and west, entering Puget Sound via the Hylebos Waterway in Commencement Bay at the Port of Tacoma. Hylebos Creek is tidally influenced to approximately 0.5 mile upstream from the Hylebos Waterway. Based on its mean annual flow, the main stem of Hylebos Creek is classified as a shoreline of the state.

Before the mid-19th century, the Hylebos Creek watershed is thought to have been one of the most productive small salmon streams draining to south Puget Sound (King County 1990). Development of the region began in 1851 when the first Euro-American settlers began arriving in the Tacoma area. Since that time, extensive forest cover has been removed, wetlands have been drained and filled, stream channels have been modified, and forested areas have been converted to impervious surfaces. Currently, Hylebos Creek is located in one of the most heavily urbanized watersheds in the state (Kerwin 1999). The Puyallup Tribe of Indians is focused on restoration of salmon habitat in Hylebos Creek and its tributaries.

Riparian Vegetation

Emergent vegetation dominates the riparian zone from the I-5 crossing southwest to 70th Avenue E and includes species such as reed canarygrass, common rush (*Juncus effusus),* yellow-flag iris (*Iris pseudacorus*), creeping buttercup (*Ranunculus repens*), and slough sedge (*Carex obnupta*) (WSDOT 2019). Near the curve closer to 70th Avenue E, Himalayan blackberry is present along the retaining wall and/or fence. This reach of the stream has low-quality riparian buffer conditions, which can be largely attributed to the confined and straightened channel positioned between the I-5 fill slope and commercial properties. In the vicinity of 70th Street E, Himalayan blackberry becomes more dominant. Downstream and extending through the Pacific Highway E crossing, the quality of the riparian habitat improves. This habitat consists of forested and shrub areas that are dominated by black cottonwood, red alder, willows (*Salix* sp.), salmonberry, Douglas' spiraea, English ivy, Himalayan blackberry, reed canarygrass, and various other grasses (WSDOT 2019). The lack of mature trees within the overall riparian zone limits LWD recruitment potential to the stream, which not only reduces habitat complexity and cover but can contribute to elevated stream temperatures.

Physical In-Stream Habitat

Mainstem Hylebos Creek in the project area flows through low-gradient floodplain habitat with some slight sinuosity. Habitats are dominated by deep mid-channel and lateral scour pool habitats. LWD is present in small quantities within the reach. The potential for future recruitment is limited by the lack of large, mature stands of trees in this reach, combined with the limited ability of upstream areas to transport LWD to the area. The lack of in-stream and canopy cover reduces the quality of pool habitats. Sediments are dominated by fine materials, including sand and silt. While there is an overall lack of in-stream cover, pool depth is likely sufficient to provide important rearing habitat for juvenile salmonids. While there is some access to floodplain habitats from the main stem, there is a lack of off-channel and side channel habitats that could provide additional rearing habitat for juvenile salmonids.

Biological Connectivity

There are no documented barriers to fish passage downstream of the study area (WDFW 2023c).

Water Quality and Quantity

The mainstem Hylebos Creek is currently identified on the most recent (2018) 303(d) list of impaired waters for fecal coliform bacteria. Upstream of the mainstem, the East Fork and West Fork Hylebos Creek are both 303(d) listed for various water quality parameters as well as some smaller headwater tributaries including West Fork Hylebos Creek Tributary 0014C. Please refer to Sections 3.1.1.1 through 3.1.1.3 for more information on water quality within these Hylebos Creek tributary streams. Refer to Attachment C, Figure C-3 for locations of all 303(d)-listed waterbodies in the study area.

The hydrologic regime of Hylebos Creek is influenced by numerous factors, including land cover, topography, soils, climate, and precipitation patterns. The main source of hydrology for the Hylebos Creek watershed is precipitation with an average rainfall of 40 inches per year occurring predominantly between October and March, which corresponds to higher flows during this time frame (EarthCorps 2016; USGS 2020). The combination of these precipitation events with high levels of impervious surface and development in the basin restricts the amount of flood storage within the watershed, leading to an increased frequency and severity of flood events (EarthCorps 2016; King County 1990).

During the summer months, there are low in-stream flow events in Hylebos Creek (NWIFC 2016). In 1980, Ecology set guidelines for in-stream flows and prohibited new surface water withdrawals from Hylebos Creek (Ecology 1995). Despite these protections and the above-average rainfall, a watershed assessment conducted by Ecology determined that low-flow levels continued to decrease (Ecology 1995) and may be a result of water well withdrawals (NWIFC 2016).

Fish and Habitat Use

Fish use for the mainstem Hylebos Creek is identical to that described above in Section 3.1.1.3 West Fork Hylebos Creek, including documented presence of Chinook salmon, coho salmon, steelhead, chum salmon, pink salmon, and cutthroat trout. No bull trout are documented in Hylebos Creek main stem (NWIFC 2023). However, bull trout could use habitats at the mouth of the stream, outside of the study area (WSDOT 2019).

3.1.2.13 Surprise Lake Creek

Surprise Lake Creek (also called Surprise Lake Drain in some documents) originates north of the Puyallup River Valley from spring-fed Surprise Lake in the Edgewood city limits. The stream drains residential areas in Edgewood and is conveyed south to the Puyallup River Valley, where it drains additional residential and agricultural areas in Fife before joining the mainstem Hylebos Creek immediately upstream of Pacific Highway E (SR 99). Rights of entry were not granted for the parcel that contains Surprise Lake Creek in the study area. For this reason, information about this stream is drawn from existing sources, including documents prepared for the WSDOT SR 167 Completion Project.

Riparian Vegetation

Between I-5 and SR 99, the stream buffer condition of Surprise Lake Creek provides higher functions and values than buffer areas upstream of I-5, which are primarily in agricultural land use. Riparian vegetation is a mixture of shrubs and herbaceous plants. Vegetation in this area includes willows, red-twig dogwood, Pacific ninebark, Himalayan blackberry, bittersweet nightshade, reed canarygrass, velvet grass (*Holcus lanatus*), and manna grass (*Glyceria striata*). No trees are present; therefore, the potential for this area to contribute LWD and cover to the stream is limited.

Physical In-Stream Habitat

Surprise Lake Creek flows northwest from the I-5, crossing to its confluence with Hylebos Creek on the southeast side of Pacific Highway E in the study area. Habitats in this short reach are dominated by mid-channel scour pool habitat. The upstream culvert is responsible for the creation of the channel scour. Substrates are dominated by silt. No LWD or other in-stream cover is present within the reach. This area likely provides some limited rearing habitat for juvenile salmonids.

Biological Connectivity

There are no documented barriers to fish passage downstream of the study area (WDFW 2023c).

Water Quality and Quantity

Surprise Lake Creek within the study area is a perennial stream and is identified on the most recent (2018) 303(d) list of impaired waters for exceeding the established aquatic life criterion for mercury (Ecology 2023). The listed reach is upstream of the study area and begins near the outlet from Surprise Lake extending to the valley floor. Refer to Attachment C, Figure C-3 for locations of all 303(d)-listed waterbodies in the study area.

Fish and Habitat Use

WDFW (2023a) and NWIFC (2023) indicate that there is no documented use of Surprise Lake Creek by either resident or anadromous salmonids. However, WDFW indicates that there are no physical barriers and that the stream is gradient accessible to all species that are currently documented or presumed to occur in Hylebos Creek, which includes Chinook salmon, coho salmon, chum salmon, pink salmon, and steelhead (WDFW 2023a, 2023c). WSDOT observed three-spine stickleback in Surprise Lake Creek throughout the study area during their field investigations to support the SR 167 Completion Project (WSDOT 2019).

3.1.2.14 Fife Ditch Tributary 1

Fife Ditch Tributary 1 originates on the south side of Pacific Highway E near the Emerald Queen Casino and flows 0.5 mile north to the south side of 8th Street E where it turns west and flows 0.4 mile to its confluence with Fife Ditch. Fife Ditch continues an additional 0.8 mile north to the confluence with the left bank of Hylebos Creek just upstream of the Hylebos Waterway. The channel is used primarily as a stormwater conveyance feature through the industrial and commercial areas of Fife. Pierce County Drainage District 23 currently maintains this ditch and operates the Fife Ditch Pump Station, which pumps surface water from the ditch system into Hylebos Creek.

Riparian Vegetation

The channel is confined within a maintained ditch and riparian vegetation is limited to a narrow band of reed canarygrass, lawn grasses, Himalayan blackberry, and a few scattered ornamental trees and shrubs. The width of the riparian zone ranges between 20 and 30 feet.

Physical In-Stream Habitat

As discussed above, Fife Ditch Tributary 1 is a stormwater conveyance feature. Habitats are primarily mid-channel pools and shallow glide habitat. Channel slopes are less than 1 percent throughout. There are no in-stream structures or woody debris within the channel. Sediments are primarily silts, with some gravels near culvert inlet and outlets that are likely exposed during high flow events. The channel provides no spawning or rearing potential for salmonids.

Biological Connectivity

No culverts have been identified as barriers to fish passage in Fife Ditch Tributary 1 within and downstream of the study area (WDFW 2023c). All downstream culverts are identified by WDFW as occurring in non-fish-bearing waters (WDFW 2023c). WDFW has determined that Fife Ditch Tributary 1 is a non-fish bearing stormwater ditch based upon WDFW surveys in support of the WSDOT SR 167 Completion Project (Penk 2023a, pers. comm.).

Water Quality and Quantity

Segments of Fife Ditch Tributary 1 in the study area are believed to flow perennially. There are currently no 303(d) listings for Fife Ditch Tributary 1 (Ecology 2023); however, it is likely the stream has never been assessed for water quality. Observations of the ditch indicate that water quality is generally poor and has high turbidity (water is not clear due to suspended sediments). Refer to Attachment C, Figure C-3 for locations of all 303(d)-listed waterbodies in the study area.

Fish and Habitat Use

NWIFC (2023) indicates that Fife Ditch Tributary 1 is gradient-accessible to fall Chinook salmon, fall chum salmon, odd-year pink salmon, coho, and winter steelhead. In contrast, WDFW (2023c) characterizes Fife Ditch Tributary 1 as non-fish bearing. Regardless, because there are no barriers between Fife Ditch and Fife Ditch Tributary 1, it should be assumed that the documented distribution of coho salmon, chum salmon, and steelhead within Fife Ditch could extend into Fife Ditch Tributary 1. Based on poor habitat and water quality, Chinook salmon are not expected to be present in reaches of this stream in the study area.

3.1.2.15 Fife Ditch

Fife Ditch drains runoff from an approximate 2-square-mile area centered around industrial areas associated with the Port of Tacoma and the industrial, commercial, residential, and agricultural areas within the City of Fife (Parametrix 1991). The ditch conveys runoff flows through a tide gate into Lower Hylebos Creek just upstream of the Hylebos Creek confluence with the Hylebos Waterway. Historically, runoff from the area entered the Hylebos Creek Drainage Basin; however, the nearly flat topography of the area and need to drain agricultural fields led to the creation of an entirely separate drainage basin, the Fife Ditch Drainage Basin. This drainage basin includes a vast network of drainage ditches with its own pump station and outfall to Lower Hylebos Creek near the discharge point to the Hylebos Waterway. Fife Ditch and the associated pump station are owned and operated by Pierce County Drainage District 23 (Brown and Caldwell 2015). The City of Fife plans to take over the ownership and operation of the pump station and drainage system from Drainage District 23 in the future.

Riparian Vegetation

Riparian coverage is almost non-existent along the ditch system. The existing vegetation is limited primarily to reed canarygrass, mowed herbaceous vegetation, and grasses. Very few trees exist within the riparian corridor in the study area.

Physical In-Stream Habitat

The entire ditch system is a stormwater conduit for the surrounding commercial and industrial land uses, which provides little in the way of habitat for fish or other aquatic life. The channel geometry of Fife Ditch is linear and uniform, and sediments consist primarily of silts and clays (USGS 1986). LWD is absent from the channel and the majority of the stream is piped within the study area.

Biological Connectivity

All Fife Ditch culvert crossings have been identified as occurring on a non-fish bearing stream (WDFW 2023c). Table J4.3-7 summarizes the status of potential or known fish passage barriers to Fife Ditch downstream of the study area.

Table J4.3-7 Fish Passage Barrier Assessment for Fife Ditch in the Study Area

Approximate Road Crossing	Unique Site I.D.	Distance Downstream (miles)[1]	Barrier Status	Assessment Year	Ownership
12th Street E	105 R122118b	0.03 mi	On a non-fish-bearing stream	2020	Public
4th Street E	105 R122118a	1.1 mi	On a non-fish-bearing stream	1999	Public
Taylor Way East	105 R122117a	1.3 mi	On a non-fish-bearing stream	1999	Pierce County

Source: WDFW Fish Passage and Diversion Screening Inventory Database (WDFW 2023c)
Notes:
(1) Measured from the northern project limit of the Fife Segment between 13th Street E and 15th Street E.

Water Quality and Quantity

Fife Ditch is identified on the most recent (2018) 303(d) list of impaired waterbodies for exceeding aquatic life criteria for two water quality parameters, including ammonia-N and dissolved oxygen (Ecology 2023). Surface water flows have been documented varying from 0.3 to 16.0 cubic feet per second and are characterized as sluggish (USGS 1986). Observations of the ditch indicate that water quality in Fife Ditch is poor and has high turbidity. Refer to Attachment C, Figure C-3 for locations of all 303(d)-listed waterbodies in the study area. Fife Ditch generally supports perennial flow.

Fish and Habitat Use

NWIFC (2023) indicates that Fife Ditch is gradient accessible to Chinook salmon, chum salmon, coho salmon, odd-year pink salmon, and winter steelhead extending upstream to the Fife Ditch alignment adjacent to Pacific Highway E. However, only fall-run chum salmon are currently mapped as documented in Fife Ditch upstream to 12th Street E (NWIFC 2023). There appears to be a mapping error in several web map applications that show a connection between Fife Ditch (non-fish bearing) and Wapato Creek (fish bearing).In some instances, Fife Ditch is even mapped as Wapato Creek. WDFW’s fish passage database and associated culvert assessments, supported by habitat surveys, identify Fife Ditch and all tributaries as non-fish bearing (WDFW 2023c). WDFW has determined that Fife Ditch is a non-fish bearing stormwater ditch based upon WDFW surveys in support of the WSDOT SR 167 Completion Project (Penk 2023a, pers. comm.).

3.1.2.16 Wapato Creek

Wapato Creek originates from diffuse seeps and springs along the north side of the Puyallup River valley and directly north of Puyallup. The stream flows approximately 13 miles through agricultural, residential, and light industrial areas south of I-5 before crossing into the heavy industrial area north of I-5 and flowing an additional mile to its discharge point on the east side of Blair Waterway. Tidal influence extends approximately 0.7 mile upstream to the crossing of 12th Street E (Port of Tacoma 2014). It is thought that Wapato Creek used to serve as a high flow channel for the White/Stuck River during periods of high flow (Kerwin 1999). From the 1920s to the 1940s, much of the marsh habitat along both lower Wapato and Hylebos Creek was converted to agricultural use through the construction of extensive dike systems (Corps et al. 1993).

In 2021, in partnership with the Puyallup Tribe of Indians, the Port of Tacoma completed the Lower Wapato Creek Habitat Project approximately 0.2 mile downstream of the study area. The project provides advance mitigation for future unavoidable impacts on Wapato Creek and wetlands on Port-owned properties downstream of the site. The project involves (1) replacing the two fish-barrier culverts that convey Wapato Creek under 12th Street E with a single, fish-passable bridge, (2) relocating Wapato Creek from a ditched system to a longer, meandering stream channel, and (3) restoring estuarine and wetland habitats and a forested upland buffer surrounding the relocated stream channel.

Riparian Vegetation

The riparian corridor of Wapato Creek has been substantially altered from historic conditions, and today there is limited or no functioning riparian habitat along the stream. In the project area, willow and reed canarygrass are prevalent at and below the OHWM, with a narrow corridor of red alder, Himalayan blackberry, and red-twig dogwood along the upper banks.

Physical In-Stream Habitat

The channel slope in the reach between I-5 and Pacific Highway E is less than 1 percent. The channel is primarily confined by fill slopes with little functioning floodplain. LWD is absent from the channel and in-stream cover provided by vegetation and boulders is also limited within the study area. Gravels are present in areas but heavily embedded with fines, limiting the suitability of the habitat for spawning. Mid-channel pools are the dominant habitat through the reach, likely providing some limited rearing habitat for juvenile salmonids.

Biological Connectivity

One barrier to fish passage is present downstream of the study area (Table J4.3-8). Biologists performing the field assessment were unable to determine whether the structure is a partial or complete barrier (WDFW 2023c).

Table J4.3-8 Fish Passage Barrier Assessment for Wapato Creek in the Study Area

Approximate Road Crossing	Unique Site I.D.	Distance Downstream (miles)[1]	Barrier Status	Assessment Year	Ownership
SR 509 Westbound Lanes	105 R121419a	0.50 mi	Unknown	2017	Public

Source: WDFW Fish Passage and Diversion Screening Inventory Database (WDFW 2023c)
Notes:
(1) Measured from the Pacific Highway E crossing of Wapato Creek.

Water Quality and Quantity

Wapato Creek is identified on the most recent (2018) 303(d) list of impaired waters for bacteria and dissolved oxygen (Ecology 2023). Refer to Attachment C, Figure C-3 for locations of all 303(d)-listed waterbodies in the study area. Wapato Creek also contains one impairment by a non-pollutant, in the upper reaches, for in-stream flow. The in-stream flow impairment has been largely attributed to a failed flood control project that was originally intended to prevent flooding from upper Wapato Creek by diverting peak flows into a stormwater bypass system that flows into the Puyallup River. However, the project had the opposite effect in that almost all flows are currently diverted into the bypass and only flood events flow into the lower Wapato Creek. This diversion has contributed to critical low flows in lower Wapato Creek for over 30 years.

Fish and Habitat Use

WDFW (2023a) and NWIFC (2023) indicate that coho salmon, chum salmon, and winter steelhead have been documented in Wapato Creek within the study area and that juvenile coho use this area for rearing. WDFW also indicates that the stream is gradient-accessible to pink salmon and Chinook salmon, but their occurrence within the stream has not been documented to date.

3.1.2.17 Erdahl Ditch Tributary 1

The Erdahl Ditch drainage system is a human-created system that has been channelized to convey surface water runoff from the western portion of the City of Fife to its discharge in the Blair Waterway. A pump station is located at the current outlet, which was built in 1985 and upgraded in 2008 (Brown and Caldwell 2015). Erdahl Ditch Tributary 1 originates on the north side of I-5 just west of the Wapato Creek crossing of I-5. It flows west and around the Port of Tacoma Road E southbound of the I-5 off-ramp. Here it enters a culvert and parallels Pacific

Highway E for approximately 1,100 feet before joining Erdahl Ditch Tributary 2. From that point the Erdahl Ditch tributaries turn north and join other stormwater ditches to form the main channel of Erdahl Ditch in Tacoma before discharging into Blair Waterway.

Riparian Vegetation

The riparian corridor of Erdahl Ditch Tributary 1 within the study area is vegetated with reed canarygrass along the margins of the stream, and the surrounding upland buffer contains Lombardy poplar (*Populus nigra*), English laurel (*Prunus laurocerasus*), big-leaf maple, salal (*Gaultheria shallon*), and evergreen huckleberry (*Vaccinium ovatum*). The huckleberry and salal appear to be mitigation plantings. Most of the channel outside of the study area and along I-5 is dominated by reed canarygrass.

Physical In-Stream Habitat

Erdahl Ditch Tributary 1 is maintained as a stormwater conveyance facility and is characterized by alternating segments of straight and narrow trapezoidal channel and piped segments. The open channel portion of Erdahl Ditch Tributary 1 within the study area is approximately 10 feet wide with an average 2-foot wetted width. Substrates are dominated by silt. No in-stream habitat features such as LWD or boulders are present. Overall, the channel slope is less than 1 percent throughout the system, which results in slow and sluggish backwater habitats. Habitat complexity is very low.

Biological Connectivity

Two culverts have been identified as potential barriers to fish passage in Erdahl Ditch Tributary 1 downstream of the study area (WDFW 2023c). The current status of these barriers is unknown, and it is unclear whether these are partial or full passage barriers. Table J4.3-9 summarizes the status of potential or known fish passage barriers in Erdahl Ditch Tributary 1 downstream of the study area.

Table J4.3-9 Fish Passage Barrier Assessment for Erdahl Ditch Tributary 1 in the Study Area

Approximate Road Crossing	Unique Site I.D.	Distance Downstream (miles)[1]	Barrier Status	Assessment Year	Ownership
SR 509	993016	0.60 mi	Unknown	2021	Public
Port of Tacoma Road E	921065	1.10 mi	Unknown	2015	Public

Source: WDFW Fish Passage and Diversion Screening Inventory Database (WDFW 2023c)
Notes:
(1) Measured from the intersection of Pacific Highway E and 33rd Avenue E.

Water Quality and Quantity

Erdahl Ditch and its tributaries are not identified on the most recent (2018) 303(d) list of impaired waterbodies for exceeding any water quality criterion (Ecology 2023). Because the primary purpose of Erdahl Ditch is to convey stormwater, it is unclear whether the area is routinely evaluated for degradation of water quality. It is likely water quality is impaired given that this conveyance system drains a heavily used road system and areas of commercial and industrial development and has little riparian cover or seasonal flow.

Erdahl Ditch Tributary 1 conveys stormwater runoff from an area between commercial properties on the south side of Pacific Highway E and the area on the north side of I-5, between Wapato Creek and the southbound I-5 Port of Tacoma Road exit. This conveyance feature is typically dry for most of the year. A pump station is located at the discharge point of the Erdahl Ditch system into the Blair Waterway, which was installed to control flooding of the low-elevation areas of Fife. No flow data are available for the Erdahl Ditch system. Refer to Attachment C, Figure C-3 for locations of all 303(d)-listed waterbodies in the study area.

Fish and Habitat Use

WDFW (2023a) does not identify distribution of salmonids into the Erdahl Ditch drainage system; however, WDFW does indicate that the ditch system is gradient accessible to Chinook salmon, chum salmon, coho salmon, and odd-year pink salmon. Poor habitat conditions, likely water quality impairments, and insufficient flow during most of the year, likely preclude use of the ditch system by salmonids. Recent communications with WDFW indicate that the Erdahl Ditch tributaries will be considered non-fish bearing stormwater ditches, similar to the Fife Ditch Tributary (Penk 2023b, pers. comm.).

3.1.2.18 Erdahl Ditch Tributary 2

A detailed description of the Erdahl Ditch drainage system is included in Section 3.1.2.17. Erdahl Ditch Tributary 2 conveys drainage from along 20th Street E south of I-5 via two 48-inch-diameter culverts to the north side of I-5. Upon discharging to the north side of I-5, Erdahl Ditch Tributary 2 receives additional stormwater contributions from ditches running parallel with I-5 before entering another culvert that discharges to an open channel north of Pacific Highway E. The only segment of open channel within the study area (approximately 50 feet in length) lies between I-5 and the commercial property to the north. It is likely that Erdahl Ditch Tributaries 1 and 2 converge at Pacific Highway E and are then piped across the roadway to an open channel on the north side of Pacific Highway E.

Riparian Vegetation

Most of Erdahl Ditch Tributary 2 in the study area is piped; the only open channel portion is within a roadside ditch. Vegetation within the ditch is dominated by reed canarygrass and Himalayan blackberry.

Physical In-Stream Habitat

The only open-channel portion of Erdahl Ditch Tributary 2 in the study area is a short (approximately 50 feet long) segment between the twin 48-inch culvert outlets beneath I-5 and the culvert inlet beneath commercial development to the north. Ditches and wetlands drain into the open channel from the east and west. The channel is approximately 4 feet wide with a maximum depth of approximately 2 feet. Bottom substrates are dominated by silt. Similar to Erdahl Ditch Tributary 1 and because of its primary use as a stormwater conveyance facility, habitat complexity and condition are poor. No LWD or other in-stream habitat was observed during the site visit.

Biological Connectivity

Two culverts have been identified as potential barriers to fish passage on Erdahl Ditch Tributary 2 downstream of the study area (WDFW 2023c). The current status of these barriers is unknown, and it is unclear whether these are partial or full passage barriers. Table J4.3-10 summarizes the status of potential or known fish passage barriers in Erdahl Ditch Tributary 2 downstream of the study area.

Table J4.3-10 Fish Passage Barrier Assessment for Erdahl Ditch Tributary 2 in the Study Area

Approximate Road Crossing	Unique Site I.D.	Distance Downstream (miles)[1]	Barrier Status	Assessment Year	Ownership
SR 509	993016	0.30 mi	Unknown	2021	Public
Port of Tacoma Road	921065	0.80 mi	Unknown	2015	Public

Source: WDFW Fish Passage and Diversion Screening Inventory Database (WDFW 2023c)
Notes:
(1) Measured from Pacific Highway E.

Water Quality and Quantity

See Section 3.1.2.17 above for a description of water quality in the Erdahl Ditch drainage basin. Erdahl Ditch Tributary 2 conveys stormwater runoff from the south side of I-5 to the north side of I-5 and is typically dry for most of the year. A pump station is located at the discharge point of the Erdahl Ditch system into the Blair Waterway, which was installed to control flooding of the low-elevation areas of Fife. No flow data are available for the Erdahl Ditch system. Refer to Attachment C, Figure C-3 for locations of all 303(d)-listed waterbodies in the study area.

Fish and Habitat Use

See Section 3.1.2.17 above for a description of fish use in the Erdahl Ditch drainage basin.

3.1.2.19 Puyallup River

The Puyallup River originates from the Puyallup and Tahoma glaciers on the slopes of Mount Rainier within the boundaries of Mount Rainier National Park. The two glaciers form the North Fork and South Fork Puyallup Rivers, respectively. The North Fork and South Fork Puyallup River converge just outside of the park forming the mainstem Puyallup River that flows approximately 45 miles north and west to the discharge point in Commencement Bay within the City of Tacoma. Over the course of its journey, the Puyallup River is joined by three large glacially fed tributaries, including the Mowich River, Carbon River, and White River. The lower 2.5 miles of the Puyallup River is tidally influenced (Ecology et. al. 2006). The Puyallup River is classified as a shoreline of statewide significance based upon mean annual flows exceeding 1,000 cubic feet per second.

The Puyallup River basin was one of the first areas in Puget Sound to be settled by arriving Euro-American immigrants in the early 1850s (Kerwin 1999). Much of the surrounding floodplain in the lower valley was cleared of natural vegetation to support agricultural activities; extensive dike and levee systems were built. A large driver for flood protection in the lower valley was the permanent diversion of the White River into the Puyallup River system in 1906, which effectively doubled the flows in the lower Puyallup River. The lower 26 miles of the Puyallup River have been straightened and channelized within a system of revetments and levees, dramatically changing the river’s connections to off-channel, side-channel, and floodplain habitats.

The quality and quantity of habitat and the natural processes that contribute to both have been substantially altered by past and present land use practices. These include forestry, hydropower (Electron Dam on the mainstem Puyallup River), and flood control projects in the upper watershed (Mud Mountain Dam on the White River). Flood control, agriculture, and urbanization typify existing land uses of the lower watershed.

Historically, the lower Puyallup River and its associated floodplain contained numerous braids, side channels, and extensive floodplain wetlands. The mouth of the river was characterized by extensive mudflats and a large estuarine delta. The mainstem Puyallup River between Sumner and Puyallup has been straightened and placed within flood control levees. The floodplains have been deforested and converted to agricultural, commercial, and industrial land uses, and most of the tide flats filled to support the industrial land uses including the current Port of Tacoma facilities. Less than 5 percent of the original estuarine habitat in and around the mouth of the Puyallup River remains intact today (Shared Strategy for Puget Sound 2023). These impacts have contributed to severe declines in salmon and steelhead populations throughout the watershed. Efforts have been underway since the early 1990s to connect some of these areas with the former floodplain and lower estuary. These efforts include the Gog-le-hi-te wetland restoration downstream of the study area and the Sha-Dadx off-channel restoration upstream of the study area.

The cities of Tacoma and Fife, overseen by the Washington State Department of Ecology, have regulatory authority within the shoreline jurisdiction of the river. The Puyallup Tribe of Indians has authority for work within the OHWM of the river in the study area. In addition, WDFW is responsible for preserving, protecting, and perpetuating fish resources, as required under the Hydraulic Code (Chapter 77.55 RCW).

Riparian Vegetation

Riparian vegetation on both sides of the river is dominated by Himalayan blackberry, reed canarygrass, willow, young red alder, giant horsetail, and Douglas' spiraea. The vegetation corridor in this area is extremely narrow due to adjacent development of the I-5 corridor and the presence of the levee itself. Vegetation is managed along the levee and on both sides of river, and trees are not allowed to become established due to concerns related to destabilization of the levee.

Physical In-Stream Habitat

The Puyallup River is currently separated from its floodplain by a series of dikes, revetments, and levees along both banks. These actions have greatly simplified the historic river channel complex, reducing the availability of off-channel and side-channel habitats, complex pools, and large woody material that were important components of fish habitat. These channel simplifications have also changed the natural hydrology within these river reaches, further reducing or eliminating the suitability of the remaining in-stream habitat for rearing juvenile salmon or migrating and foraging adults.

The project area is located within the lower tidally influenced portion of the Puyallup River. The channel through this section is straight and uniform as it is contained within a system of levees on both banks. Both banks are heavily armored with riprap. LWD is present within the reach and is deposited within this lower reach during high flow events. Some gravels are present; however, they are heavily compacted and not suitable for spawning (Marks et al. 2018). As discussed above there is some limited off-channel habitat, but only a mere fraction of what occurred historically. The lower river in the project area is primarily a mid-channel pool. The area is an important migrator corridor for adult salmonids moving upstream to spawn and juvenile fish outmigrating to the marine waters of Puget Sound. While the area does still support some rearing and is important for the physiological transition of juvenile salmonids as they prepare to move from the fresh water to saltwater, the presence of off-channel, low energy areas has been largely removed by confining the channel between levees and eliminating connections to the former floodplain.

Biological Connectivity

Currently, there are no barriers to fish passage on the Puyallup River downstream of the study area (WDFW 2023c).

Water Quality and Quantity

The Puyallup River is identified on the most recent (2018) 303(d) list of impaired waters for temperature and mercury (Ecology 2023). The Puyallup Tribe of Indians also has jurisdiction for water quality within the OHWM of the Puyallup River. Refer to Attachment C, Figure C-3 for locations of all 303(d)-listed waterbodies in the study area. The Puyallup River has a current multi-parameter Total Maximum Daily Load (TMDL) in place to address other water quality concerns including Ammonia-N, BOD_5, Chlorine, and dissolved oxygen. The Puyallup River also contains one impairment by a non-pollutant, in the upper reaches, for in-stream flow. The mouth of the Puyallup River downstream of the study area also contains a 303(d) listing for sediment impairment for exceedance of the sediment bioassay criterion (Ecology 2023). Only one location of the lower Puyallup River — the stretch between the Cities of Puyallup and Sumner approximately 9.5 miles upstream of I-5 — has had a B-IBI evaluation. B-IBI scores in this area indicate poor stream health (PSSB 2024).

Much of the agriculture land that once dominated the lower valley has been replaced by dense residential, commercial, and industrial land uses. Increasing water demand (groundwater withdrawal) and conversion of land to impervious surfaces have altered hydrologic conditions in the lower valley. This has disrupted the ability of the stream to accommodate low flow conditions as well as peak flood events (Kerwin 1999). As a result, sedimentation within the river channel has been a concern, as has localized flooding and damage to levees.

Fish and Habitat Use

The Puyallup River supports populations of eight salmonid species, including fall- and spring-run Chinook salmon, fall-run chum salmon, coho salmon, coastal cutthroat trout, odd-year pink salmon, sockeye salmon, winter steelhead, and bull trout (Marks et al. 2018, 2019, 2020, and 2021; NWIFC 2023; WDFW 2023a). The Puyallup River in the study area is used primarily as a migration corridor for these species during their upstream spawning migrations as adults and during their seaward migrations downstream as juveniles.

According to NWIFC (2023), the lower Puyallup River may provide rearing habitat for juvenile Chinook salmon and coho salmon. However, the Puyallup River channel bed in the study area is of uniform depth and consists of relatively uniform sand and silt material. The riverbed in this area provides limited, if any, rearing function for juvenile or adult salmonids (NMFS and USFWS 2009). In studies that encompassed the river in the study area, Puyallup Tribal Fisheries (2005) found few areas of gravel suitable for spawning; where present, gravel was generally too compacted to provide suitable spawning substrates (Marks et al. 2018).

The Puyallup River in this area is also the key migratory corridor for anadromous bull trout entering and leaving spawning areas in the upper watershed (USFWS 2017). Based on degraded habitat conditions in the lower Puyallup River and adjoining nearshore areas of Commencement Bay, combined with the small proportion of anadromous fish in the Puyallup River system, USFWS (2017) estimated that the number of bull trout using habitats in the in the vicinity of the I-5 bridge crossing is relatively small.

In addition to the salmonid species identified above, several other fish species have been identified in the lower river and adjacent estuarine wetlands, including threespine stickleback, largescale sucker (*Catostomus macrocheilus*), prickly sculpin (*Cottus asper*), Pacific staghorn sculpin (*Leptocottus armatus*), and starry flounder (*Platichthys stellatus*). Marine mammals (e.g., seals and sea lions) also forage on salmon in the lower reaches of the Puyallup River.

3.1.2.20 First Creek

First Creek is a small tributary that discharges to the left bank of the Puyallup River near the I-5 crossing. First Creek originates in Tacoma in the vicinity of E 46th Street and E 56th Street on the plateau above the Puyallup River and flows north for approximately 2.7 miles to its discharge point along the left bank of the Puyallup River north of I-5. The stream flows through primarily residential areas before dropping down to the Puyallup River valley floor where the land use changes to commercial and heavy industrial. There are no surface-flowing portions of First Creek within the study area. All flow through the study area is contained in a 72-inch-diameter pipe. Because no functional riparian vegetation or in-stream habitat is present in the study area, these habitat elements are not described in this report.

Biological Connectivity

One barrier has been identified within the study area (WDFW 2023c). Its current status is unknown, and it is unclear whether this is a complete or partial barrier. Table J4.3-11 summarizes the status of potential or known fish passage barriers in First Creek within or downstream of the study area.

Table J4.3-11 Fish Passage Barrier Assessment for First Creek in the Study Area

Approximate Road Crossing	Unique Site I.D.	Distance Downstream (miles)[1]	Barrier Status	Assessment Year	Ownership
Unnamed dirt levee access road on west side of Puyallup River	933187	0.00	Unknown	2015	Public

Source: WDFW Fish Passage and Diversion Screening Inventory Database (WDFW 2023c)

Water Quality and Quantity

First Creek is not identified on the most recent (2018) 303(d) list of impaired waters Ecology 2023. Refer to Attachment C, Figure C-3 for locations of all 303(d)-listed waterbodies in the study area. No flow data is available for First Creek.

Fish and Habitat Use

NWIFC (2023) indicates that First Creek is gradient-accessible to Chinook salmon, chum salmon, coho salmon, odd-year pink salmon, and winter steelhead; however, no documented use has been reported.

3.2 Vegetation, Wildlife, and Wildlife Habitat

3.2.1 Vegetation

Vegetation in the study area was classified in land cover types and characterized according to the methods described in Section 2.2. Eleven cover types were identified in the study area.