Downtown Redmond Link Extension
SEPA Addendum

Appendix C
Ecosystems
Technical Report Addendum

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TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

LIST OF FIGURES

TABLE OF CONTENTS (CONTINUED)

LIST OF TABLES

ATTACHMENTS

ACRONYMS AND ABBREVIATIONS

APE	area of potential effect
Ballard Locks	Hiram M. Chittenden Locks
BMP	best management practice
CAO	Critical Area Ordinance
cfs	cubic feet per second
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DPS	distinct population segment
EA	Environmental Assessment
Ecology	Washington State Department of Ecology
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESU	evolutionarily significant unit
FGDC	Federal Geographic Data Committee
FR	Federal Register
FTA	Federal Transit Administration
FWHCA	Fish and Wildlife Habitat Conservation Area
GIS	geographic information system
GMA	Growth Management Act
KCC	King County Code
LWD	large woody debris
MBTA	Migratory Bird Treaty Act
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
OHWM	ordinary high water mark
PHS	Priority Habitats and Species
RCW	Revised Code of Washington

ACRONYMS AND ABBREVIATIONS (CONTINUED)

ROD	Record of Decision
RZC	Redmond Zoning Code
SEPA	State Environmental Policy Act
SMA	Shoreline Management Act
SMP	Shoreline Master Program
Sound Transit	Central Puget Sound Regional Transit Authority
SR	State Route
TMDL	total maximum daily load
TPSS	traction power substation
UGA	Urban Growth Area
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington State Department of Natural Resources
WRIA	Water Resource Inventory Area
WSDOT	Washington State Department of Transportation

1 INTRODUCTION

The Downtown Redmond Link Extension Project (project) will add 3.4 miles of light rail and two new light rail stations from the interim terminus of the Redmond Technology Center Station (formerly called the Overlake Transit Center Station) to downtown Redmond (Figure 1-1).

This light rail corridor was evaluated as Segment E of the 2011 East Link Project Final Environmental Impact Statement (Final EIS). The Final EIS and Record of Decision (ROD) identified the Marymoor Alternative E2 as the Preferred Alternative in Segment E. The Sound Transit Board selected the Marymoor Alternative E2 (referred to hereafter as the 2011 Project) to be built as part of the full length East Link Project, although at the time Segment E was not funded for construction and operation. Since 2011, project plans as well as project area conditions have changed. As a result, Sound Transit has identified project refinements in Segment E and is updating the environmental review to address these changes. These modifications are referred to as the Proposed Design Refinements.

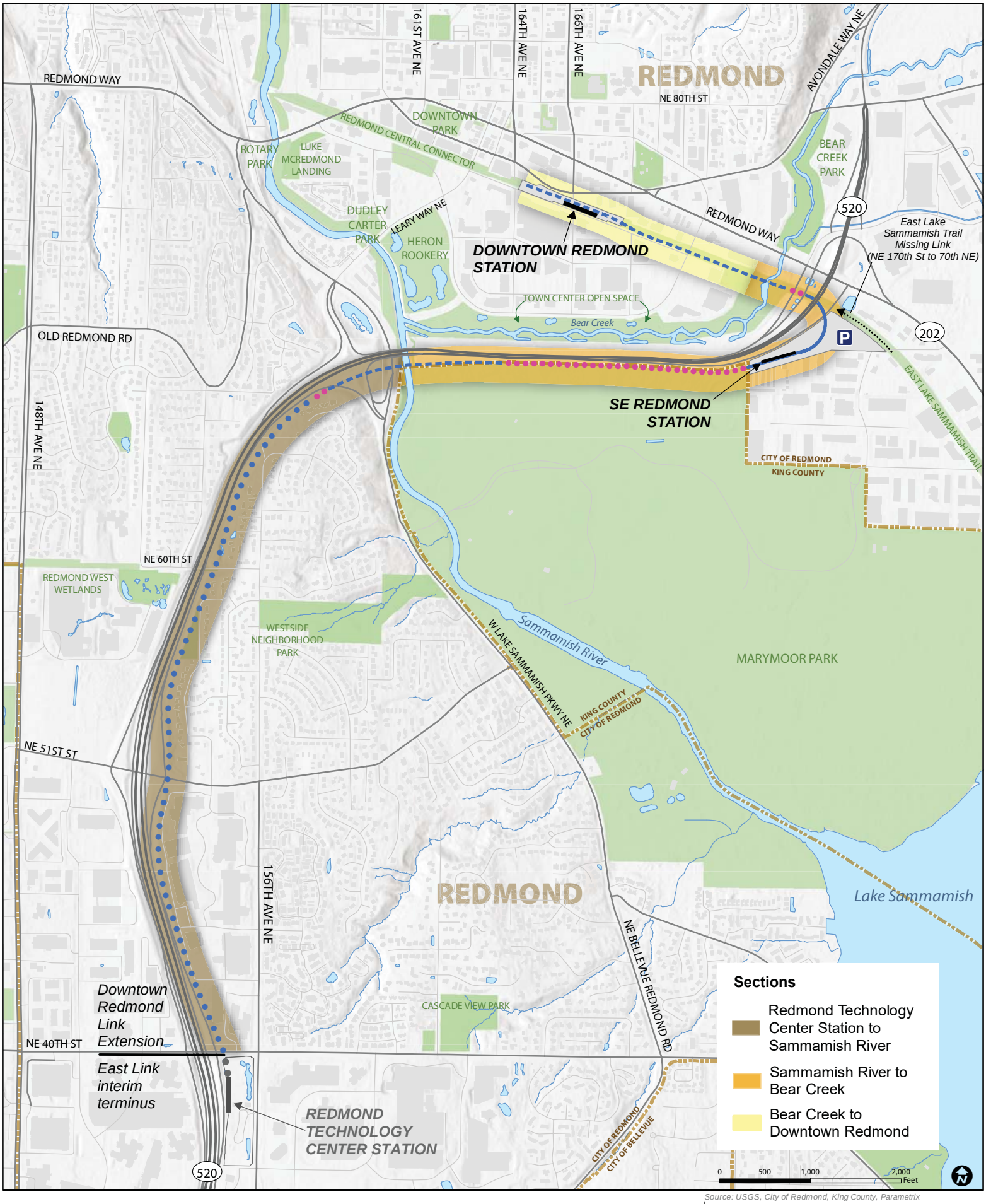
This report is an addendum to Appendix H3, Ecosystems Technical Report, prepared for the East Link Project (Sound Transit 2011). Analyses in this report address the changes in impacts of the Downtown Redmond Link Extension Project. Consistent with the requirements of the National Environmental Policy Act (NEPA) and the State Environmental Policy Act (SEPA), this report provides updated information about existing conditions and addresses the effects of the Downtown Redmond Link Extension project on wetlands, aquatic species and habitat, vegetation, wildlife species and habitat, and threatened and endangered species. In addition, this report presents mitigation options for avoiding, minimizing, and compensating for potential impacts.

1.1 Proposed Design Refinements

The Proposed Design Refinements are shown in Figure 1-1 and sections within the corridor are described below. The Downtown Redmond Link Extension corridor was designated into three geographic sections: Redmond Technology Center Station to Sammamish River, Sammamish River to Bear Creek, and Bear Creek to Downtown Redmond. Because the East Link maintenance facility has been located in Bellevue, the Proposed Design Refinements do not include a maintenance facility location. The descriptions of the three segments are followed by a summary of project elements that were not described or analyzed in the 2011 East Link Final EIS.

1.1.1 Redmond Technology Center Station to Sammamish River

In the section between the Redmond Technology Center Station and the Sammamish River, the light rail route runs parallel to the east side of State Route (SR) 520. The alignment would generally be at-grade with SR 520 and use retained-cut sections to cut into the hillside and pass under existing overpasses at NE 40th Street, NE 51st Street, and NE 60th Street. The retained-cut sections would range from ground level up to approximately 16 feet where the alignment passes under NE 40th Street, NE 51st Street, and NE 60th Streets. As the alignment follows SR 520 and curves east, it transitions to an elevated structure crossing over the West Lake Sammamish Parkway NE interchange and the Sammamish River.



Source: USGS, City of Redmond, King County, Parametrix

Figure 1-1
Alignment with Proposed Design Refinements
Downtown Redmond Link Extension

The alignment with the Proposed Design Refinements is similar to the 2011 Project, but has been modified in several locations to minimize impacts on adjacent roadways and to accommodate the Washington State Department of Transportation (WSDOT) planned improvements (WSDOT 2013). Between NE 40th Street and NE 51st Street, the alignment has been shifted up to 20 feet away from SR 520 to maximize available WSDOT right-of-way and limit impacts on the adjacent property. The refined alignment has also been shifted up to 25 feet away from SR 520 south of NE 60th Street and up to 30 feet near the West Lake Sammamish Parkway NE eastbound off-ramp.

With the Proposed Design Refinements, a traction power substation (TPSS) would be located in the vicinity of SR 520 and NE 65th Street, whereas the TPSS in this area for the 2011 Project would be located under the elevated guideway near the West Lake Sammamish Parkway/SR 520 interchange.

1.1.2 Sammamish River to Bear Creek

Between the Sammamish River and the SE Redmond Station, the Proposed Design Refinements are similar to the 2011 Project. The elevated guideway would be about 50 to 60 feet above the Sammamish River with the Proposed Design Refinements, which is approximately 15 to 20 feet lower than anticipated for the 2011 Project. The elevated guideway for the Proposed Design Refinements would match the height of the SR 520 bridge and would not have any columns within the ordinary high water mark (OHWM) of the river. The Proposed Design Refinements would transition from elevated to a retained-fill section as it crosses Marymoor Park, whereas the 2011 Project would transition from elevated to at-grade across the park. In the Proposed Design Refinements, the retained-fill section would be between 5 and 14 feet higher than the current ground level and would provide grade separation from Marymoor Park facilities. Similar to the 2011 Project, the Proposed Design Refinements alignment would then transition to ground level as it enters the SE Redmond Station. The elevated section of the alignment would utilize columns that penetrate deeply into the ground in the western portion of Marymoor Park, after which construction impacts would not extend deeper than approximately 4 feet below the current ground surface along the eastern portion of Marymoor Park to the SE Redmond Station area.

The major changes in this section are related to the City of Redmond's plans allowing the Marymoor Subarea to develop around the SE Redmond Station as a transit-oriented neighborhood with mixed-use developments, including a revised street network and new trail connections. Station facilities for both the 2011 Project and the Proposed Design Refinements would include a 1,400-stall parking garage as well as circulation for transit, passenger pick-up and drop-off, and connections to trails in the area. The Proposed Design Refinements would rebuild NE 70th Street, currently a dead-end street, to serve the station and surrounding land uses and to connect to the SE Redmond street system consistent with City of Redmond plans. The second TPSS would be located at the SE Redmond Station, whereas the 2011 Project placed the second TPSS in the vicinity of 166th Avenue NE in the rail corridor.

From the SE Redmond Station, the alignment is similar to the 2011 Project, turning to the northwest, crossing underneath SR 520, and entering the former BNSF rail corridor. The Proposed Design Refinements would cross under SR 520 at-grade and require reconstruction of the SR 520 eastbound off-ramp and westbound on-ramp. The Proposed Design Refinements would slightly raise SR 202 (Redmond Way) and a short section of NE 76th Street to align with the reconstructed westbound on-ramp and its intersection, which would be modified. The Proposed Design Refinements and the 2011 Project alignment would both rise to cross on a new bridge elevated about 3 to 6 feet over Bear Creek. The Proposed Design Refinements would also accommodate an at-grade trail connection between the East Lake Sammamish Trail and Redmond Central Connector Trail with a bridge over Bear Creek, which may be constructed by Sound Transit as part of the project with funding provided by King County, or funded and constructed by King County at a later time. This trail connection is a missing

segment of King County's East Lake Sammamish Trail, and the Proposed Design Refinements' raising of the SR 520 ramps makes this at-grade connection possible.

The Bear Creek channel and its floodplain would be regraded and broadened to remove some past fill and constrictions in the floodplain from the existing railroad bridge, which is no longer in use and would be removed. These improvements to the Bear Creek channel would complement restoration efforts completed downstream since 2011. The improvements were not contemplated and therefore not analyzed for the 2011 Project.

To accommodate stormwater discharges, two new outfalls would be needed to convey stormwater from the guideway to the Sammamish River. One outfall would be located on each side of the river. Because of the early stage of design during preparation of the Final EIS, these outfalls were not previously anticipated; however, one or more outfalls would have been needed to discharge stormwater for the 2011 Project. In the SE Redmond Station vicinity, several new stormwater facilities would infiltrate runoff from the guideway. Some of the facilities may be open ponds, while others may be underground infiltration galleries (a type of drainage system) or other suitable methods.

1.1.3 Bear Creek to Downtown Redmond

In the section between Bear Creek and downtown Redmond, the Proposed Design Refinements have the same general alignment but with some different features than the 2011 Project. After crossing over Bear Creek, the refined alignment would continue on an elevated structure, whereas the 2011 Project would return to grade. The alignment in downtown Redmond would shift slightly south of the 2011 Project alignment, and it would be shorter. The elevated Downtown Redmond Station and tail tracks would shift approximately 1,600 feet east compared to the 2011 Project. The Downtown Redmond Station would span 166th Avenue NE and remain in the existing rail corridor easement on the north side of NE 76th Street. Approximately 460 feet of tail tracks for train layover and turnback operations would continue west of the station, terminating just east of 164th Avenue NE. Crossover tracks would be located just west of 170th Avenue NE in downtown Redmond, whereas the 2011 Project previously located the crossover tracks west of the SE Redmond Station.

1.1.4 New Project Elements

The project includes several work elements below the OHWM of the Sammamish River and Bear Creek. These work elements were not addressed in the Ecosystems Technical Report that was prepared for the 2011 Project (Sound Transit 2011). The most substantive changes from the previously analyzed project design are associated with the crossing of Bear Creek. These are described below, followed by descriptions of minor modifications at the Sammamish River crossing.

Portions of several guideway support structures would likely be installed below the OHWM of Bear Creek. The exact location of the structures relative to the OHWM is not known because the future location of the OHWM (following stream channel widening) cannot be predicted. No structures would be placed within the active channel of Bear Creek; the nearest structure would be more than 10 feet from the top of the bank. Construction would be completed in the dry. The active channel would be spanned by a 100-foot bridge between the eastern abutment and the first set of support columns west of Bear Creek. The southern end of the eastern bridge abutment would fall within the area defined by the existing OHWM. West of the stream, one of the support columns for the western bridge pier would be below the existing OHWM, as would the bases of the next two support columns to the west.

In addition, several improvements to Bear Creek in the project corridor are proposed. The improvements would connect to past restoration efforts downstream of the existing rail crossing corridor and continue upstream to the SR 202 crossing. The stream channel and floodplain would be regraded and the channel would be broadened. Existing fill and constrictions that would be removed from the floodplain include the treated wood bridge where the BNSF railroad corridor crosses Bear Creek, as well as portions of the berm that was built for the railroad alignment. A wider channel would be constructed where the existing stream channel and floodplain are constricted by the railroad bridge and the berm. Additional habitat improvements include placing large woody debris (LWD) in the floodplain, enhancing stream substrates, and planting native trees and shrubs in riparian and floodplain areas. Adjacent uplands may be excavated to create more floodplain storage and off-channel habitat.

Bear Creek would need to be protected during construction of the new channel. A temporary displacement of the stream channel may be needed to build the new channel, which may include a temporary flow bypass.

The only work below the OHWM of the Sammamish River would be the installation of two new outfalls to convey treated stormwater runoff from the guideway. One outfall would be on the east side of the river and would have a pipe size of 18 to 24 inches in diameter. The outfall would be below the OHWM of the river. The other new outfall, also with a pipe size of 18 to 24 inches in diameter, would be on the west side of the river. The location of the second outfall relative to OHWM has not been determined. Rocks would be placed downgradient of both outfall discharge points to prevent erosion. Where ground-disturbing work below the OHWM is necessary, cofferdams would be used to isolate work areas from the river.

1.2 Data Gathered

Resource analysts performed literature and data reviews to identify and characterize potentially affected ecosystem resources in and near the project area. Existing information was compiled and reviewed first so as to focus field survey efforts for verifying data and filling information gaps. Maps and other existing documents were an important resource for identifying ecosystem features in the project study area. The following resources were reviewed:

- East Link Project Ecosystems Technical Report and supporting materials (Sound Transit 2011)
- Aerial photography of the project corridor (including the King County aerial photography database and Google Earth database)
- Best available science review for the King County critical areas ordinance (King County 2004)
- Information from websites and agency interviews about sensitive and protected species and habitat from the City of Redmond and King County
- Critical area maps from local jurisdictions (City of Redmond 2005a, 2005b, and 2016; King County 2017a)
- Endangered Species Act (ESA) listing information from the U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration (NOAA) Fisheries Service
- Environmental Assessments (EAs), EISs, and other documentation prepared for other projects in the Downtown Redmond Link Extension project area, such as Phase II of the Redmond Central Connector multi-use nonmotorized trail project (GeoEngineers 2010), and SR 520, Medina to SR 202: Eastside Transit and HOV Project, Ecosystems Discipline Report (WSDOT 2009)
- King County Area Washington Soil Survey (Natural Resources Conservation Service [NRCS], U.S. Department of Agriculture [USDA] 2017)
- National Wetlands Inventory (NWI) data (USFWS 2017a)

- Wetland and stream mapping by King County (King County 2017a)
- Priority Habitats and Species (PHS) data (Washington Department of Fish and Wildlife [WDFW] 2017a)
- A catalog of Washington streams and salmon utilization (Williams et al. 1975)
- The salmon and steelhead habitat limiting factors report for the Cedar-Sammamish Basin (Water Resource Inventory Area [WRIA] 8) (Kerwin 2001)
- The final Lake Washington/Cedar/Sammamish Watershed (WRIA 8) Chinook salmon conservation plan (WRIA 8 Steering Committee 2005)
- SalmonScape fish data and maps (WDFW 2017b)
- StreamNet data and maps (StreamNet 2017)
- Fish passage barrier maps from WDFW and WSDOT
- USFWS Critical Habitat Maps for Threatened and Endangered Species (USFWS 2017c)
- The most recent Water Quality Assessment and Clean Water Act Section 303(d) list prepared by the Washington State Department of Ecology (Ecology 2017)
- Water quality monitoring data (King County 2016b)
- Stream flow data from the King County Hydrologic Information Center (King County 2017b)
- Washington State Department of Natural Resources (WDNR) Natural Heritage Program database (WDNR 2016)
- Sound to Sage: Breeding Bird Atlas of Island, King, Kitsap, and Kittitas Counties, Washington (Opperman et al. 2006)
- Recent studies of fish and wildlife use of habitats in the project area (e.g., Thomas 2008; King County 2014; Kiyohara 2017; Friends of Marymoor Park 2016; Jeanes and Morello 2016; eBird 2017; Seattle Audubon Society 2017)

1.3 Related Regulations, Plans, and Policies

Project activities that may affect wetlands, aquatic species, and habitat; vegetation, wildlife species, and habitat; or threatened and endangered species in the project area are subject to the following regulations, plans, and policies:

Federal

- National Environmental Policy Act (NEPA)
- Sections 404, 402, and 401 of the Clean Water Act (CWA)
- Section 7 of the Endangered Species Act (ESA)
- Magnuson-Stevens Fishery Conservation and Management Act
- Bald and Golden Eagle Protection Act
- Migratory Bird Treaty Act (MBTA)
- Protection of Wetlands, Presidential Executive Order 11990
- Final Rule on Compensatory Mitigation for Losses of Aquatic Resources (2008)
- U.S. Army Corps of Engineers 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) (U.S. Army Corps of Engineers 2010)

- Coastal Zone Management Act (CZMA)
- Treaty of Point Elliott of 1855

State

- Washington State Environmental Policy Act (SEPA)
- Hydraulic code (Washington Administrative Code [WAC] Chapter 220-110)
- Shoreline Management Act (SMA)
- Growth Management Act (GMA) (Revised Code of Washington [RCW] 36.70A)
- Protection of Wetlands, Governor's Executive Order EO 89-10
- Protection of Wetlands, Governor's Executive Order EO 90-04
- Washington Water Pollution Control Act (RCW 90.48)
- Wetland Mitigation in Washington State (Ecology et al. 2006)
- Washington Department of Fish and Wildlife Priority Habitats and Species Management Recommendations

Local

- Critical Area Ordinances (CAOs) for the City of Redmond and King County
- Shoreline Master Programs (SMPs) for King County and the City of Redmond
- City of Redmond Citywide Watershed Management Plan (City of Redmond 2013)
- Comprehensive Plans for King County and the City of Redmond

Miscellaneous

- Sammamish River Corridor Action Plan Final Report (U.S. Army Corps of Engineers and King County 2002)
- Sound Transit Environmental Policy (Sound Transit 2004)
- Sound Transit Sustainability Plan (Sound Transit 2015)
- Sound Transit Stream Assessment Guidelines (Sound Transit 2016)
- Bear Creek Basin Plan (King County 1995)

1.4 Study Areas

Sound Transit has established distinct study areas for vegetation and wildlife resources based on the project footprint. The project footprint consists of the construction limits (i.e., the maximum extents within which clearing, grading, and the operation of construction machinery will occur) for the alignment route and the areas within the vicinity of stations, maintenance facilities, park-and-ride lots, TPSS, and roadway widening, including any trees of significance (as defined by the applicable jurisdiction) within these areas.

The study area for vegetation and wildlife habitat consists of the project footprint, plus the areas within 200 feet of either side of the project footprint, which are considered to be the area of potential effect (APE).

For wildlife, the study area includes areas in which project construction could affect habitat quality for wildlife species that may use habitats in the area. Habitat evaluations include the vegetation assessment data. Resource analysts also reviewed documented occurrences of sensitive wildlife species within 0.25 mile of project construction areas to study wildlife potentially affected by project-related noise and human activity.

For streams, field studies were conducted up to 300 feet upstream and downstream from where project limits cross the stream (in accordance with WAC 73-201A-400 and the King County and City of Redmond CAOs). For wetlands, field studies were conducted within 300 feet of the project footprint, wherever property access was granted. In some areas, property access restrictions limited the extent of on-the-ground wetland surveys. This is the area in which existing information about wetlands and streams was gathered and reviewed. Field studies were conducted within a more limited area, based on the maximum width of the regulatory buffers that may be established for wetlands or streams found in the study area. In areas with limited property access, estimates of wetland extents and ratings were based on aerial photography, topographic maps, and other background sources, as well as attributes visible from publicly accessible areas.

1.5 Impact Assessment Assumptions

The impact analysis describes the extent, magnitude, duration, and character of impacts on ecosystem resources for the project. Impacts are quantified where appropriate and possible (e.g., area of wetland or vegetation impacts).

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 includes temporary construction impacts (between the permanent project right-of-way and the construction limits) and permanent operational impacts within the project right-of-way.

For analysis purposes, Sound Transit assumed that all lands within the construction limits would be disturbed during construction and that all vegetation would be removed. These assumptions, as detailed in the East Link Final EIS, Appendix H3, are also applied to the assessment, restoration, avoidance, and minimization of impacts to vegetation, wildlife habitat, wetlands, streams, and other critical areas (Sound Transit 2011).

1.6 Comparison to 2011 East Link Final EIS

Between the Redmond Technology Center Station and Bear Creek, the project footprint and alignment for the Proposed Design Refinements are very similar to the 2011 Project. However, the Proposed Design Refinements capture wetland impacts along SR 520 that were not documented at the time the 2011 East Link Final EIS was prepared. Wetland impacts in the 2011 East Link Final EIS were based on a reconnaissance-level wetland assessment. This addendum presents information based on a ground-based field delineation. These impacts would have been similar for Marymoor Alternative E2 presented in the 2011 East Link Final EIS if the wetlands along SR 520 had been mapped at that time.

Between Bear Creek and the Downtown Redmond Station, the 2011 East Link Final EIS described different potential impacts for wetlands and stream. Because of the construction of the Redmond Central Connector Trail, the baseline conditions have changed and resulted in design changes to accommodate multiple facilities in the former rail corridor. In the 2011 East Link Final EIS, Marymoor Alternative E2 was assumed to be built on the existing railroad fill prism. However, much of this prism was used to construct the Redmond Central Connector, or is planned to be used to support a future extension of this trail. As a result, the project footprint was moved to the southwest to avoid the Redmond Central Connector, resulting in more wetland and stream impacts than estimated in 2011.

2 STUDY OBJECTIVES AND METHODS

This document supports the NEPA re-evaluation and SEPA addendum focusing on changes in impacts compared to the 2011 East Link Final EIS in Segment E (the Redmond segment), as updated by SEPA addenda issued in 2013 and 2016. Resource analysts reviewed and, as necessary, updated information about the affected environment for aquatic resources, vegetation and wildlife, and wetlands. Updates focused on information that supported assessments of the potential project-related impacts on these ecosystem components—for example, changes in the regulatory status of fish and wildlife species, new information about habitat conditions for species of concern or their locations, or the results of wetland delineation studies. Effects analyses evaluated changes in the potential environmental impacts and mitigation of the Proposed Design Refinements, relative to those presented in the 2011 East Link Final EIS.

This chapter describes the objectives and methods used to study the aquatic resources (Section 2.1), vegetation and wildlife resources (Section 2.2), and wetland resources (Section 2.3).

2.1 Aquatic Resources

2.1.1 Study Objectives

This section identifies aquatic species known or expected to occur in the study area and characterizes the existing conditions of aquatic habitats, as well as providing information about species with local, state, or federal regulatory status, including species listed as threatened or endangered under the ESA. The assessment of effects on aquatic species and habitats focuses on key habitats and stream features that may be affected by the project and that are directly related to ecological functions that support stream ecosystems. Using the stream habitat assessment guidelines established by Sound Transit (Sound Transit 2016), resource analysts conducted research and field surveys to identify, map, and describe aquatic species and habitats within the study area. Information about aquatic habitat conditions is based on the following key aquatic habitat elements:

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

Consistent with the 2016 Sound Transit stream assessment guidelines, resource analysts implemented the Phase 2 project approach to provide analysis of final design and information for permitting. The guidelines specify different levels of detail for the data to be collected for each key aquatic habitat element. These levels of detail, referred to as Tracks (Track A, B, or C), generally correlate to the phase of the project, the extent to which access is available, and/or the magnitude of anticipated impacts. Track A typically applies to planning-level projects where site access is limited and no impacts are anticipated. Track B applies to projects where site access allows for the collection of detailed information and where minor impacts are anticipated. Track C applies to projects where site access allows for the collection of detailed information and where substantial impacts are anticipated.

Based on the expectation that the project would entail in-water work and that riparian vegetation may be directly affected, resource analysts used Track C methods for assessing effects on riparian vegetation. Because runoff from project-related impervious surfaces would discharge to reaches of the Sammamish

River and Bear Creek that are on the 303(d) list of impaired waterbodies, resource analysts also used Track C methods to assess effects on water quality and quantity. Track B methods were used for all other parameters.

2.1.2 Methods

Resource analysts reviewed background material, including fish distribution data (e.g., Jeanes and Morello 2016; King County 2017a; WDFW 2017a, WDFW 2017b; StreamNet 2017), local critical area maps, aerial photographs, water quality assessments, and environmental documentation for recent work on SR 520 in the study area. In the field, resource analysts conducted aquatic habitat surveys 300 feet downstream and 100 feet upstream of all points where the alignment crosses a stream. Resource analysts collected information about the condition of in-stream and riparian habitats, and flagged the OHWM of streams that might be affected by project construction or operation. Professional land surveyors then surveyed the flagged points.

Resource analysts classified streams according to the interim water typing definitions in WAC section 222-16-031, and the applicable stream classification systems in the Redmond Zoning Code and the King County Code. The resource analysts then identified regulatory buffers based on each stream's classification. For each stream in the study area, resource analysts identified downstream impediments to fish passage. Assessments of habitat conditions were based on the premise that anadromous fish may one day be able to access the area even if they cannot under present conditions. The resource analysts worked with spatial analysts to develop maps showing streams and stream buffers, as well as known or potential barriers to fish passage.

Analyses of short-term (i.e., construction-related) effects on aquatic resources were based on the amounts of aquatic habitat and regulatory stream buffers within the portions of the project footprint that would be subject to temporary or permanent modification. Analyses of long-term effects on vegetation and wildlife resources were based on the amounts of aquatic habitat and regulatory stream buffers within the portions of the project footprint that would be subject to permanent modification.

To support a determination of the potential need to reinitiate consultation under Section 7 of the ESA (based on differences from the analyses presented in the October 2010 East Link Biological Assessment), resource analysts reviewed information about species listed or proposed for listing under the ESA, along with information about proposed or final designations of critical habitat for ESA-listed species.

2.2 Vegetation and Wildlife Resources

2.2.1 Study Objectives

Resource analysts reviewed and, as necessary, updated information about the existing condition and regulatory status of plants and animals that could be affected by construction and operation of the project. The goal of these reviews was to evaluate changes in the potential environmental impacts and mitigation of the Proposed Design Refinements, relative to those presented in the 2011 East Link Final EIS.

2.2.2 Methods

Based on literature review and field observations, resource analysts identified vegetation types and wildlife habitat features in the study area and evaluated the potential for wildlife species to use those habitats. The wildlife species assessed include ESA-listed species and other species with regulatory status under local CAOs. Resource analysts reviewed background material, including the 2011 East Link Ecosystems Technical Report, data from the WDFW Priority Habitats and Species Program, data from

the WDNR Natural Heritage Program, the USFWS Information for Planning and Conservation website, local critical area maps, and aerial photographs.

Resource analysts delineated and classified cover types (land cover) using aerial photographs and visited these areas during field surveys. Major cover types were identified and classified based on the structural categories defined in the 2011 East Link Final EIS (Sound Transit 2011) and modified to accurately characterize local habitats. For the Downtown Redmond Link Extension, the mapped cover types included:

- Unvegetated and Road
- Developed Area—Commercial
- Developed Area—Residential
- Roadside Right-of-way
- Mown grass
- Grassland
- Brush
- Upland Forest
- Riparian Forest and Shrub
- Wetlands (Forested, Scrub-shrub, and Emergent)
- Stream Channels
- Stormwater Ponds

Habitats are described in Table 2-1, along with a qualitative assessment of relative habitat value. Relative habitat value is based on habitat structure, disturbance types and frequency, and time required to recover habitats following clearing.

Wildlife habitat values were not attributed to each occurrence of a cover type along the project corridor but instead were assigned to the cover type as a whole. Habitat value within a cover type at a specific location can vary and depends on several factors, such as size of the area; presence of (or proximity to) other valuable habitat; level and type of human disturbance; diversity of plant species; presence of multiple cover layers (i.e., tree, shrub, forb, and emergent layers); presence of threatened, endangered, or sensitive species; and extent of invasive weeds.

Table 2-1. Cover Types and Associated Wildlife Habitat Value for Downtown Redmond Link Extension Project

Cover/Habitat Type	Description	Habitat Value
Unvegetated and Road	Paved roadways; these areas lack wildlife habitat features and are a risk to wildlife. Also includes parking lots and artificially surfaced playfields.	None.
Developed—Commercial	Business properties that are dominated by buildings and parking areas. Some trees and patches of understory occur. The understory is highly disturbed and many non-native species are present.	Low. Some tree canopy habitat is available for birds and squirrels.

Table 2-1. Cover Types and Associated Wildlife Habitat Value for Downtown Redmond Link Extension Project

Cover/Habitat Type	Description	Habitat Value
Developed—Residential	Private homes and neighborhoods including buildings, sidewalks, streets, and yards. Tree and overall vegetation cover is greater than in commercial areas. The understory is disturbed and many non-native species are present. Risk to wildlife from domestic animals is greater than in commercial areas.	Low but spatially variable. Some tree canopy habitat is available for birds and squirrels. Some yards are managed to support native wildlife habitat by retaining native vegetation. Others are highly altered and are disturbed regularly by mowing, pesticide application, and pet use.
Roadside Right-of-way	Areas along roadways that are maintained for vehicular safety with mowing and herbicide application. These areas are disturbed regularly with maintenance actions, roadway noise, and pollution. These areas are dominated by non-native grasses and forbs and invasive species.	Low. There is very limited habitat structure and the periodic maintenance disturbance is very high. These areas may provide some browsing habitat for herbivores such as deer, rabbits, and rodents, and some limited foraging habitat for birds.
Mown Grass	This cover type includes regularly mown turf grass areas used for sports and recreation in Marymoor Park.	Low. There is very limited habitat structure and the disturbance is very high. These areas may provide some browsing habitat for herbivores such as deer, rabbits, and rodents, and some limited foraging habitat for birds. This habitat type would be quick to re-establish to current conditions after disturbance.
Grassland	This habitat type is represented by stands of unmown, or infrequently mown, reed canarygrass in Marymoor Park.	Medium. Although dominated by an invasive species, grasslands do provide habitat to support species adapted to meadows and open areas. The infrequent disturbances in these areas and structural complexity of the tall grass provide resources for a variety of mammals, reptiles, and birds. This habitat type would be quick to re-establish to current conditions after disturbance.
Brush	This habitat type includes patches of blackberry, as well as areas of horticultural varieties and native shrubs.	Medium. Areas include native and non-native shrubs. Native shrubs support native wildlife species throughout their life histories. However, thickets of blackberry and other invasive shrubs do provide good perching, nesting, and hiding habitat for small birds, reptiles, and mammals, including foraging habitat for some species.

Table 2-1. Cover Types and Associated Wildlife Habitat Value for Downtown Redmond Link Extension Project

Cover/Habitat Type	Description	Habitat Value
Upland Forest	All areas that are dominated by trees, which are outside of riparian areas or wetlands. Trees are primarily native species, but non-native species occur in planted locations along roadways and in developed areas.	High. Diverse structural complexity; relatively long time to recover this habitat following disturbance.
Riparian Forest	Areas dominated by trees within approximately 200 feet of the OHWM of streams and rivers.	High. Diverse structural complexity; relatively long time to recover this habitat following disturbance. The proximity to streams further elevates the value of this habitat to wildlife and aquatic processes.
Riparian Shrub	Areas dominated by shrubs within approximately 200 feet of the OHWM of streams and rivers.	Medium. Moderate structural complexity; short time to recover this habitat following disturbance. The proximity to streams further elevates the value of this habitat to wildlife and aquatic processes.
Forested Wetland	Wetland areas dominated by trees.	High. Diverse structural complexity; relatively long time to recover this habitat following disturbance. The wetland functions further elevate the value of this habitat to wildlife and aquatic processes.
Scrub-shrub Wetland	Wetland areas dominated by shrubs.	High. Diverse structural complexity. The wetland functions further elevate the value of this habitat to wildlife and aquatic processes.
Emergent Wetland	Wetland areas dominated by grasses and forbs.	High. Moderate structural complexity. The wetland functions further elevate the value of this habitat to wildlife and aquatic processes.
Stream Channels	Relatively non-vegetated stream and river channels. Some submerged aquatic vegetation is present.	High. Many in-stream processes elevate the value of this habitat to aquatic wildlife.
Stormwater Ponds	Areas excavated specifically to detain and manage stormwater from impervious areas. Most areas are dominated by non-native grass species and are maintained through mowing and dredging.	Low. The limited structural diversity and periodic disturbance regime limits the value to wildlife. The ponded habitat tends to have a highly variable water table and polluted water source, severely limiting the value of the habitat to aquatic species.

Using field observation, aerial photographs, and pertinent literature, project resource analysts gathered and classified vegetation data, including dominant plant species composition and relative abundance by habitat type. Observations of noxious or invasive species were also recorded. The resource analysts worked with spatial analysts to develop maps showing the delineated vegetation communities and habitat types, as well

as locations of special habitat features identified during field surveys, priority habitats and species identified by WDFW, rare plant populations identified by the Natural Heritage Program, and other key ecological features needed to analyze impacts of the project. Sensitive information regarding the locations of proposed, candidate, and listed species and habitats are described in this report but not mapped to protect the integrity of this information.

To support the analysis of effects on wildlife, resource analysts identified wildlife species that are associated with the land cover types in the study area, and with specific habitat elements within each cover type. Resource analysts identified the relative function of each plant community in providing habitat for wildlife, based on field observations, literature review, professional opinion, and agency consultation. Resource analysts also assessed locations of known ecologically sensitive areas and important wildlife occurrences that may be sensitive to disturbance from noise or human presence. The assessment included a review of site-specific wildlife data, including bird surveys (e.g., eBird 2017), supplemented with data gathered during field visits.

Analyses of short-term (i.e., construction-related) effects on vegetation and wildlife resources were based on the amounts of different land cover types within the portions of the project footprint that would be subject to temporary or permanent modification, as well as the potential for construction-related noise and human activity to disturb wildlife species of concern at breeding sites and other sensitive areas. Analyses of long-term effects on vegetation and wildlife resources were based on the amounts of different land cover types within the portions of the project footprint that would be subject to permanent modification.

To support a determination of the potential need to reinitiate consultation under Section 7 of the ESA (based on differences from the analyses presented in the October 2010 East Link Biological Assessment), resource analysts reviewed information about species listed or proposed for listing under the ESA, along with information about proposed or final designations of critical habitat for ESA-listed species.

2.3 Wetland Resources

2.3.1 Wetland Resources Study Objectives

Wetland resources in the project vicinity were mapped and characterized to accurately provide the following information:

- An inventory of wetlands, buffers, and their conditions in the study area
- The project's temporary construction impacts and permanent operational impacts on wetlands
- Methods to avoid, minimize, or compensate for impacts

2.3.2 Wetland Resources Methods

Wetlands in the study area were evaluated using background information and data collected during field surveys. Background information on soils, hydrology, previously mapped wetlands, and aerial photography was used to assess site conditions and strategize field surveys. A field survey was conducted to identify, map, and describe wetlands within the study area.

Vegetation, soil, and hydrology conditions were documented at representative locations (sample plots) using methods outlined in the U.S. Army Corps of Engineers Wetland Delineation Manual (Environmental Laboratory 1987) and indicators described in the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0) (Corps 2010). These sample plots were identified in the field with labeled flagging and documented by professional surveyors. Both wetland and upland sample plots were documented. If a wetland contained multiple vegetation types

(e.g., forested and scrub/shrub), at least one wetland sample plot was located in each cover type. Wetland determination data forms were developed for all sample plots. Wetland boundaries and sample plot locations were mapped by professional surveyors. Observations of existing conditions and characteristics were recorded for each wetland and associated buffer.

Potential wetlands within parcels to which rights-of-entry had not been obtained were identified based on field observations from public areas; current local, state, and federal habitat maps and reports; and aerial photographs. Areas that appear to possess wetland indicators were included to provide a conservative estimate of the alternative's impacts. Documented wetlands from other projects or sources were evaluated and, where appropriate, included in the Downtown Redmond Link Extension wetland findings.

Each wetland identified in the study area received a unique identifier that is tracked in a geographic information system (GIS) database.

Wetlands were classified according to the USFWS system (Cowardin et al. 1979; Federal Geographic Data Committee [FGDC] 2013) and the hydrogeomorphic (Brinson 1993) classification systems. Wetland ratings and functions were assessed by applying the Washington State Wetland Rating System for Western Washington (Hruby 2004) [unincorporated King County only], and the Washington State Wetland Rating System for Western Washington – 2014 Update (Hruby 2014) [entire study area]. Wetlands were classified and rated according to local CAOs (King County Code [KCC] 21A.24.318; City of Redmond Zoning Code [RZC] 21.64.030(A)).

Wetland functions were assessed using the Washington State Wetland Rating System for Western Washington (Hruby 2004) and the Washington State Wetland Rating System for Western Washington – 2014 Update (Hruby 2014).

2.3.3 Wetland Determination

Wetland determinations are based on an analysis of background data and the results of site investigations. Field work was initiated based on property access schedules. Delineations in Marymoor Park and near Bear Creek began in February 2017, with follow-up hydrology assessments in March and April (due to above-average precipitation in February and March). Some private property (Microsoft campus) was also delineated during this period. City of Redmond properties were delineated in April. Areas within the WSDOT right-of-way were delineated in May and June.

Precipitation during early 2017 was well above average, with Redmond receiving over 200 percent of average annual rainfall. In addition, snowfall in late January and early February was followed by warm rain-on-snow events that further elevated ground and surface water elevations well above typical conditions (see Wetland and Stream Delineation Report, Attachment C). As such, the evaluation of hydrology included observations later in the spring to differentiate hydrological conditions resulting from excessive precipitation compared to typical conditions.

Soils are disturbed in much of the study area. Along the south end of the project corridor, extensive grading associated with the building of SR 520 has removed the original soil profile. The soils present were affected by cut and fill activities. Within Marymoor Park, historical hydric soils have been drained for many decades, originally to support agriculture. This area is also largely dominated by reed canarygrass and other non-native hydrophytic plants. As a result, much of this portion of the park contains soils and vegetation that meet technical criteria for wetlands. Therefore, determinations in this area are primarily based on the observation of continuous wetland hydrology from late March to late April (to adjust for the unseasonably wet early spring).

3 AFFECTED ENVIRONMENT

The following sections describe the existing conditions of aquatic resources, vegetation, wildlife, and wetlands that may be affected by the construction or operation of the Downtown Redmond Link Extension. Discussions focus on updates to information that was presented in the Ecosystems Technical Report prepared for the 2011 Project (Sound Transit 2011), emphasizing information that supports assessments of the potential project-related impacts on these ecosystem components. Scientific names of species identified in this report are listed in Attachment A.

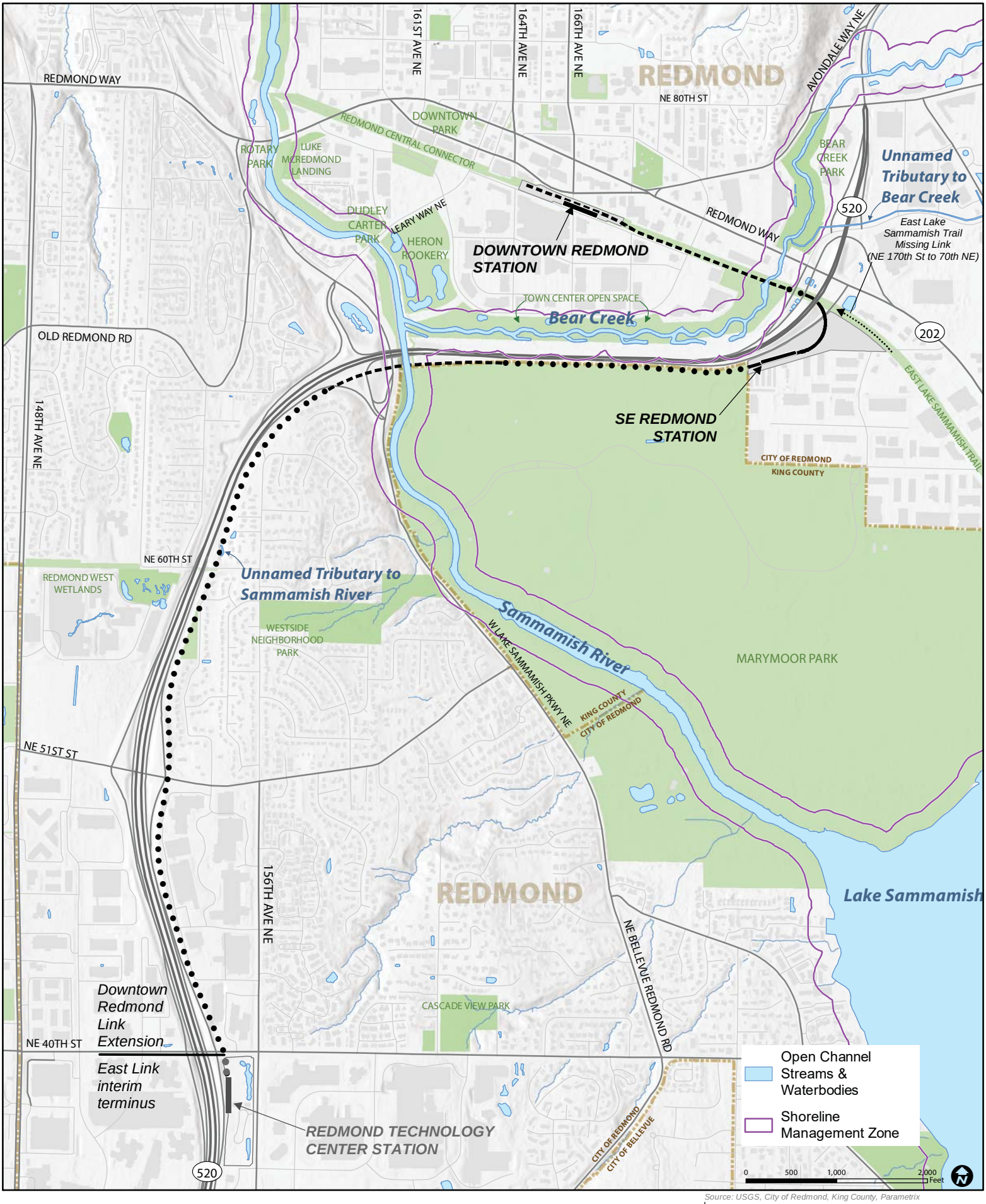
3.1 Aquatic Resources

This section identifies aquatic species and habitats that may be affected by the construction and operation of the Downtown Redmond Link Extension. The extension would be constructed in an urban area where aquatic habitats have been moderately to highly modified by past development. The proposed route lies within areas that were disturbed by the construction of SR 520 and the BNSF railroad. Some segments of smaller streams near SR 520 have been placed in conveyance systems consisting of pipes and ditches, interfering with natural flow patterns and processes such as groundwater recharge. The surrounding areas, with the exception of Marymoor Park, are dominated by commercial and residential development with extensive areas of impervious surface.

The study area drains to the Sammamish River in WRIA 8, Lake Washington/Cedar/Sammamish. The eastern portion of the study area drains to Bear Creek, a tributary to the Sammamish River. Remnants of a smaller tributary to the Sammamish River flow through pipes, ditches, and surface channels paralleling SR 520 south of the Sammamish River crossing (Figure 3-1). The Sammamish River discharges to Lake Washington, which drains to Puget Sound through the Lake Washington Ship Canal, an artificial waterway constructed in 1916.

Many species of fish, both native and introduced, inhabit WRIA 8. Discussions in this document focus on salmonids—anadromous[1] salmonids in particular—because these species are a management concern due to habitat degradation and population declines. Salmonids in WRIA 8 are a mix of native and introduced stocks. For example, sockeye salmon 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). Chinook salmon naturally reproduce in many of the watershed's streams and are supplemented by hatchery production of fish originally from the Green River (Weitkamp and Ruggerone 2000). Coho salmon in the watershed also appear to be a mix of naturally produced and hatchery fish (Walter 2013). Chum salmon and pink salmon have also been observed, although WDFW (2017b, 2017c) does not identify any populations of either species in WRIA 8. Rainbow trout and steelhead are a mix of introduced hatchery and native stocks. Cutthroat trout, in both resident and anadromous (i.e., sea-run) forms, are also present in the watershed. Kokanee salmon (a form of sockeye that remains in freshwater habitats throughout its life cycle) are also found in Lake Sammamish and some of its tributary streams (Berge and Higgins 2003).

[1] Anadromous fish begin their life in fresh water, migrate to marine waters to reach maturity, and then return to fresh water as adults to spawn.



Alignment
- At-Grade
- Elevated
- Retained Cut/Fill

Station Platform
Station Area

City Limits
Parks / Open Space

Figure 3-1
Aquatic Resources
Downtown Redmond Link Extension

3.1.1 Streams and Stream Habitat

Consistent with Sound Transit's stream habitat assessment guidelines (Sound Transit 2016), 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, fish habitat use, and stream typing

The Proposed Design Refinements alignment crosses three streams. Two of these (the Sammamish River and Bear Creek) are classified as shorelines of the state; the third is an unclassified tributary to the Sammamish River that flows primarily through pipes in the SR 520 right-of-way. The location of the streams is shown in Figure 3-1. Table 3-1 summarizes regulatory information for the streams in the study area.

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

Stream Name	Stream Index No. [a]	State Interim Water Type[b]	Local Jurisdiction	Local Jurisdiction Stream Classification	Local Jurisdiction Buffer Width (feet) [c]
Sammamish River	08.0057	Type 1	Redmond	Class I	150
Sammamish River[d]	08.0057	Type 1	King County	Type S	115 [c]
Bear Creek	08.0105	Type 1	Redmond	Class I	150
Unnamed tributary to Bear Creek	N/A	Type 2	Redmond	Class II	100 + 50-foot outer buffer
Unnamed tributary to the Sammamish River (LLID 1221262476704)	N/A	Type 3	Redmond	Class III	100

a WRIA identification numbers according to Williams et al. (1975)

b WAC 222-16-031

c RZC Table 21.64.020 (effective 4/16/2011); KCC 21A.24.358 (updated May 12, 2017)

d The King County buffer width for the Sammamish River is based on (a) the location of the study area within the designated Urban Growth Area, and (b) the designation of the condition of the basin as "low," according to the map in Appendix A of the King County Critical Areas Ordinance.

N/A = Not applicable

3.1.1.1 Sammamish River

The presence and condition of aquatic habitats in the Sammamish River in the study area have not changed substantially from what was described in the 2011 Ecosystems Technical Report. Discussions in this subsection supplement and update the information presented in the 2011 report to frame the updated impact analysis.

Within the Redmond city limits, the Sammamish River and all lands extending 200 feet landward from the river's OHWM are subject to the regulatory requirements of the City's SMP. The SMP describes the environmental designation of the Sammamish River shoreline jurisdiction as follows:

> Designate the King County Sammamish River Park as Urban Conservancy and designate the balance of the adjacent property within the 200 foot shoreline jurisdiction as High

Intensity/Multi-Use. This designation shall be coincidental with the King County park property, which is approximately 100 feet in width, as of January 1, 2008.

The shoreline zone within the boundaries of Marymoor Park falls within the shoreline management jurisdiction of King County. According to King County Code (KCC) 21A.25.050, the King County shoreline jurisdiction consists of the Sammamish River and all lands extending 200 feet landward from the river's OHWM, as well as the 100-year floodplain and contiguous floodplain areas 200 feet landward from the 100-year floodplain, and all wetlands associated with the Sammamish River.

As discussed in the 2011 Ecosystems Technical Report, the Sammamish River in the study area has been extensively modified and simplified from pre-settlement conditions. The U.S. Army Corps of Engineers straightened the Sammamish River in the 1960s as a flood-control project, using sidecast material to construct uniform banks along the channel (U.S. Army Corps of Engineers and King County 2002). The following subsections describe key habitats and stream features that are directly related to ecological functions supporting stream ecosystems and that may be affected by the project, consistent with the stream habitat assessment guidelines established by Sound Transit (2016).

Riparian Vegetation

Riparian vegetation in the reach of the Sammamish River that includes the study area is severely degraded, consisting almost entirely of non-native shrubs and herbs—predominantly Himalayan blackberry and reed canarygrass (U.S. Army Corps of Engineers and King County 2002). Although the river banks in the study area are heavily armored, native and non-native shrubs (e.g., twinberry, willows, Himalayan blackberry) and young trees (primarily alder and bigleaf maple, as well as some cottonwood) have become established (Figure 3-2).

Figure 3-2. Riparian vegetation and the Sammamish River in the study area, looking north (downstream) from the left bank

The functional riparian buffer west of the river is approximately 30 feet wide, consisting of a single row of deciduous trees (primarily red alder and bigleaf maple) and various native and non-native shrubs, with relatively dense cover. Beyond that distance, the buffer zone consists of (1) the 12-foot-wide paved Sammamish River Trail; (2) a 30- to 50-foot-wide vegetated area with ornamental trees, native

and non-native shrubs, and mowed grasses; and (3) the 70-foot-wide roadway of West Lake Sammamish Parkway NE.

Riparian vegetation on the east side of the river extends a greater distance from the river bank. Immediately south of the West Lake Sammamish Parkway on-ramp to SR 520, a 50-foot strip was cleared for the highway widening project in 2009 but was subsequently replanted. The innermost 50 feet of the riparian zone in that strip is densely covered with native and non-native shrubs, along with some recently planted conifers such as shore pines. East of that area, the previously cleared strip has been planted with young coniferous trees (western red cedar). South of the previously cleared strip, the innermost portion of the riparian buffer is densely vegetated with a 40- to 60-foot-wide band of deciduous trees (red alder, cottonwood, and Lombardy poplar) and shrubs. After being interrupted by a 10-foot-wide gap for an unpaved access route, the tree canopy extends east for approximately 60 more feet. Beyond that, the riparian buffer is dominated by low-growing, primarily non-native grasses and shrubs.

Downstream (north) of the project site, the river is spanned by SR 520; riparian vegetation is very sparse in the areas under the highway. The ground surface is covered with a mixture of wood chip mulch, bare soil, and exposed riprap. Invasive species, such as hedge bindweed and Himalayan blackberry, have become established in some areas under the overpass.

Within the riparian zone, the dominant tree species are red alder, Douglas-fir, Oregon ash, bigleaf maple, and black cottonwood. Some non-native deciduous trees such as Norway maple also occur in the riparian zone. Many of the trees in this area are wrapped with fencing for protection from beavers. Other trees have been damaged or felled by beaver activity. The dominant shrub species are Himalayan blackberry, Scouler's willow, Sitka willow, vine maple, red osier dogwood, and Pacific ninebark. Tree canopy cover exceeds 100 percent (complete canopy, multiple layers in some areas) throughout the corridor. In some areas, trees and/or shrubs extend over the stream channel. The banks are densely rooted with good soil cohesion. Extensive areas of riprap have been placed along the river banks to limit erosion. Ground cover is dominated by shrubs and occupies approximately 60 percent of the riparian area. Herbaceous cover is generally sparse and dominated by non-native grasses. There are no large snags or downed logs in the study area. Small, short pieces of downed wood were observed on some site visits but appear to be mobile. The steep, hardened river banks limit the opportunity to rack up woody debris or develop persistent jams.

Physical In-stream Habitat

In general, habitat in the Sammamish River is highly degraded. Glides (one of the least desirable habitat types for salmonids) make up more than 98 percent of the river's length (Jeanes and Morello 2016). Dense aquatic vegetation, most notably Eurasian water milfoil and Brazilian elodea, is present in many areas. During a site visit in August 2017, the riverbed at and near the proposed crossing site was densely vegetated with filamentous algae, common elodea, Brazilian elodea, and Eurasian water milfoil. The reach that flows through the study area includes some of the highest-quality habitat in the river, with 22 percent riffles, 3 percent pools, and 75 percent glide (U.S. Army Corps of Engineers and King County 2002). Within the study area itself, however, only glide habitat is present, with no riffles or pools (King County 2014). The stream channel is approximately 65 to 70 feet wide. Substrates are uniformly sand and silt except directly under the SR 520 bridge, where cobble and riprap are present on the banks and in the river bed (Sound Transit 2011). LWD is essentially absent from the channel in the study area.

No off-channel habitat exists, and the river has very little capacity to form any such habitat due to its low gradient, the deepened channel, and bank armoring. All former oxbows and sloughs have either been filled in or cut off from the river by modifications to the water level (U.S. Army Corps of Engineers and King County 2002). Channel sinuosity is low.

Key restoration opportunities in this reach include temperature reduction through modification of the Lake Sammamish outflow, riparian revegetation, and creation of cool-water refuge by utilizing groundwater sources in the reach (U.S. Army Corps of Engineers and King County 2002).

Table 3-2 summarizes the characteristics of physical in-stream habitat in the Sammamish River in the study area, using the metrics and measurements recommended by Sound Transit (2016).

Table 3-2. Characteristics of Physical In-stream Habitat in the Sammamish River in the Study Area

Parameter	Metric/Measurement	Characteristics of Sammamish River in Study Area
Channel Form and Profile	Macrohabitat—habitat type	Only glide habitat is present in the study area, with no riffles or pools.
	Macrohabitat—pool characteristics	Not applicable—no pools.
	Stream Reach Classification	Class I (Redmond), Type S (King County and Redmond), Type 1 (Washington State)
	Stream Slope	Extremely low: < 2 feet per 10,000 feet of channel length.
	Stream Patterns	River has been extensively modified and straightened. All former oxbows and sloughs have either been filled in or cut off from the river.
	Confinement	The stream channel is confined.
	Channel Dimension/Shape	Bankfull width is 65 to 70 feet; excavated.
Streambank Condition	Stability	Banks are hardened and/or heavily vegetated; no evidence of instability.
	Bank Hardening/Revetments	Areas near and under SR 520 are armored with cobble and riprap.
Substrate/ Sediment	Particle Frequency	Predominantly silt and sand.
	Percentage of Fine Sediments/Embeddedness	Larger substrates are coated with fines but are not deeply embedded. A thick, soft layer of fine sediments is present along the stream banks.
Large Woody Debris	LWD Presence, Frequency, and Location	No LWD present. Some 2- to 4-inch-diameter, 3- to 4- foot-long logs were observed near the bank during site visits, but were mobile and not persistent.
	Debris Jams	Not applicable—no LWD.
	LWD Size	Not applicable—no LWD.
	Age and Type	Not applicable—no LWD.
Cover and Refuge	Pool Quality	No pools.
	Undercut Banks	No undercut banks, but very steep banks armored with riprap in some areas.
	Off-channel/Side-channel Habitat	Essentially absent; river has very little capacity to form any off-channel habitat due to low gradient, deepened channel, and bank armoring. Extensive evidence of beaver activity including many felled trees and shrubs, gnaw marks, and branch-dragging trails.
	In-stream Cover/Protection	Some riprap has fallen into the river providing some in-stream cover. Some overhanging vegetation is present. Aquatic macrophytes (primarily common elodea, Brazilian elodea, and Eurasian water milfoil) occur in patches and cover approximately 20% of the stream bed in the study area.

Biological Connectivity

No physical barriers to fish passage have been identified in the Sammamish River downstream of the study area.

Water Quality and Quantity

In 2011, the Sammamish River was on the 303(d) list of impaired waters, based on violations of state standards for temperature and oxygen. The Sammamish River in the study area is also on the current (approved July 22, 2016) 303(d) list of impaired waterbodies, based on violations of standards for dissolved oxygen, pH, and water temperature. Elevated water temperatures in the Sammamish River from July through September have been identified as a significant factor limiting production of Chinook salmon and other anadromous salmonid species during their spawning migration to Issaquah Creek, the Issaquah Creek Hatchery, Bear Creek, and other tributaries (WRIA 8 Steering Committee 2005). Daily maximum temperatures in the river near Lake Sammamish have exceeded 26.6°Celsius and are frequently greater than 20°Celsius during the summer months (Jeanes and Morello 2016). Water quality monitoring data from King County indicate an increasing trend in Sammamish River water temperatures between 1979 and 2007 (King County 2016b).

King County maintains a gauging station in the Sammamish River in Marymoor Park, approximately 0.8 mile upstream of the study area. Based on data collected from July 2001 through March 2017, the annual average discharge at that site is approximately 213 cubic feet per second (cfs) (King County 2017b). Monthly average discharges during that period ranged from 19 cfs (August 2015) to 798 cfs (January 2006). Averaged over the full data period, monthly average discharges ranged from 34 cfs (in August) to 407 cfs (in January) (King County 2017b).

Several culverted discharges to the Sammamish River were observed during site surveys. On the west bank, a 24-inch culvert discharges to the river directly under SR 520, which was assumed to be stormwater from the highway. Another larger but partially obscured culvert discharges on the same bank, immediately downstream of the SR 520 bridge. It appears to discharge water from stormwater ponds located immediately to the west, which are partially fed by piped but natural stream flow and road runoff. On the east bank, an 18-inch culvert occasionally discharges water from a floodplain mitigation site and depression excavated immediately east of the river. Another 18-inch culvert discharges water collected in a stormwater swale near SR 520.

Fish Habitat Use

The Sammamish River provides little rearing or spawning function for salmonids but serves as a migratory corridor for fish that spawn in its tributaries. Cutthroat trout spawn at the mouths of tributaries where gravel is present (Sound Transit 2011). From 1996 to 2016, volunteers from the King County Salmon Watcher Program documented Chinook, sockeye/kokanee, and coho salmon in the Sammamish River (King County 2016a). According to WDFW (2017a, 2017b), the Sammamish River in the study area provides spawning habitat for Chinook salmon. The potential for spawning in the main stem is limited, however, by high water temperatures, low water velocities, and the lack of suitable spawning substrates (U.S. Army Corps of Engineers and King County 2002). WDFW (2017a) also reports that steelhead, sockeye, and kokanee are present in the river, and that the reach in the study area provides rearing habitat for coho salmon. Most sockeye in the river are bound for Bear Creek, and the Chinook salmon are bound for the WDFW hatchery in Issaquah (Sound Transit 2011; Jeanes and Morello 2016). The primary limiting factor for salmon in the river reach that flows through the study area is elevated temperature; other than water temperature, habitat in this reach is of moderate quality (U.S. Army Corps of Engineers and King County 2002).

3.1.1.2 Bear Creek

Despite the effects of expanding urban development and an associated shift from forest to impervious surfaces and landscaped areas, Bear Creek continues to be a major producer of salmon in WRIA 8 (Lawson et al. 2012). The Bear Creek drainage is known to support Chinook salmon, coho salmon, sockeye salmon, kokanee salmon, steelhead, and cutthroat trout. The Washington State Salmon Recovery Fund has sponsored many millions of dollars of habitat restoration in the Bear Creek watershed, including in-stream work, riparian restoration, and the reconfiguration of the confluence of Evans Creek with Bear Creek. In recognition of its role in upstream staging and downstream migration and rearing, and as a refuge for salmonids escaping the warmer waters of the Sammamish River, King County (1995) recognized the Lower Bear Creek sub-basin as a Locally Significant Resource Area.

The Bear Creek corridor in the study area is surrounded by developed parcels. To the west and northwest is the commercial core of downtown Redmond, consisting almost entirely of impervious surfaces. NE Redmond Way (SR 202) crosses Bear Creek approximately 250 feet north of the proposed alignment. SR 520 runs parallel to the stream south and east of the proposed crossing. Heavily developed commercial and retail complexes are on the opposite side of SR 520 from Bear Creek to the east and southeast. A corridor of relatively undeveloped land provides some riparian habitat along Bear Creek within the study area, and in adjoining reaches upstream and downstream.

A timber stringer bridge spans Bear Creek at the site of the former railroad crossing. The bridge is approximately 30 feet long and 14 feet wide and was constructed on treated wood piles with abutments of horizontal wood planks resting on stone and concrete riprap. Two sets of five piles apiece support the bridge at either abutment, and a third set of six piles supports the bridge in the center of the stream (Figure 3-3). An additional 16 piles, cut off below the elevation of the OHWM, are also present in the streambed. A WDFW fish-monitoring barge is moored to this bridge. A gravel road, built on railroad bed fill, accesses the southeast side of the bridge from the westbound on-ramp to SR 520. An informal walking route occurs on the railroad fill northwest of the railroad bridge.

Figure 3-3. Timber bridge over Bear Creek at the location of the former railroad crossing

Reaches of Bear Creek within and near the study area have been the subject of extensive habitat restoration work and contain several mitigation sites. In the late 1990s, WSDOT and the City of Redmond collaborated on habitat enhancement efforts in Bear Creek immediately adjacent to the location where the proposed alignment crosses the stream (railroad bridge site). These efforts included riparian plantings and wetland restoration.

More recently, a major restoration effort was implemented downstream of the study area, in part as mitigation for the SR 520, I-5 to Medina Bridge Replacement and HOV project. The restoration work, called the Lower Bear Creek Restoration Project was designed to establish a compositionally and structurally complex ecosystem with attributes important for supporting fish and wildlife, with an emphasis on anadromous fish such as Chinook, coho, and sockeye salmon. The design included channel reconfiguration (to increase meandering), LWD placement, bank stabilization, stream gravel, native riparian plantings, and wetland creation. Adjacent uplands were excavated to create more floodplain storage and habitat associated with the new channel. Riparian and floodplain areas were planted to enhance in-stream and riparian functions such as cover, shading, LWD recruitment, bank stabilization, terrestrial insect food production, and leaf litter organic debris in support of in-stream food sources. Approximately 3,000 pieces of LWD were added to the stream channel within the bankfull width (Lawson et al. 2012). The upstream end of the recently restored reach is approximately 1,500 feet downstream of the site where the proposed alignment would cross Bear Creek.

The regulatory requirements of the City of Redmond's SMP apply to Bear Creek and all lands extending 200 feet landward from the OHWM of the stream, as well as portions of the 100-year floodplain and any associated wetlands that extend beyond the 200-foot buffer. The City of Redmond has designated a 150-foot-wide Urban Conservancy corridor adjacent to Bear Creek; the remaining 50 feet of the Shoreline Management Zone is designated as a High Intensity/Multi-use environment. According to SMP Policy SL-5, development should be encouraged in previously disturbed, under-utilized High Intensity/Multi-use shoreline environments, such as the BNSF corridor in the study area.

The only observed culvert discharging to Bear Creek in the study area conveys stormwater from detention ponds under the SR 520 bridge. It is approximately 30 inches in diameter.

Riparian Vegetation

The Bear Creek riparian area in the vicinity of the proposed crossing is vegetated with a mixture of native and non-native species. Tree cover is extensive and dominated by native species, including red alder, Oregon ash, black cottonwood, and western red cedar, with scattered Douglas-fir at the highest elevations (Figure 3-4). Non-native deciduous trees also occur in the riparian area, along adjacent roads, trails, and other developments. Forested areas have understory vegetation composed of a mixture of native shrubs (salmonberry, red osier dogwood, willows), invasive Himalayan and cutleaf blackberry, and a fairly sparse herbaceous stratum containing native piggy-back plant and slough sedge, as well as invasive creeping buttercup and reed canarygrass. Scrub-shrub areas are dominated by a mixture of shrubs described above. Emergent areas are dominated by dense stands of reed canarygrass. Beaver activity is apparent from numerous downed trees, cut shrubs, and dams. Habitat values of the riparian community are high, based on the complex vegetation and stream structure, presence of snags and LWD, and the extent of the restored corridor and its connectivity to habitats upstream and downstream.

Figure 3-4. Bear Creek riparian area, looking upstream from the former rail corridor crossing

Physical In-stream Habitat

Habitat in Bear Creek in the study area is a mixture of pools and runs. Substrates are predominantly gravel and cobble, with some silt and sand present. Overall spawning and rearing habitat quality in this reach is good. The stream channel was built in association with a major channel relocation and habitat enhancement project downstream of the proposed crossing. More than 100 logs with rootwads have been installed in the banks of the meandering channel. This area provides both overflow channel and wetland habitat. During a site visit in August 2017, a right bank debris jam was observed approximately 100 feet upstream of the anticipated guideway crossing location. Some pieces of woody debris were also caught on the upstream end of the timber stringer bridge at the rail corridor crossing. When the rail corridor was constructed, fill was placed up to the bridge abutments as shown in Figure 3-3. This constrains the flow of Bear Creek, restricting the floodplain and floodway to approximately 30 feet at the timber stringer bridge. The constriction of the bridge causes the 100-year water surface to increase by approximately 2 feet upstream of the bridge opening.

Table 3-3 summarizes the characteristics of physical in-stream habitat in Bear Creek in the study area, using the metrics and measurements recommended by Sound Transit (2016).

Table 3-3. Characteristics of Physical In-stream Habitat in Bear Creek in the Study Area

Parameter	Metric/Measurement	Characteristics of Bear Creek in Study Area
Channel Form and Profile	Macrohabitat—habitat type	Pools and runs.
	Macrohabitat—pool characteristics	Pools present, but scattered and generally shallow (less than 1 foot deep).
	Stream Reach Classification	Class I (Redmond), Type 1 (Washington State)
	Stream Slope	Approximately 0.2%.
	Stream Patterns	Stream has been restored to include meandering channel, side-channels, and backwaters.
	Confinement	The stream channel is not confined.
	Channel Dimension/Shape	Bankfull width is 20-25 feet with a natural stream cross-section.
Streambank Condition	Stability	No evidence of instability. Minor areas of erosion and deposition are present.
	Bank Hardening/Revetments	Between SR 202 (Redmond Way) and the BNSF corridor crossing, both banks are armored with riprap.
Substrate/ Sediment	Particle Frequency	Predominantly gravel and cobble.
	Percentage of Fine Sediments/ Embeddedness	Some silt and sand are present, but embeddedness is minimal.
Large Woody Debris	LWD Presence, Frequency, and Location	LWD present as isolated pieces and in jams and, outside of the mainstem channel, in beaver dams.
	Debris Jams	Small jams occur in sidechannels approximately 100 feet downstream.
	LWD Size	Some pieces larger than 12 inches in diameter and more than 10 feet long are present.
	Age and Type	Mostly new, small diameter deciduous.
Cover and Refuge	Pool Quality	Variable. Generally shallow, but some are deeper and with overhanging cover.
	Undercut Banks	Present in some areas, especially north bank, and upstream and downstream of crossing.
	Off-channel/Side-channel Habitat	Extensive off-channel habitat as a result of restoration actions.
	In-stream Cover/Protection	Extensive overhanging vegetation. Other cover is provided by the railroad bridge and the WDFW barge.

Biological Connectivity

No physical barriers to fish passage have been identified in Bear Creek or the Sammamish River downstream of the study area.

Water Quality and Quantity

In 2008, the U.S. Environmental Protection Agency (EPA) approved total maximum daily loads (TMDLs) for fecal coliform, temperature, and dissolved oxygen for the Bear Creek watershed. The Washington State Department of Ecology (Ecology) has been working with tribal, federal, state, and local stakeholders to implement projects consistent with the Water Quality Improvement Plan for the watershed. Water quality improvement efforts implemented through the plan have included riparian restoration projects and educational efforts, such as encouraging people to reduce fertilizer use and pick up pet waste. Projects implemented by the City of Redmond have included installing bioretention cells, pervious pavement, a stormwater trunk line, a stormwater wetpond, decant bays, and an on-site stormwater management system designed to reduce the quantity of heavy industrial runoff. Bear Creek

in the study area is on the current (approved July 22, 2016) 303(d) list of impaired waterbodies, based on degradation of biological integrity.

King County maintains a gauging station in Bear Creek at Union Hill Road, approximately 0.5 mile upstream of the study area. Based on data collected from October 1987 through March 2017, the annual average discharge at that site is approximately 78 cfs (King County 2017b). Monthly average discharges during that period ranged from 14 cfs (August 2006) to 357 cfs (January 1997). Averaged over the full data period, monthly average discharges ranged from 21 cfs (in August) to 144 cfs (in January) (King County 2017b).

Fish Habitat Use

Lawson et al. (2012) determined that the reach of Bear Creek immediately downstream of the study area is used by salmonids as a migration and rearing corridor, but not for spawning, and that Chinook, coho, and sockeye salmon spawn in upstream reaches of Bear Creek. The reach downstream of the study area and north of SR 520 is identified as a migration or rearing area of considerable importance for one or more species of juvenile salmon (Lawson et al. 2012). According to WDFW (2017a, 2017b), Bear Creek in the study area provides spawning habitat for Chinook and sockeye salmon, and rearing habitat for coho salmon. WDFW (2017a) also documents the presence of kokanee salmon and steelhead in the study area. From 1996 to 2016, volunteers from the King County Salmon Watcher Program documented Chinook, sockeye/kokanee, and coho salmon in Bear Creek, as well as chum salmon (which were characterized as strays) (King County 2016a).

WDFW operates a smolt trap in Bear Creek from the fish-monitoring barge at the approximate location of the proposed light rail alignment crossing. Based on extrapolations from capture data, Kiyohara (2017) generated the following estimates for the abundance of juvenile salmonid migrants from Bear Creek in 2016:

- Sockeye salmon: 81,125 ± 20,814 (95 percent confidence interval)
- Chinook salmon: 45,946 ± 17,473
- Coho salmon: 11,545 ± 2,828

3.1.1.3 Unnamed Tributary to Sammamish River

In addition to the streams described above, the study area includes an unnamed tributary to the Sammamish River, identified by WDNR (2017) as LLID 1221262476704. This watercourse runs parallel to SR 520 southwest of the Sammamish River crossing, discharging to the Sammamish River downstream of SR 520. Although Williams et al. (1975), WDFW (2017a, 2017b), and the City of Redmond (Map 64.3, Streams Classification, effective March 20, 2016) do not identify a stream in that area, the watercourse appears on maps based on the WDNR Fish Habitat Water Typing Model, and on maps developed by King County (2017a), NWI, and Washington Trout (2005). Historical (1936, King County iMap) aerial imagery and topographic contours (U.S. Geological Survey [USGS] 1897) suggest that a surface-flowing watercourse with multiple branches once flowed north from the location of NE 40th Street, and now has largely been piped through this reach. Field observations and mapping review suggest that the stream currently discharges from a pipe to a stormwater pond located north of SR 520, within the intersection with West Lake Sammamish Parkway NE. Flow is then piped to a confluence with the Sammamish River immediately downstream of the SR 520 bridge crossing (Figure 3-5).

Figure 3-5. Unnamed Tributary to the Sammamish River, photographed south of SR 520 and east of NE 60th Street

During field reviews in May 2017, a stream was found flowing in an 8-foot-wide channel south of SR 520, immediately east of the NE 60th Street overpass, and presumed to be a branch or segment of LLID 1221262476704. The water flowed at surface into the WSDOT right-of-way from private property, flowing for approximately 20 feet through a forested area in the right-of-way before entering a culvert with an unknown discharge location. Washington Trout (2005) did not conduct field surveys of this watercourse and classified it as Type 9, untyped/unknown mapped stream. Reaches upstream of the NE 60th Street overpass were also not surveyed by Washington Trout, but classified as Type 4 (perennially flowing, non-fish habitat) and Type 5 (seasonally flowing, non-fish habitat) (Washington Trout 2005). This watercourse is not mapped as a stream by WDFW; therefore, fish passage has not been evaluated. The likelihood of fish migrating between the river and the surface-flowing segment is extremely low, however, for several reasons. To enter the watercourse, fish would have to pass through the stormwater pond that empties to the river via a pipe. Upstream of the stormwater pond, the watercourse is contained within pipes for several thousand feet, flowing at surface for only the short segment described above. No other surface-flowing segments are readily apparent farther upstream.

Many streams in the city of Redmond originate along the crest of the Sammamish River valley wall, gather flow from springs and seeps as they flow down the valley walls, and then infiltrate into the ground when reaching the valley floor (Washington Trout 2005). It is possible that this unnamed tributary to the Sammamish River is the remnant of a stream that historically followed that pattern.

Based on the intermittent flow and no salmonid fish use mapped by WDFW (2017b) paired with the Washington Trout (2005) findings, the City of Redmond defines such streams as Class IV streams, according to RZC 21.64.020.A.2. Based on the channel width and gradient, the watercourse would meet the criteria for a type Ns Water according to WAC 222-16-030(4). For the purposes of this assessment, the watercourse is assumed to be a Redmond Class IV stream with a 25-foot buffer.

3.1.1.4 Unnamed Tributary to the Bear Creek

The study area includes an unnamed tributary to Bear Creek identified by WDNR as LLID 1221079476713. Within the study area, this waterbody runs parallel to where the off-ramp for SR 520 continues into NE 76th Street. The unnamed tributary to Bear Creek originates northeast of the study area and resurfaces after discharging out of three various sized culverts under the Univar USA parking lot (parcel number 0623100020). The stream then flows approximately 750 feet through an emergent wetland (WRE-7) before being conveyed through two large culverts under an old levee. The water then discharges to Bear Creek approximately 75 feet north of the Redmond Way/SR 202 bridge. The unnamed tributary to Bear Creek is mapped by King County (2017a), WDFW (2018), and the WDNR (2018); however, no maps match the field observations and delineation. The City of Redmond (Map 64.3, Streams Classification, effective March 20, 2016) does not identify a stream in this area.

Field visits occurred in April 2018 after a period of heavy rains. At this time, the unnamed tributary to Bear Creek had an average channel width of approximately 15 feet. During the field visit, juvenile fish bearing par marks (unknown if trout or salmon) were observed where it resurfaces south of parcel number 0623100020. WDNR maps the unnamed tributary to Bear Creek as a Type 2 perennial fish-bearing stream. WDFW's SalmonScape mapping tool identifies the stream as intermittent/ephemeral with the modeled presence of Chinook, coho, steelhead, and sockeye. Based on the potential presence of fish, the stream is classified by Redmond as a Class II according to RZC 21.64.020.A.2.

Riparian vegetation

The majority of the unnamed tributary to Bear Creek flows through an emergent wetland composed of reed canarygrass, bull thistle, Kentucky blue grass, meadow foxtail, and bentgrass. Near the confluence with Bear Creek, it flows adjacent to a scrub-shrub plant community. This scrub-shrub community consists primarily of willow and Himalayan blackberry.

3.1.2 Fish and Other Aquatic Species

As noted above, species of salmon known to be present in the Sammamish River watershed include Chinook, coho, and sockeye/kokanee salmon, as well as steelhead/rainbow and cutthroat trout. The presence of bull trout has not been confirmed. Chum salmon and pink salmon occasionally enter the watershed, but are not known to be a sustaining population (King County 2014). Several species of native and introduced non-salmonid fishes are also present in the Sammamish River and its tributaries. Reproducing populations of smallmouth bass, largemouth bass, yellow perch, northern pikeminnow, largescale sucker, three-spine stickleback, and sculpin have been documented in sections of the Sammamish River, while other species are likely residents during specific periods of the year (U.S. Army Corps of Engineers and King County 2002). In addition to the species mentioned above, Kiyohara (2017) captured the following species in Bear Creek between January and July 2016: lamprey, green sunfish, whitefish, peamouth, dace, bluegill, pumpkinseed, and brown bullhead catfish.

3.1.2.1 Species of Concern

Species of concern, defined as those with a regulatory status that prompts individual attention through federal, state, and/or local permitting processes, include the following:

- Species listed or proposed for listing as threatened or endangered under the ESA
- Species for which Fish and Wildlife Habitat Conservation Areas (FWHCAs) are established under local critical areas rules
  - In the City of Redmond, areas designated as FWHCAs include the following:
    - Areas with which any of the following species have a primary association: Species listed as state endangered, state threatened, state sensitive, or state candidate, as well as species listed or proposed for listing by the USFWS or the National Marine Fisheries Service (NMFS)
    - State priority habitats and areas associated with state priority species
    - Habitats and species of local importance (no aquatic species are classified as species of local importance, however)
  - In King County, areas designated as FWHCAs include the following:
    - Areas with which federal- or state-listed endangered, threatened, or sensitive species have a primary association
    - Habitats of local importance and habitats for species of local importance

Resource analysts reviewed WDFW's lists of state- and federally listed species, as well as the list of state priority species known or expected to occur in King County, and identified aquatic species of concern that may use habitats in the study area.

ESA-listed Species

Discussions in this document pay particular attention to species with listing status under the ESA because such status triggers additional regulatory review. The ESA requires each federal agency (in this case, the Federal Transit Administration [FTA]) to ensure that any actions it undertakes or approves do not jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of their designated critical habitat. To meet this requirement, FTA initiated consultation with USFWS and NMFS concerning the potential effects of the East Link Preferred Alternative on ESA-listed species and critical habitat. Sound Transit prepared a biological assessment to serve as the basis for the consultation (Sound Transit 2010). Based on the analysis in that document, and on the implementation of proposed mitigation measures, FTA determined that construction and operation of the East Link may affect, but is not likely to adversely affect, ESA-listed species and critical habitat. FTA received letters of concurrence from NMFS on December 7, 2010, and from USFWS on February 23, 2011.

The Proposed Design Refinements contain work elements that were not assessed in the 2010 Biological Assessment and are therefore not covered under the letter of concurrence issued by the Services in 2011. Therefore, Sound Transit prepared a separate Biological Assessment that is specific to the Downtown Redmond Link Extension Project (see Appendix F of the SEPA Addendum). The 2018 Biological Assessment addressed Chinook salmon, steelhead, and bull trout, all of which are listed as threatened. The listing status of these species has not changed, and no additional aquatic species have been listed or proposed for listing under the ESA in the study area. Formal consultation was initiated with NMFS in April 2018 for the project's direct and indirect effects on Chinook salmon and steelhead. NMFS issued a Biological Opinion indicating that the project as proposed would not jeopardize the continued existence of listed Chinook salmon, and concurred with the findings of the 2018 Biological Assessment that the project is not likely to adversely affect listed steelhead (NMFS 2018). Reinitiation of

consultation with USFWS was not warranted because bull trout occurrence in the project area during construction would not be anticipated.

The discussions below provide updated information about the status of ESA-listed species in the study area, as well as those species' use of habitats in the study area. This information supports an analysis of the potential for project construction and operation in the study area to result in effects that differ from those anticipated in the 2010 Biological Assessment. No aquatic resources in the study area have been designated or proposed for designation as critical habitat for any ESA-listed species. Therefore, critical habitat is not addressed further in this document.

The 2010 Biological Assessment addressed Chinook salmon, steelhead, and bull trout, all of which are listed as threatened. The listing status of these species has not changed, and no additional aquatic species have been listed or proposed for listing under the ESA in the study area. The following subsections summarize the status of these species, as well as the timing and nature of their habitat use in the study area.

Puget Sound Chinook Salmon

The Puget Sound evolutionarily significant unit (ESU) of Chinook salmon is listed as threatened under the ESA (63 Federal Register [FR] 11482, March 24, 1999) and the species is a candidate for listing at the state level. The ESU includes naturally spawned Chinook salmon originating from rivers flowing into Puget Sound, along with Chinook salmon from 26 artificial propagation programs, including the Issaquah Creek program in the Lake Washington basin. Primary factors contributing to declines in Chinook salmon in the Puget Sound ESU include habitat blockages, genetic modification of wild fish through interbreeding with hatchery fish, urbanization, logging, hydropower development, harvests, and flood control and flood effects (NMFS 1998).

Fish that use stream habitats in the study area belong to the Sammamish population. The most recent 5-year estimate of spawning abundance for wild Chinook salmon in the Sammamish population was 160 fish, making up less than 1 percent of the total number of spawning fish in the ESU (NFSC 2015). The estimated abundance of spawning females in Bear Creek ranged between 120 and 150 from 2000 to 2006; the estimates were below 100 females in all but 3 of the years between 2007 and 2016 (Kiyohara 2017).

Adult Chinook salmon enter the Lake Washington system from July through September (Celedonia et al. 2011). Adults typically begin to appear in the Sammamish River in late August or early September, passing through the river on their way to suitable spawning habitat in tributaries (Jeanes and Morello 2016). Migration to spawning grounds is typically complete by November. Sammamish River Chinook salmon spawn primarily in Issaquah Creek, Bear Creek, and Cottage Lake Creek, and to a lesser degree in the larger tributaries to the Sammamish River (North Creek, Swamp Creek, and Little Bear Creek) and to Lake Washington (Kelsey Creek, Coal Creek, May Creek, Thornton Creek, and McAleer Creek) (WDFW 2017c). Even though WDFW (2017a, 2017b) identifies the Sammamish River in the study area as breeding habitat for Chinook salmon, the potential for spawning or rearing in the main stem is limited by high water temperatures, low water velocities, and the lack of suitable spawning substrates (U.S. Army Corps of Engineers and King County 2002).

Spawning of Chinook salmon in the Lake Washington basin occurs from October to December, with peak spawning activity usually in the first few weeks of October (Burton et al. 2009). Fry emerge from redds between January and early April (Kiyohara and Zimmerman 2009). Most Chinook salmon in the Lake Washington basin rear in freshwater for 1 to 6 months before migrating to marine habitats. Chinook salmon from Sammamish River tributaries may emigrate as fry (primarily between February and April) or as smolts (primarily between late April and early July). Most juvenile Chinook salmon in the Lake Washington basin emigrate from the system via the Lake Washington Ship Canal by mid-summer; most

of the remaining juveniles have left by September. A small proportion of the population may remain in freshwater habitats for approximately 1 year.

In 2016, the Bear Creek smolt trap was in operation from January 24 through July 3. During that period, outmigrating juvenile Chinook salmon were captured during all but the final week (Kiyohara 2017). Approximately 99 percent of the captures occurred between late February and early June (Kiyohara 2017). Juvenile Chinook salmon captured in Bear Creek were detected moving through the Hiram M. Chittenden Locks (Ballard Locks) in the Lake Washington Ship Canal between May 7 and June 29, 2016 (Kiyohara 2017).

Migrating adult Chinook salmon seek cover in deep pools, log jams, and undercut banks, until ready to spawn. They require a steady supply of clean, cool, well-oxygenated water, and clean gravel for successful spawning. Factors influencing the survival of all juvenile salmonids include the availability of suitable habitat, prey, and refuge from predators and floods. The structural complexity of habitat, in the form of pools and riffles, with interspersed downed woody debris of various size classes, is additionally important for the in-stream survival of both adult and juvenile salmonids. Such features are largely absent from the Sammamish River in the study area. Fresh et al. (1999) found that Chinook salmon spent an average of 9 days in the Sammamish River, indicating a low probability of adult Chinook salmon being in the study area for an extended period.

Jeanes and Morello (2016) conducted surveys for Chinook salmon in the Sammamish River from August through October 2015. The survey area extended approximately 6 miles downstream from the outlet of Lake Sammamish. Counts of live Chinook salmon peaked during mid-September and decreased steadily after the first week of October. Most observations of Chinook salmon during the survey period occurred in the uppermost reaches of the river, including the reach that flows through the study area (Jeanes and Morello 2016).

Puget Sound Steelhead

The Puget Sound steelhead distinct population segment (DPS) is listed as a threatened species (72 FR 26722, May 11, 2007). The DPS includes all naturally spawned anadromous steelhead originating below natural and manmade impassable barriers from rivers flowing into Puget Sound (79 FR 20802, April 14, 2014). The DPS also includes steelhead from six artificial propagation programs, none of which operate in the Lake Washington system.

Fish that use stream habitats in the Lake Washington system belong to the Lake Washington population. The number of naturally spawned steelhead in this population is very low. The most recent 5-year estimate of spawning abundance for the Lake Washington population was 12 fish (Ford 2011). It is not clear to what degree steelhead historically used tributaries in the Lake Washington basin (WDFW 2017c). Given the low steelhead counts at the Ballard Locks, the species is unlikely to be present in Sammamish River tributaries in appreciable numbers; WDFW currently does not monitor tributaries to northern Lake Washington and Lake Sammamish/Sammamish River for steelhead (WDFW 2017c).

Adult steelhead typically enter rivers and streams in the Lake Washington system from November through May and spawn from February through June (Myers et al. 2015). No spawning is known to occur in the Sammamish River (U.S. Army Corps of Engineers and King County 2002). Most Puget Sound steelhead mature within 18 months after hatching and migrate to sea at age 2, with smaller numbers of fish emigrating to the ocean between 1 and 3 years of age. Seaward migration by juveniles occurs principally from April to June, with fish typically spending 1 to 3 years in the ocean before returning to fresh water (Busby et al. 1996).

WDFW (2017a, 2017b) identifies Bear Creek and the Sammamish River in the study area as migratory habitat for steelhead. There are no recent records of steelhead spawning in the Sammamish River or its

tributaries, however. Since 1999, WDFW has monitored the emigration of juvenile salmonids from Bear Creek, using traps located in the project action area. The period when the traps are in place encompasses the period of peak juvenile steelhead outmigration (April to June). Since 2002, a total of six juvenile steelhead have been captured in Bear Creek (WDFW 2017d; Kiyohara 2017). The most recent captures were in 2016, when two juvenile steelhead were captured after a period of 7 years (2009 to 2015) with no captures at all (Kiyohara 2017). It is possible, although unlikely, that small numbers of steelhead could pass through the study area on their way to and from potentially suitable spawning habitat in upstream tributaries.

Bull Trout

The bull trout is listed as a threatened species (64 FR 58910, November 1, 1999) and is a candidate for listing at the state level. All bull trout in the coterminous United States are included in the listing. Bull trout have been observed entering Lake Washington in small numbers, but the Sammamish River and tributaries are not known or expected to support bull trout spawning or rearing. The only spawning population of bull trout documented in the Lake Washington system is in the upper Cedar River above Chester Morse Lake, which is upstream of a natural barrier to upstream migration (Shared Strategy for Puget Sound 2007). No spawning activity or juvenile rearing has been observed anywhere else in the basin. No bull trout have been documented in any of the tributaries to Lake Washington, including the Sammamish River (WDFW 2017b).

Bull trout have been observed entering Lake Washington through the fish ladder viewing area at the Ballard Locks, where every year, one or two fish are seen traveling into the lake. Many researchers believe that these fish are seasonal transient strays (i.e., not residents) rather than fish produced within the system. Surveys have not produced conclusive evidence for the presence or absence of bull trout in the Lake Washington system, outside of the population in the Cedar River drainage (King County Department of Natural Resources 2000). For regulatory purposes, USFWS assumes that natural production is possible in the system.

USFWS (2015a) has identified Lake Washington and its tributaries (including the Sammamish River) as foraging, migration, and overwintering habitat for bull trout. A few stray individuals have been observed at scattered locations in the Lake Washington basin, but no evidence of reproduction has been observed (U.S. Army Corps of Engineers and King County 2002). Neither Bear Creek nor the Sammamish River is known or expected to support bull trout spawning or rearing; bull trout do not reproduce in any of the low-elevation tributaries in the Lake Washington system. WDFW (1999) determined that successful spawning by bull trout occurs only upstream of the winter snow line (i.e., the elevation at which snow is present on the ground for much of the winter). Water temperatures in the Sammamish River exceed the thermal tolerance exhibited by bull trout, and probably preclude their presence in the river during most months (Goetz 1989).

Adult bull trout likely migrate into the Lake Washington basin to forage during the winter and early spring when water temperatures are cold (WDFW 1998). Overwintering subadults and adults may remain in freshwater habitats until late winter and spring (Goetz et al. 2004; USFWS 2010). If any bull trout use habitats in the study area, it would be during this period.

Other Aquatic Species of Concern

In addition to the ESA-listed species discussed above, several species that may use aquatic habitats in the study area have state listing status or are identified by King County as species of local importance. Table 3-4 presents the regulatory status of these species and summarizes each species' known or expected use of habitats in the study area.

Table 3-4. Aquatic Species of Concern[a] in the Study Area

Species	Status[b]	Habitat Use in Study Area
Fish		
Chum salmon	SC, SP, KCSLI	Unknown. Individuals observed in the area are likely strays.
Coho salmon	SP, KCSLI	Spawning in Bear Creek, October through December; fry emerge from redds in March to June. Juveniles may be present in Sammamish River or Bear Creek year-round.
Cutthroat trout	SP, KCSLI	Spawning in gravel at the mouths of tributaries to the Sammamish River; juveniles may rear in the study area and resident adults may be present year-round.
Kokanee	SP, KCSLI	Spawning in the Sammamish River or Bear Creek, September to November; fry emerge in April and May and rear in Lake Washington.
Pacific lamprey	SP, KCSLI	The known current and historic distribution of Pacific lamprey does not include the Sammamish River basin; potential spawning and rearing habitat is present, however.
Pink salmon	SP, KCSLI	Unknown. Individuals observed in the area are likely strays.
Rainbow trout	SP, KCSLI	Occasionally observed in the Sammamish River; presumed present in Bear Creek.
River lamprey	SP, SC	Lamprey of unknown species have been reported in the Sammamish River; potential spawning and rearing habitat in the Sammamish River and Bear Creek.
Sockeye salmon	SC, SP, KCSLI	Spawning in Bear Creek, September through December; fry emerge from redds in winter and early spring, then migrate downstream to rear in Lake Washington.
Aquatic Invertebrates		
Oregon floater (mussel)	KCSLI	Associated with low-gradient rivers, lakes, and reservoirs, particularly sandbars near the mouths of tributary streams or below riffles. Potentially present.
Western floater (mussel)	KCSLI	Associated with low-gradient rivers, lakes, and reservoirs, particularly sandbars near the mouths of tributary streams or below riffles. Potentially present.
Western pearlshell mussel	KCSLI	Generally found in cold, clean creeks and rivers that support salmonid populations. Present in Bear Creek upstream of the study area; mortality and population declines have been a source of concern.
Western ridged mussel	KCSLI	Similar habitat associations as western pearlshell. Not documented in any watersheds of the Puget Sound basin.

Sources: Berge and Higgins 2003; King County 2014; King County 2016a; NatureServe 2017; Thomas 2008; U.S. Army Corps of Engineers and King County 2002; USFWS 2015b; WDFW 2017a, c.

[a] Species of concern are those for which fish and wildlife habitat conservation areas are established under the critical areas rules of King County and the City of Redmond. See discussion in the introduction to this subsection. Species listed under the ESA are discussed in the preceding three subsections of this document.

[b] SC = Candidate for state listing; SP = State priority species; KCSLI = King County species of local importance

3.1.3 Tribal Fishing

Judicial decisions have affirmed that federally recognized tribes have treaty rights that include, but are not limited to, the rights to harvest fish free of state interference (subject to conservation principles) and to co-manage the fishery resource. The Muckleshoot Indian Tribe has treaty rights in the Lake Washington watershed that are protected through federal treaty and law. Because of concerns over the ability of tribal citizens to exercise their fishing rights, the Muckleshoot Indian Tribe has been active in efforts to improve fisheries resources in the Lake Washington watershed.

The Muckleshoot Indian Tribe's Fisheries Division Habitat Program is tasked with protecting and restoring fish abundance, including water quality, so that tribal citizens can exercise their treaty-reserved commercial, subsistence, and ceremonial fishing rights. Some fish populations in WRIA 8 have declined to the point that tribal citizens cannot exercise those rights. The abundance of other species populations in most years is too low to meet tribal needs. In recent years, limited fisheries for coho, sockeye, and Lake Sammamish Chinook salmon have been scheduled in WRIA 8 for Muckleshoot tribal citizens.

3.2 Vegetation and Wildlife Resources

The study area includes a range of cover types and wildlife habitats. Much of the study area comprises urban development, including commercial and residential areas. These areas support wildlife species adapted to disturbed urban areas. However, patches of less-developed habitats occur in Marymoor Park, forested areas along SR 520, and the Bear Creek and Sammamish River riparian corridors. Vegetation conditions and wildlife habitats are described in the following subsections.

Wildlife species and habitats in the study area have not changed substantially from what was described in the 2011 East Link Final EIS and supporting documents. As described in Subsection 3.2.1, however, the way in which terrestrial habitats in the study area are classified has been slightly modified to provide more details specific to local habitat conditions. Lists of wildlife species known or expected to be present in the study area are included in Attachment B.

3.2.1 Vegetation

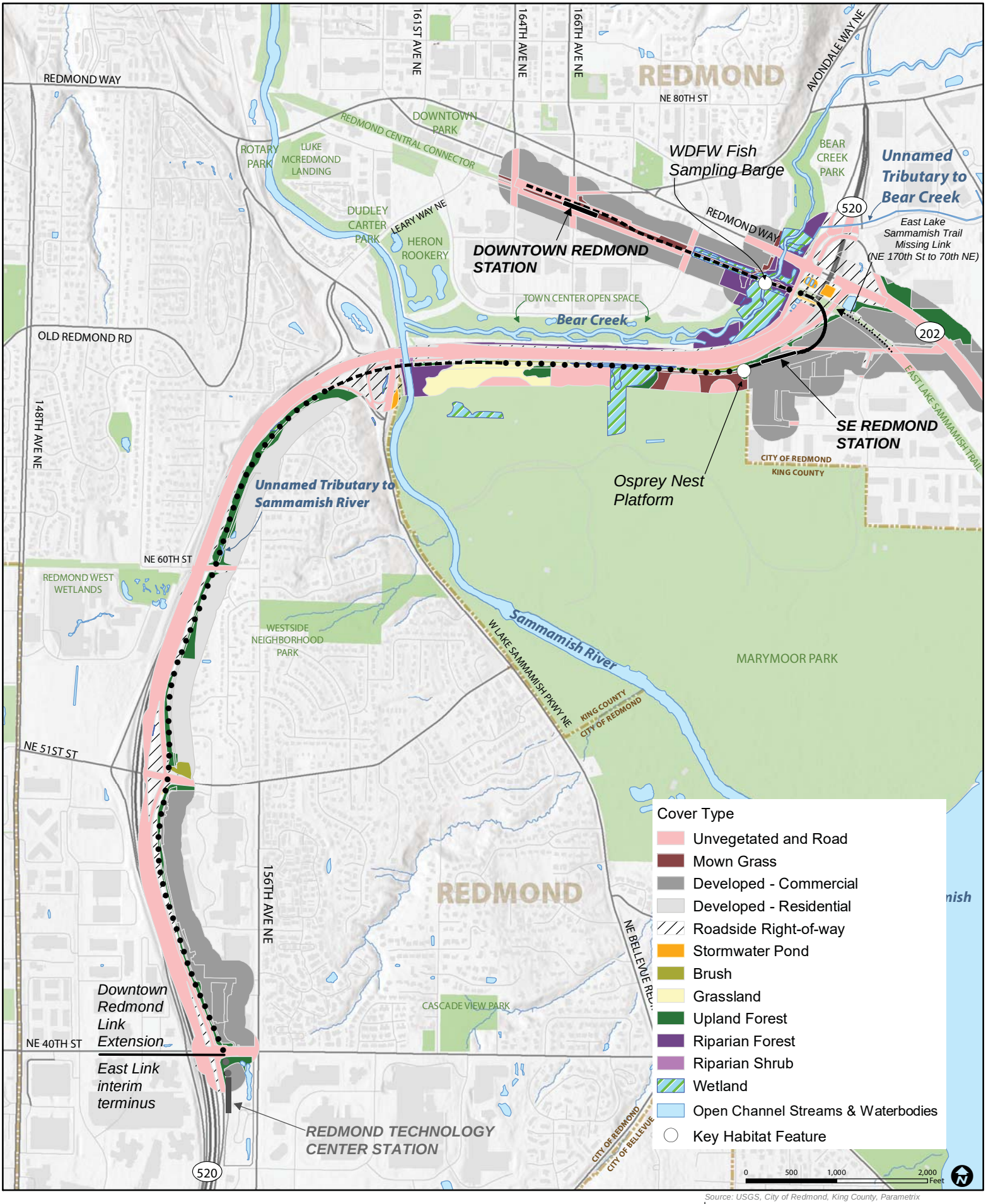
Vegetation in the study area was evaluated for the presence of rare plants and priority ecosystems through a review of the Natural Heritage program database (WDNR 2017). There are no documented occurrences of rare plants or priority ecosystems within several miles of the study area. No rare species or priority ecosystems (according to WDNR definitions) were observed during field surveys.

Some parcels in the study area are considered Core Preservation Areas by the City of Redmond, based on transfers of development rights or the presence of open space easements (RZC 21.78). They are defined as those areas that protect habitat and that are preserved through any of the regulatory mechanisms provided in this Zoning Code, including Native Growth Protection Areas, Class I streams and their buffers, Class II through IV streams, and other areas similarly protected.

Cover in the entire study area was classified and characterized according to the methods described in Section 3.1. Fifteen cover types were identified in the study area. Their relative habitat value, occurrence, and description is presented in Table 2-1. Figure 3-6 shows the mapped locations of the cover types. Table 3-5 summarizes the acreage of each cover type in the study area.

Table 3-5. Summary of Vegetation and Wildlife Habitats in the Study Area

Cover/Habitat Type	Acreage in Study Area
Unvegetated and Road	5.11
Developed—Commercial	84.64
Developed—Residential	20.40
Roadside Right-of-way	26.50
Mown Grass	5.98
Grassland	6.41
Brush	1.68
Upland Forest	19.88
Riparian Forest	12.86
Riparian Shrub	0.09
Forested Wetland	7.62
Scrub-shrub Wetland	1.47
Emergent Wetland	0.52
Stream Channels	0.85
Stormwater Ponds	1.38



Source: USGS, City of Redmond, King County, Parametrix

Figure 3-6
Vegetation and Wildlife Habitat
Downtown Redmond Link Extension

3.2.2 Terrestrial Wildlife

Wildlife use of habitats in urban landscapes depends on the general location of the habitat, the size and type of undisturbed habitats, the degree of connectivity and extent of travel corridors between and among these habitats, and the types and levels of human activity. Much of the study area falls within commercial, industrial, and residential areas that provide habitat only for adaptable species such as sparrows, starlings, doves, rats, mice, raccoons, opossums, and squirrels. Birds such as common pigeons and cliff swallows commonly build nests on bridges and road overpasses, and many bat species use such structures as temporary roosting sites. Animals that use habitats in the study area are also exposed to high noise levels associated with traffic on SR 520 and major arterial roadways.

Larger habitat patches and those connected to other natural areas or heavily vegetated residential neighborhoods support a larger variety of species, such as songbirds, raptors, small mammals, coyotes, and black-tailed deer. Songbird species commonly found in habitats similar to those in the study area include American robin, song sparrow, Steller's jay, American crow, spotted towhee, black-capped chickadee, white-crowned sparrow, northern flicker, Bewick's wren, and red-breasted nuthatch. Raptors include American kestrel, sharp-shinned hawk, Cooper's hawk, red-tailed hawk, and great horned owl. Red-tailed hawks and other raptors prey on voles that are found in abundance in the grassy vegetation in the SR 520 right-of-way.

Most patches of forest cover in the study area are fragmented and separated from surrounding habitat areas by commercial and residential developments and roads. Despite their isolation, these areas still provide habitat for forest-associated resident and migratory songbirds, as well as for hawks, owls, woodpeckers, and small mammals.

Rivers and streams are used as travel corridors by many wildlife species, including semi-aquatic species such as muskrat, mink, otter, frogs, salamanders, turtles, and snakes (Jackson 2003). Despite the widespread urbanization of the study area, riparian areas along the streams may serve as a connective corridor between pockets of wildlife habitat. In general, however, patches of forest and other native habitat types in the study area are isolated from other areas of similar habitat and do not serve as connective corridors to other areas of habitat outside of the study area.

Habitats with a lesser degree of disturbance are available in Marymoor Park and along the riparian corridors of the Sammamish River and Bear Creek. Encompassing approximately 640 acres, Marymoor Park was once part of the floodplain of Lake Sammamish. Currently, the Sammamish River runs through a portion of the park, originating at the outlet of Lake Sammamish at the southern boundary of the park. The park offers a variety of habitats, including herbaceous, scrub-shrub, and forested wetlands; riparian corridors; deciduous upland forests; and grassy fields. Wildlife species that use the park and river corridor adjacent to the park include American bald eagle, osprey, belted kingfisher, beavers, and deer. The presence of a dog off-leash area and areas of intensive human activity (e.g., ball fields) may limit the use of those areas by wildlife. A restoration project along the banks of Bear Creek exists upstream and downstream from the proposed light rail crossing of the creek. Non-native vegetation has been removed and replanted with native shrubs and tree saplings.

3.2.3 Species and Habitats of Concern

Species of concern, defined as those with a regulatory status that prompts individual attention through federal, state, and/or local permitting processes, include the following:

- Species listed or proposed for listing as threatened or endangered under the ESA
- Species for which FWHCAs are established under local critical areas rules
  - In the City of Redmond, areas designated as FWHCAs include the following:
    - Areas with which any of the following species have a primary association: Species

listed as state endangered, state threatened, state sensitive, or state candidate, as well as species listed or proposed for listing by the USFWS or NMFS
    - State priority habitats and areas associated with state priority species
    - Habitats and species of local importance (great blue heron currently the only designated species of local importance in Redmond)
  - In King County, areas designated as FWHCAs include the following:
    - Areas with which federal- or state-listed endangered, threatened or sensitive species have a primary association
    - Habitats of local importance and habitats for species of local importance
    - Wildlife habitat networks designated by King County
    - Wildlife habitat conservation areas for protected species identified in KCC 21.A.243.382
- Bird species protected under the Migratory Bird Treaty Act

Based on reviews of the distribution and habitat associations of state-listed and federally listed species, state priority species, King County protected species, and species of local importance, resource analysts identified wildlife species of concern that may use habitats in the study area (i.e., non-marine habitats in lowland urban and residential settings, excluding unique habitats such as old-growth forest or sphagnum bogs). Table 3-6 presents the regulatory status of these species and summarizes each species' known or expected use of habitats in the study area.

Table 3-6. Wildlife Species of Concern in the Study Area

Species	Status[b]	Habitat Use in Study Area
Amphibians		
Northern red-legged frog	KCSLI	No recent records. Likely present historically. May breed at sites where standing water persists until July; adults may be found in moist forest or riparian areas more than 2 miles from suitable breeding habitat.
Western toad	SC, SP	No recent records. May breed in permanent wetlands, ponds, lakes, and off-channel habitats or rivers; adults may move up to a few miles through uplands.
Birds		
American bittern	KCSLI	Occasionally sighted in Marymoor Park; breeding possible. May breed in dense freshwater marshes and extensive wet meadows near open water.
Bald eagle	SP, KCPS	Common year-round; breeding confirmed. Nests in prominent trees near large waterbodies; feeds primarily on fish.
Band-tailed pigeon	SP, KCSLI	Common during breeding season, occasionally seen at other times; breeding possible. Nests in trees, often favoring open sites bordered by tall conifers. Mineral springs provide important nutrients.
Barrow's goldeneye	SP, KCSLI	Occasional visitor to Lake Sammamish during winter.
Belted kingfisher	KCSLI	Fairly common year-round resident; breeding possible. Nests in sandy vertical banks near shorelines and wetlands in freshwater and saltwater environments.
Brant	SP, KCSLI	Rare winter visitor to Marymoor Park.
Cinnamon teal	KCSLI	Occasional spring visitor to Marymoor Park. Associated with small, shallow, freshwater wetlands with emergent vegetation.

Table 3-6. Wildlife Species of Concern in the Study Area (continued)

Species	Status[b]	Habitat Use in Study Area
Common goldeneye	SP, KCSLI	Common winter visitor to Lake Sammamish.
Common loon	SS, SP	Occasional visitor to Lake Sammamish.
Great blue heron	SP, KCSLI, KCPS, RSLI	Common year-round; breeding confirmed. Nests in mature forests, forages in shallow, slow-moving or still calm water. There is a nesting colony in Marymoor Park, approximately 3,200 feet south of the proposed alignment.
Hairy woodpecker	KCSLI	Uncommon year-round; confirmed breeding. Associated with mature coniferous forest, as well as mixed forests, wooded parks, and conifer-lined streams and shorelines. Nests in holes excavated in deciduous trees or conifer snags.
Hooded merganser	SP, KCSLI	Common year-round; breeding possible. Nests in tree cavities near small, forested, freshwater wetlands with emergent vegetation. Low-elevation freshwater lakes, ponds, sloughs, and slow-moving rivers are all used.
Olive-sided flycatcher	KCSLI	Occasionally seen during breeding season. Nests along forest edges and openings. Tall, prominent trees and snags serve as singing and foraging perches.
Osprey	KCSLI	Common during breeding season. Nests on an artificial platform near SR 520 at northern end of Marymoor Park. Forages on fish in Lake Sammamish and the Sammamish River.
Peregrine falcon	SP, KCPS	Occasionally seen at all times of year. No nesting habitat (cliffs and cliff-like structures) nearby.
Pileated woodpecker	SC, SP	Occasionally seen year-round; breeding possible. Requires forested habitats with large trees and snags.
Purple finch	KCSLI	Common year-round; breeding possible. Generally found in moist coniferous and mixed-forest lowlands, especially those with many openings and edges and an abundant understory.
Purple martin	SC, SP	Uncommon during breeding season. Nests in tree cavities or artificial structures over water; feeds over open land near water. Regularly seen using nest gourds at north end of Lake Sammamish.
Trumpeter swan	SP, KCSLI	Occasional winter visitor to Marymoor Park.
Tundra swan	SP, KCSLI	Rare winter visitor to Marymoor Park.
Vaux's swift	SC, SP, KCPS	Common during breeding season; breeding possible. Nests and roosts in natural cavities with vertical entranceways, such as hollow trees and snags, in areas of coniferous or mixed forest.
Western grebe	SC, SP, KCSLI	Fairly common, winter; rare, summer. Generally found on open water.
Western meadowlark	KCSLI	Uncommon, winter; occasional visitor during breeding season. Associated with open habitats, such as grasslands and agricultural areas. Nest on the ground, typically under dense vegetation.
Western screech-owl	KCSLI	Occasionally seen, year-round. Nests in natural or artificial cavities found in open woodlands, forested stream banks, suburban areas, and parks.
Wood duck	SP, KCSLI	Common in summer, uncommon during winter; breeding confirmed. Nests in tree cavities near wooded wetlands and slow-moving, tree-lined rivers.

Table 3-6. Wildlife Species of Concern in the Study Area (continued)

Species	Status[b]	Habitat Use in Study Area
Mammals		
Mink	KCSLI	Anecdotal observations in Marymoor Park. Associated with streams, rivers, lakes, swamps, and marshes, as well as surrounding forests and meadows.
Big-brown bat, *Myotis* bats	SP, KCSLI	No known maternity or hibernation colonies or other concentrations in or near the study area. Summer roosts generally are in buildings, bridges, hollow trees, spaces behind exfoliating bark, rock crevices, or tunnels. Maternity colonies may form in attics, barns, rock crevices, or tree cavities. Caves, mines, and buildings are used for hibernation.
Townsend's big-eared bat	SC, SP, KCPS	No known maternity or hibernation colonies or other concentrations in or near the study area. Maternity and hibernation colonies typically are in caves, mine tunnels, and old buildings. Caves, tunnels, buildings, and tree cavities are used as night roosts.

Sources: eBird 2017; Friends of Marymoor Park 2016; Hallock and McAllister 2005, 2009; NatureServe 2017; Opperman et al. 2006; Seattle Audubon Society 2017; U.S. Army Corps of Engineers and King County 2002; WDFW 2017a.

[a] Species of concern are those for which fish and wildlife habitat conservation areas are established under the critical areas rules of King County and the City of Redmond. Note that no terrestrial species listed or proposed for listing under the ESA are known or expected to use habitats in the study area.

[b] SC = Candidate for state listing; SP = State priority species; KCSLI = King County species of local importance; KCPS = King County protected species.

The King County Critical Areas Code (KCC 21A.24.382, updated May 12, 2017) applies restrictions on proposed developments near nests or colonies of certain species (identified as King County protected species in Table 3-6 above). Table 3-7 lists these species and the restrictions that apply under KCC 21A.24.382, and assesses the applicability of the restrictions to the project. Note that Table 3-7 includes all species listed in KCC 21A.24.382, and not just those that are known or expected to use habitats in the study area. Note also that these restrictions only apply within Marymoor Park, where King County has jurisdiction.

Table 3-7. Development Restrictions for King County Protected Species[a]

Species	Restrictions	Applicability to Project
Bald eagle	No modifications within 800 feet of nest between March 15 and April 30. No operation of land-clearing machinery within 800 feet of nest between January 1 and August 31.	No known nests within 800 feet of the proposed alignment. Nearest mapped nest is approximately 0.8 mile away.
Great blue heron	No clearing or grading allowed within 924 feet of a rookery between January 1 and July 31.	Nearest active rookery is more than 1,000 feet from the proposed alignment.
Marbled murrelet	Protect area within 0.5 mile of active nests.	No known nests or suitable nesting habitat within 0.5 mile of the proposed alignment.
Northern goshawk	Protect area within 1,500 feet of active nests located outside of the Urban Growth Area (UGA)	Not applicable: Study area is within the UGA. No known nests or suitable nesting habitat within 1,500 feet of the proposed alignment.
Osprey	No modifications within 660 feet of active nests between April 15 and September 30.	Nest on artificial platform approximately 20 feet from proposed alignment (see Figure 3-6).

Table 3-7. Development Restrictions for King County Protected Species[a] (continued)

Species	Restrictions	Applicability to Project
Peregrine falcon	No land-clearing activities that result in loud noises within 0.5 mile of an eyrie on a cliff face between March 1 and June 30.	No known eyries or cliff faces within 0.5 mile of the proposed alignment.
Spotted owl	Protect area within 3,700 feet of active nests.	No known nests or suitable nesting habitat within 3,700 feet of the proposed alignment.
Townsend's big-eared bat	Protect areas within 450 feet of active nursery colonies or winter hibernacula outside of the UGA. No modification or destruction of buildings, bridges, tunnels, or other structures used solely for day or night roosting between March 1 and November 30.	Not applicable: Study area is within the UGA. No known nursery colonies, winter hibernacula, or roost sites used by this species in the project area.
Vaux's swift	No clearing, grading, or outdoor construction within 400 feet of an active or potential nest tree outside of the UGA between April 1 and October 31.	Not applicable: Study area is within the UGA.

[a] King County also requires protection of active breeding sites of any federally listed or state-listed endangered, threatened, sensitive, and candidate species or King County species of local importance not listed in KCC 21A.24.382.

The USFWS Information, Planning, and Conservation System identified three ESA-listed wildlife species, and one species proposed for listing, as potentially occurring in areas that might be affected by the project (USFWS 2017b). None of these species is expected to occur in the study area, however, for the following reasons:

- Marbled murrelets, listed as threatened, require old-growth forest for nesting and marine habitat for foraging. No breeding or foraging habitat is present in the study area and no observations have been documented within 10 miles (WDFW 2017a). The nearest location where critical habitat has been designated for the marbled murrelet is more than 25 miles from the study area.
- Yellow-billed cuckoos, listed as threatened, require large blocks of riparian forest habitat for breeding and foraging. No such habitat is present in or near the study area. Currently, the species no longer breeds in western Canada and the northwestern continental United States (Washington, Oregon, and Montana) (79 FR 59992, October 3, 2014). No observations of this species have been documented within 10 miles of the study area (WDFW 2017a). No critical habitat for the yellow-billed cuckoo has been proposed in Washington.
- Streaked horned larks, listed as threatened, are known to occur in Washington only in portions of southern Puget Sound, along the Washington coast, and at lower Columbia River islands (78 FR 61452, October 3, 2013). Breeding habitat for streaked horned larks in Washington consists of grasslands and sparsely vegetated areas at airports, sandy islands, and coastal spits. The subspecies is largely absent from the Puget Trough during the non-breeding season; individuals observed in this area outside of the breeding season have been seen using habitats similar to those used for breeding. No such habitat is present in the study area, and the study area is not within the known range of the subspecies. The nearest location where critical habitat has been designated for the streaked horned lark is more than 100 miles from the study area.

- North American wolverines, proposed for listing as threatened, avoid people and developed areas, and prefer cold and remote mountainous areas with persistent spring snow cover. No such habitat is present in the lowland, urban setting of the study area.

The project area does not include any parts of the official wildlife habitat network defined and mapped in the King County Comprehensive Plan.

The Migratory Bird Treaty Act of 1918, administered by USFWS, makes it unlawful to take, import, export, possess, sell, purchase, or barter any migratory bird, with the exception of the taking of game birds during established hunting seasons. The term, *take*, in this context, includes mortality or capture of migratory birds that directly and foreseeably results from an action. The law also applies to feathers, eggs, nests, and products made from migratory birds. Nearly all bird species that may occur in the study area are protected under the Migratory Bird Treaty Act. All habitats in the study area support migratory birds of some type at some time in their life cycle; therefore, all habitats identified above would be considered habitat for migratory birds.

3.3 Wetlands

Eleven wetlands were identified in the study area. Characteristics of the wetlands are described in Section 3.3.1. The mapped location of the wetlands is shown in Figure 3-7a and Figure 3-7b. A comprehensive description of the background research and field investigation results is presented in the Wetland and Stream Delineation Report (Attachment C). The information in that report is summarized in the following subsections. A summary of wetland characteristics is included in Table 3-8.

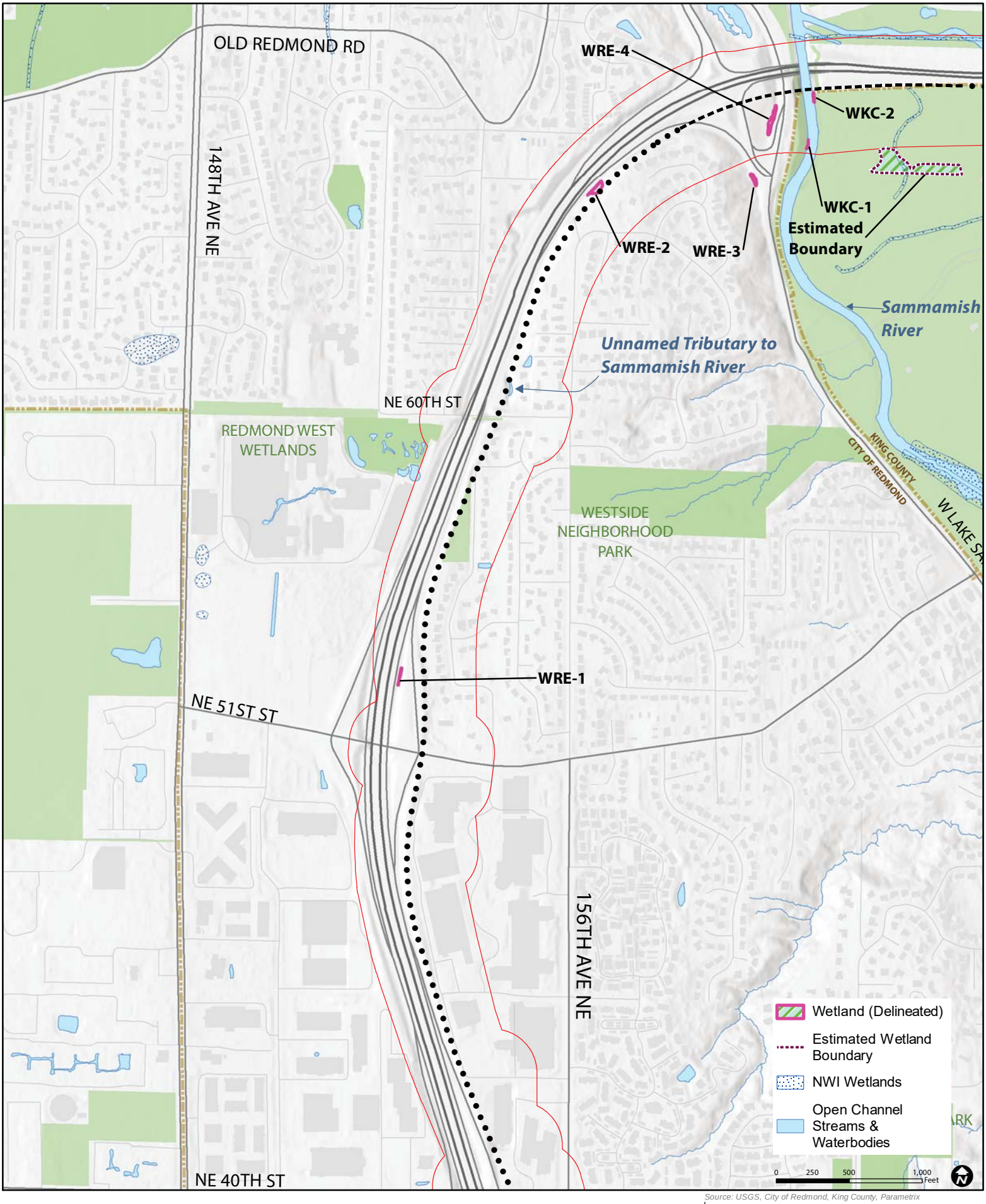
Sound Transit will request confirmation of wetland determinations from local regulatory agencies for those wetlands and streams that could be affected in the study area.

Table 3-8. Summary of Wetlands in the Study Area

Wetland	Area (acres)	USFWS Classification[a]	HGM Classification[b]	Ecology Rating (2004)[c]	Ecology Rating (2014)[d]	Local Jurisdiction Category	Standard Buffer Width (feet)
WRE-1	0.02	PEM	Slope	N/A	IV	IV[e]	50[f]
WRE-2	0.01	PSS	Slope	N/A	IV	IV[e]	50[f]
WRE-3	0.03	PFO	Depressional	N/A	IV	IV[e]	50[f]
WRE-4	0.08	PEM	Depressional	N/A	III	III[e]	80[f]
WKC-1	0.01	PSS	Riverine	III	III	III[g]	75[h]
WKC-2	0.01	PSS	Riverine	III	III	III[g]	75[h]
WKC-3	5.05	PFO/SS/EM	Depressional	III	III	III[g]	125[h]
WRE-5	>10	PFO/SS/EM	Riverine	N/A	I	I[e]	150[f]
WRE-6	0.43	PFO/SS	Riverine	N/A	I	I[e]	150[f]
WRE-7	>5	PFO/SS/EM	Riverine	N/A	I	I[e]	150[f]
WRE-8	1.01	PFO/SS/EM	Depressional	N/A	II	II[e]	150[f]
WRE-9	0.01	PFO	Depressional	N/A	III	III[e]	80[f]

PEM = palustrine emergent
PFO = palustrine forested
PSS = palustrine scrub-shrub
N/A = Not applicable

[a] FGDC 2013; Cowardin et al. 1979
[b] Brinson 1993
[c] Hruby 2004
[d] Hruby 2014
[e] RZC 21.64.030(A)
[f] RZC Table 21.64.030(A)
[g] KCC 21A.24.318(A)
[h] KCC 21A.24.325(A)(1)



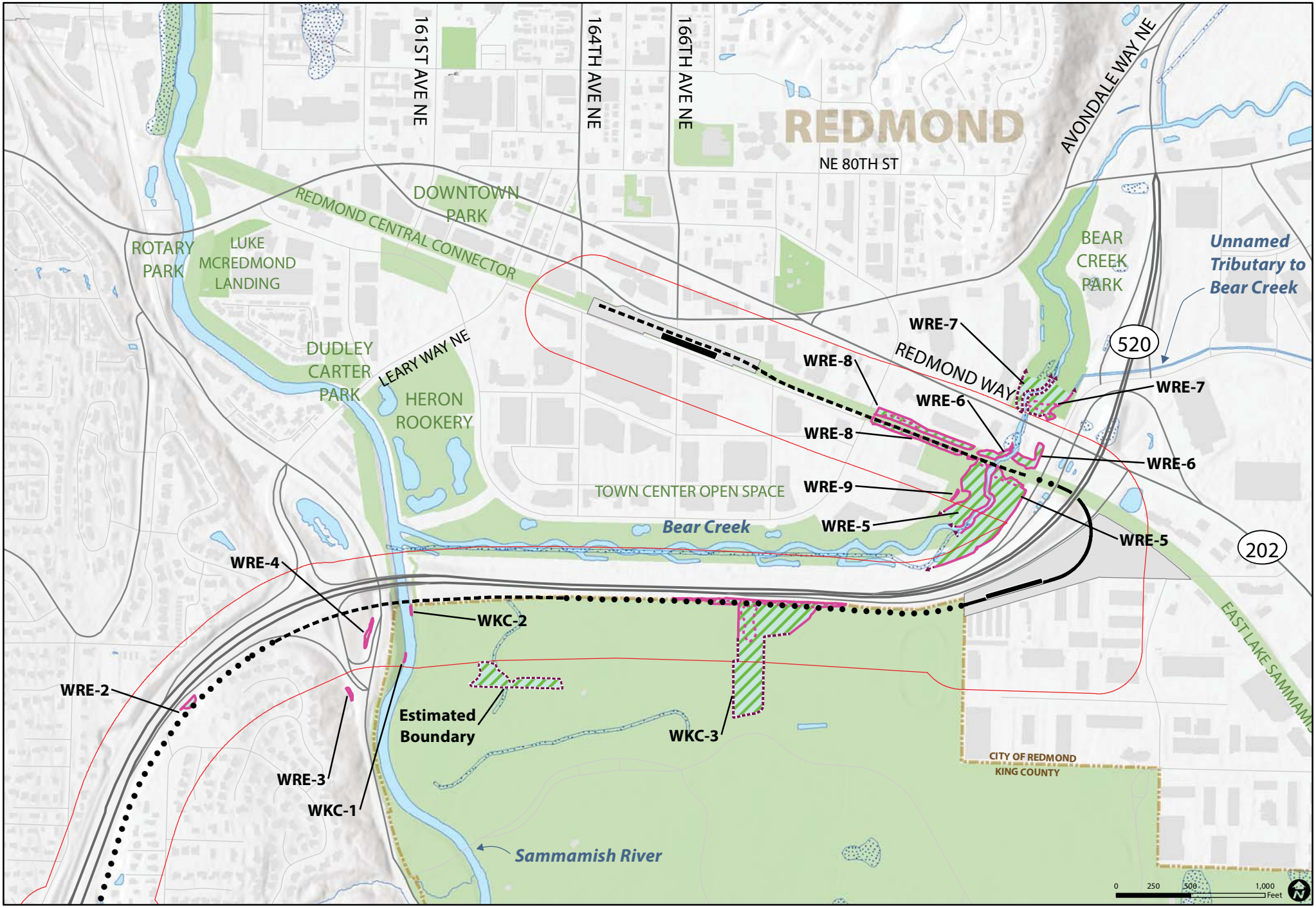
Source: USGS, City of Redmond, King County, Parametrix

Alignment
- At-Grade
- Elevated
- Retained Cut/Fill

- Station Platform
- Station
- Parks / Open Space

- Wetlands Study

Figure 3-7A
Wetlands
Downtown Redmond Link Extension



Source: USGS, City of Redmond, King County, Parametrix

Alignment
- At-Grade
- Elevated
- Retained Cut/Fill

- Station Platform
- Station
- Parks / Open Space

- Wetlands Study

- Wetland (Delineated)
- Estimated Wetland Boundary
- Habitat Type Break

- NWI Wetlands
- Open Channel Streams & Waterbodies

Figure 3-7B
Wetlands
Downtown Redmond Link Extension

3.3.1 Wetland Descriptions

3.3.1.1 Wetland WRE-1

Size: 0.02 acre
City of Redmond Rating: Category IV
USFWS Classification: Palustrine Emergent
HGM Classification: Slope

Wetland WRE-1 is located east of eastbound SR 520 and north of NE 51st Street (see Figure 3-8). The wetland is positioned in a roadside ditch (PJD 3) and extends approximately 10 feet upslope to the east before transitioning to uplands. This wetland boundary is defined by the extent of seeps and an expression of groundwater. Water from the wetland discharges to a roadside ditch (PJD 3).

Wetland hydrology is supported by groundwater expression and seeps as well as overland flow. Water generally moves through the wetland from east to west before discharging to PJD 3. Soil saturation and a high water table were observed in the wetland. Wetland WRE-1 is vegetated with an emergent plant community. Vegetation within the wetland includes cattail, soft rush, giant horsetail, colonial bentgrass, and bird's-foot trefoil (Figure 3-8). Soils met the depleted matrix hydric soil indicator.

Figure 3-8. Wetland WRE-1 photographed adjacent to SR 520 north of NE 51st Street

3.3.1.2 Wetland WRE-2

Size: 0.01 acre
City of Redmond Rating: IV
USFWS Classification: Palustrine Scrub-Shrub
HGM Classification: Slope

Wetland WRE-2 is located at the toe of a steep slope east of SR 520, north of NE 60th Street (see Figure 3-7a). Groundwater springs emerge approximately 20 feet above the toe of slope.

Groundwater expression supports the wetland hydrology. The wetland outlets to a ditch along SR 520 (PJD 6). A high water table and soil saturation was observed in the wetland.

Wetland WRE-2 is vegetated with a scrub-shrub plant community. Vegetation within the wetland includes Himalayan blackberry, Nootka rose, lady fern, giant horsetail, and creeping buttercup (Figure 3-9). Soils met the depleted matrix hydric soil indicator.

Figure 3-9. Wetland WRE-2 photographed adjacent to SR 520

3.3.1.3 Wetland WRE-3

Size: 0.03 acre
City of Redmond Rating: IV
USFWS Classification: Palustrine Forested
HGM Classification: Depressional

Wetland WRE-3 is located in a depression between SR 520 road fill and a steep slope, south of the SR 520 eastbound off-ramp to West Lake Sammamish Parkway NE (see Figure 3-7a).

Groundwater expression surface runoff and inputs from PJD 7 support the wetland hydrology. The outlet is a catch basin at the southern end of the wetland. A high water table, shallow inundation, and soil saturation was observed in the wetland.

Wetland WRE-3 is vegetated with a forested plant community. Vegetation within the wetland includes western red cedar, red alder, Himalayan blackberry, salmonberry, and reed canarygrass (Figure 3-10). Soils met the redox dark surface hydric soil indicator.

Figure 3-10. WRE-3 photographed to the east and south of SR 520, and west of West Lake Sammamish Parkway NE

3.3.1.4 Wetland WRE-4

Size: 0.08 acre
City of Redmond Rating: III
USFWS Classification: Palustrine Emergent
HGM Classification: Depressional

Wetland WRE-4 is located in a linear depression positioned in the SR 520 interchange with West Lake Sammamish Parkway NE (see Figure 3-7a).

Wetland hydrology is likely supported by seeps and surface flow from the adjacent ramp and slope. The outlet is a catch basin that allows up to 2 feet of impoundment in the wetland. A high water table, shallow inundation and sheet flow, and soil saturation were observed in the wetland.

Wetland WRE-4 is vegetated with an emergent plant community. Vegetation within the wetland is composed of reed canarygrass, meadow foxtail, common velvetgrass, giant horsetail, common rush, and Himalayan blackberry (Figure 3-11). Soils met the depleted matrix hydric soil indicator.

Figure 3-11. Wetland WRE-4 photographed to the east of West Lake Sammamish Parkway NE

3.3.1.5 Wetland WKC-1

Size: 0.01 acre
King County Rating: III
USFWS Classification: Palustrine Scrub-Shrub
HGM Classification: Riverine

Wetland WKC-1 is located on a riverine bench on the west (left) bank of the Sammamish River, upstream from the SR 520 bridge (see Figure 3-7a). It is part of a restoration area completed by WSDOT related to SR 520 improvements.

Wetland hydrology is supported by seasonal high flows and a high water table associated with the Sammamish River.

Wetland WKC-1 contains a scrub-shrub plant community. Vegetation within the wetland includes willow, cutleaf blackberry, Himalayan blackberry, and reed canarygrass (Figure 3-12). Soils met the depleted matrix hydric soil indicator.

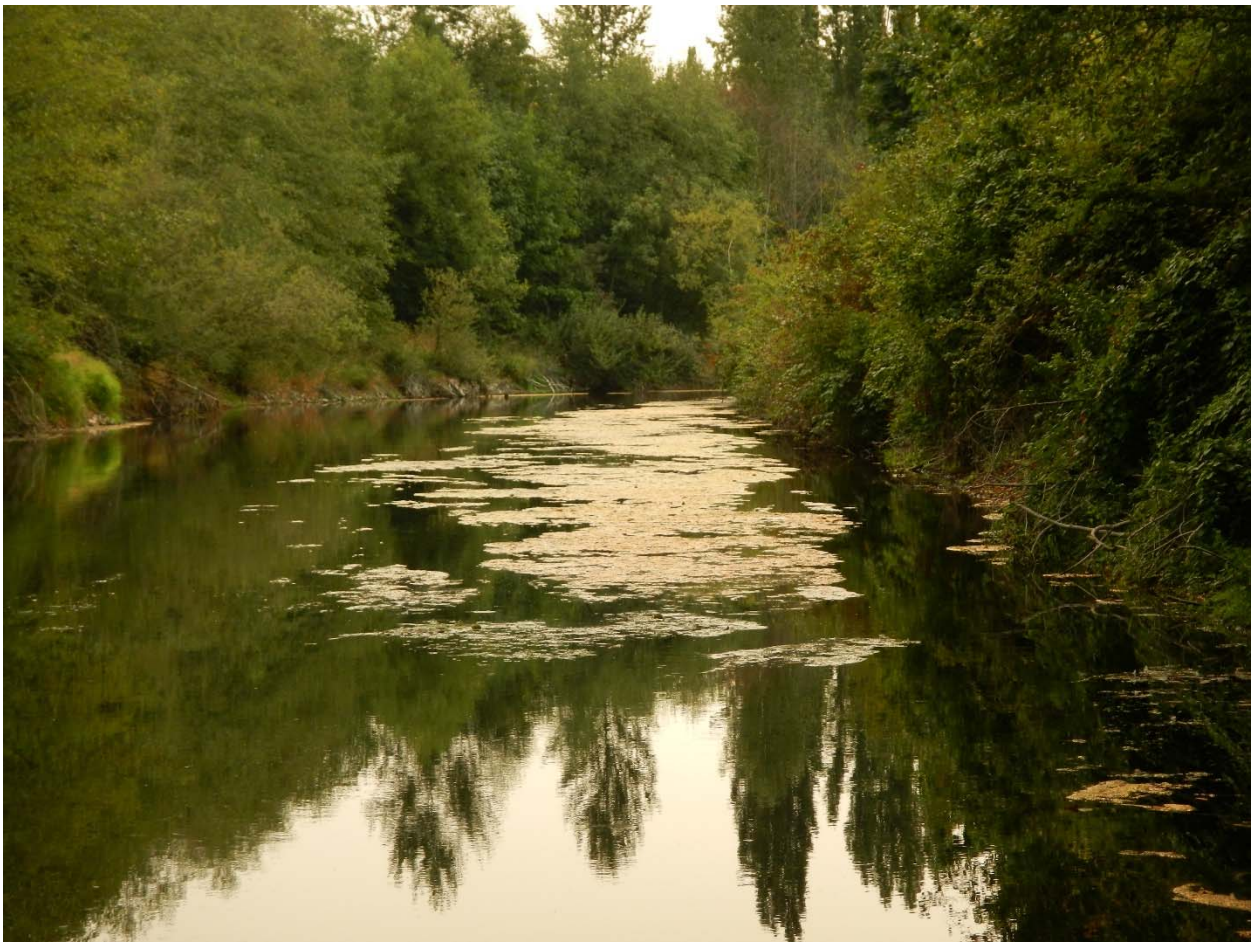


Figure 3-12. Wetland WKC-1 south of SR 520 and east of West Lake Sammamish Parkway NE

3.3.1.6 Wetland WKC-2

Size: 0.01 acre
King County Rating: III
USFWS Classification: Palustrine Scrub-Shrub
HGM Classification: Riverine

Wetland WKC-2 is located on a riverine bench on the east (right) bank of the Sammamish River, upstream from the SR 520 bridge (see Figure 3-7a). Similar to Wetland WKC-1, it is part of a restoration area completed by WSDOT related to SR 520 improvement projects.

Wetland hydrology is supported by seasonal high flows and a high water table associated with the Sammamish River.

Wetland WKC-2 contains a scrub-shrub plant community. Vegetation within the wetland includes willow, Himalayan blackberry, and reed canarygrass (Figure 3-13). Soils met the depleted matrix and depleted below dark surface hydric soil indicators.

Figure 3-13. Wetland WKC-2 and the Sammamish River photographed from the Sammamish River Trail south of SR 520

3.3.1.7 Wetland WKC-3

Size: 5.05 acre
King County Rating: III
USFWS Classification: Palustrine Forested/Scrub-Shrub/Emergent
HGM Classification: Depressional

Wetland WKC-3 is located in a depression adjacent to SR 520, along the northern perimeter of Marymoor Park. Several park-related playing fields flank the wetland: a soccer field to the west and a cricket pitch to the east (see Figure 3-7b). Wetland WKC-3 is a King County mitigation site enhanced in 2000 to compensate for impacts in Marymoor Park.

Wetland hydrology is supported by a high groundwater table and surface water runoff from adjacent areas including SR 520, adjacent grasslands, and playing fields. The wetland appears to outlet to the south into adjacent wetland areas, but no outlet structure was observed. A high water table, inundation, and saturated soils were present during field investigations.

Wetland WKC-3 contains forested, scrub-shrub, and emergent plant communities. The forested plant community is dominated by Oregon ash, red alder, Sitka spruce, and black cottonwood with an understory of willow, reed canarygrass, and slough sedge. The scrub-shrub community is dominated by Douglas spiraea, willow, Nootka rose, red osier dogwood, and shore pine with an understory of reed canarygrass. The emergent community includes slough sedge, Kentucky bluegrass, and reed canarygrass (Figure 3-14). Soils met the depleted matrix hydric soil indicator.

Figure 3-14. The palustrine forested and palustrine scrub-shrub component of Wetland WKC-3, positioned east of Marymoor Park Soccer Field 3

3.3.1.8 Wetland WRE-5

Size: Over 10 acres
City of Redmond Rating: I
USFWS Classification: Palustrine Forested/Scrub Shrub/Emergent
HGM Classification: Riverine

Wetland WRE-5 is located in a floodplain on the right and left banks of Bear Creek in the city of Redmond. Wetland WRE-5 is part of a much larger riparian wetland complex that extends upstream and downstream of the study area. In the study area, Wetland WRE-5 is west of an abandoned (railbanked) section of the BNSF railroad and its bridge, which separates Wetland WRE-5 from Wetland WRE-6 to the east (upstream) (see Figure 3-7b).

Wetland hydrology is supported by seasonal high flows associated with Bear Creek, groundwater, and surface water runoff. Wetland hydrology indicators observed included a high water table, saturation, sediment deposits, drift deposits, water-stained leaves, and drainage patterns.

Wetland WRE-5 contains a forested, scrub-shrub, and emergent plant community. Vegetation within Wetland WRE-5 includes Oregon ash, red alder, black cottonwood, common snowberry, Nootka rose, Sitka spruce, Himalayan blackberry, salmonberry, and reed canarygrass (Figure 3-15). Soils met the depleted matrix and redox dark surface hydric soil indicators.

Figure 3-15. Wetland WRE-5 and a side channel of Bear Creek pictured downstream of the railroad fill prism and east of the main Bear Creek channel

3.3.1.9 Wetland WRE-6

Size: 0.43 acre
City of Redmond Rating: I
USFWS Classification: Palustrine Forested/Scrub Shrub
HGM Classification: Riverine

Wetland WRE-6 is located in a floodplain on the right and left banks of Bear Creek (see Figure 3-7b). Wetland WRE-6 is separated from downstream Wetland WRE-5 by the railroad bridge (see description above) and from upstream Wetland WRE-7 by the SR 202 bridge over Bear Creek.

Wetland hydrology is supported by seasonal high flows associated with Bear Creek, groundwater, and surface water runoff. Wetland hydrology indicators observed included a high water table, saturation, water marks, sediment deposits, drift deposits, water-stained leaves, and drainage patterns.

Wetland WRE-6 contains a forested, scrub-shrub, and emergent plant community. Vegetation within Wetland WRE-6 includes black cottonwood, red alder, Himalayan blackberry, slough sedge, large-leaf avens, and reed canarygrass (Figure 3-16). Soils met the depleted matrix and redox dark surface hydric soil indicators.

Figure 3-16. Wetland WRE-6 photographed upstream of the railroad crossing over Bear Creek

3.3.1.10 Wetland WRE-7

Size: Over 5 acres
City of Redmond Rating: I
USFWS Classification: Palustrine Forested/Scrub-Shrub
HGM Classification: Riverine

Wetland WRE-7 is located in a floodplain on the right and left banks of Bear Creek (see Figure 3-7b). Wetland WRE-7 is separated from downstream Wetland WRE-6 by the SR 202 bridge over Bear Creek (see description above).

Wetland hydrology is supported by seasonal high flows associated with Bear Creek, groundwater, and surface water runoff. Wetland hydrology indicators observed included a high water table, saturation, water marks, sediment deposits, drift deposits, water-stained leaves, and drainage patterns.

Wetland WRE-7 contains a forested, scrub-shrub, and emergent plant community. Vegetation within Wetland WRE-7 includes black cottonwood, Himalayan blackberry, willows, and reed canarygrass (Figure 3-17). Soils met the depleted matrix and redox dark surface hydric soil indicators.

Figure 3-17. Wetland WRE-7 photographed north of Redmond Way

3.3.1.11 Wetland WRE-8

Size: 1.01 acre
City of Redmond Rating: II
USFWS Classification: Palustrine Forested/Scrub-Shrub/Emergent
HGM Classification: Depressional

Wetland WRE-8 is located in an obvious depression on both sides of the paved Redmond Central Connector Trail, south of 170th Avenue NE, in the city of Redmond (see Figure 3-7b).

Wetland hydrology is supported by high groundwater, surface runoff from adjacent areas, and inputs from a 12-inch culvert at the southern extent of the wetland, with potential stormwater input from the nearby paved parking area, trail, and Redmond Way. The outlet is a highly constricted 18-inch culvert that extends beneath 170th Avenue NE. Inundation and saturation were observed.

Wetland WRE-8 contains a scrub-shrub and emergent plant community. Vegetation within the wetland includes paper birch, Oregon ash, one-seed hawthorn, Himalayan blackberry, and reed canarygrass (Figure 3-18). Soils met the depleted matrix hydric soil indicator.

Figure 3-18. Wetland WRE-8 photographed adjacent to the Redmond Central Connector Trail

3.3.1.12 Wetland WRE-9

Size: 0.01 acre
USFWS Classification: Palustrine Forested
HGM Classification: Depressional
Local Jurisdiction: City of Redmond
Local Rating: Category III
Sample Plots: SP-102 (UPL), SP-103 (WET), SP-104 (UPL)

Wetland WRE-9 is located in a small depression to the east of the Bear Creek Trail and to the west of Bear Creek in the city of Redmond (Figure 3-18). The wetland boundary is defined by a gradual change in soil and vegetation and an abrupt topographical change that coincides with banks of the depression. The area above the depression lacks hydric soils and wetland hydrology.

Wetland hydrology is supported by a high groundwater table, which fluctuates depending on the flow of Bear Creek. There is no outlet or inlet to this wetland area, where a sparsely vegetated concave surface and water-stained leaves were observed. In addition, the vegetation passed the facultative-neutral test.

Wetland WRE-9 contains a forested plant community. Vegetation within the wetland includes black cottonwood, Oregon ash, and a trace amount of Himalayan blackberry.

Soil at SP-103 is representative of other soils observed in the wetland. Soil was examined to a depth of 18 inches and consists of two layers. The top layer is an 8-inch-thick, very dark brown (10YR 2/2) loam. The bottom 10-inch-thick layer is dark grayish brown (2.5YR 4/2) loam with strong brown (7.5YR 4/6) redoximorphic features. Soils meet the *depleted below dark surface* and *depleted matrix* hydric soil indicators. Soils in the wetland are mapped as Indianola loamy sand by the NRCS (USDA 2017).

The buffer surrounding Wetland WRE-9 includes a forested upland area to the north and south, the Bear Creek floodplain to the east, and Bear Creek Trail to the west. The upland area includes black cottonwood, Douglas-fir, Oregon ash, Himalayan blackberry, snowberry, osoberry, stickywilly, and Robert geranium. See Wetland WRE-5 and Bear Creek sections for a description of the floodplain buffer to the east.

Wetland WRE-9 is classified as palustrine forested under the USFWS system and depressional under the HGM system. Wetland WRE-9 scored 17 points using Ecology's 2014 rating form and therefore is rated as Category III according to the City of Redmond (RZC 21.64.030) and Ecology (see Attachment C.3). Overall, functions provided by Wetland WRE-9 are moderately low, as assessed by Ecology's Rating System.

Water quality functions for Wetland WRE-9 scored 6 points (moderately low). Because there is no outlet, there is the potential to pond water. In addition, persistent ungrazed vegetation comprises over 50 percent of the site and improves water quality through sediment trapping and shading.

The hydrologic functions score of Wetland WRE-9 is 5 points (moderately low). The lack of outlet and ponding potential allow for greater surface water storage; however, marks of ponding at the site measured to be less than 0.5 foot high. Because Wetland WRE-9 has no outlet, surface water is detained, thus reducing downstream flooding. However, downstream flooding is not a significant issue; therefore, the wetland has limited opportunity to provide this function.

The habitat score of Wetland WRE-9 is 6 points (moderately low). Despite the multiple vegetation classes with a moderate species diversity, the small size of the wetland resulted in a low interspersion of habitats at the site. Special habitat features include LWD, snags, and the lack of invasive species. The surrounding accessible habitat and undisturbed habitat is limited by Bear Creek Trail and the surrounding urban development.

Figure 3-19. Wetland WRE-9 photographed to the east of Bear Creek Trail

4 ENVIRONMENTAL CONSEQUENCES

This chapter describes a summary of the project actions most relevant to this discipline, followed by the expected temporary construction and permanent operational effects of the 2011 Project (as shown on the plan set dated October 10, 2017) on the following resources:

- Aquatic Resources (Section 4.1)
- Vegetation and Wildlife Resources (Section 4.2)
- Wetland Resources (Section 4.3)

The discussion of project impacts assumes that the best management practices (BMPs) described in the 2011 East Link Final EIS, Appendix H3, would be implemented and performed as expected to avoid and minimize certain impacts during construction. Additional impact avoidance and minimization measures for work below the OHWM of Bear Creek and the Sammamish River are under development. For potential mitigation measures, see Chapter 5.

During the 2011 East Link Final EIS process, Sound Transit prepared a biological assessment for ESA consultation. Analyses in that document were based in part on the expectation that no construction activities or permanent structures would be required below the OHWM of Bear Creek or the Sammamish River. As described in Section 1.1 of this document, that is no longer the case. To address the resultant changes in the manner or extent of anticipated effects on ESA-listed species, FTA and Sound Transit reinitiated consultation with NMFS. FTA and Sound Transit also asked USFWS about the need for reinitiation of consultation for species under that agency's jurisdiction. USFWS responded that reinitiation is not warranted or necessary at this time. On June 15, 2018, NMFS issued a biological opinion with a determination that construction and operation of the Downtown Redmond Link Extension will not jeopardize the continued existence of ESA-listed species under that agency's jurisdiction (NMFS 2018).

4.1 Aquatic Resources

Sound Transit considered the following potential impacts on aquatic resources:

- Direct fish mortality
- Permanent loss of physical habitat
- Permanent degradation of in-stream physical habitat, such as shading, chronic sedimentation, removal of boulders or LWD from the channel, and loss of riparian vegetation function (loss of nutrient inputs, LWD recruitment, and shade)
- Permanent degradation of water quality (increased temperature, increased turbidity, increased loading of heavy metals and hydrocarbons)
- Temporary loss of physical habitat (dewatering)
- Temporary degradation of habitat (sedimentation, removal of riparian vegetation, disturbance to stream banks)
- Altered hydrology (higher peak flows result in increased scour/deposition downstream; decreased percolation from impervious surfaces result in lower base flows)
- Lighting
- Temporary or permanent degradation of water quality (turbidity, temperature, toxicants)
- Impacts on fish passage at culverts and new culverts

- Facilitation of urban development
- Beneficial impacts associated with in-stream and riparian restoration, and daylighting existing culverts

The analysis focused on salmonids because that is the group of species of greatest concern in Pacific Northwest freshwater environments. Because the habitat requirements and the mode of potential impacts are so similar for the salmonid species present, the analysis is generic and combined for all salmonid species. Species-specific impacts are identified where appropriate. The federally listed threatened and endangered aquatic species present in the study area are all salmonids and included in the combined analysis. The discussion herein is thus limited to the potential for impacts to each species based on the proximity of their known habitat in the project vicinity to sources of potential impacts from the project. Table 4-1 below identifies the temporary and permanent impacts anticipated to both streams and their associated buffers.

Table 4-1. Summary of Temporary Construction and Permanent Operational Impacts on Streams

Stream	Permanent Impact (acres)	Temporary Impacts (acres)	Permanent Buffer (acres)	Temporary Buffer (acres)
Unnamed Sammamish River Tributary	0.01	0	0.13	0
Sammamish River	0	0.01	0.29	0.45
Bear Creek	0.02	0.17	0.43[1]	0.71[1]
TOTAL	**0.03**	**0.18**	**1.01**	**1.16**

1 Includes wetland buffer impact for WR-5 and WR-6

4.1.1 Temporary Construction Impacts

Potential temporary construction impacts on aquatic resources, consisting primarily of increased risk of sedimentation and turbidity, are described in the 2011 East Link Final EIS Appendix H3 (Sound Transit 2011). Appropriate use of BMPs described in that document would mitigate the effects of most of those impacts. Analyses in that document did not address impacts associated with habitat improvement work in Bear Creek or the placement of stormwater outfalls below the OHWM of the Sammamish River. Those impacts are described below, followed by details about temporary impacts on riparian vegetation, which were not described in the 2011 East Link Final EIS Appendix H3.

The two guideway support columns below the OHWM of Bear Creek would be installed outside of the defined stream channel during the summer months when water levels are lowest. If measures to isolate the work areas from the stream channel are deemed necessary, sheet piles or similar structures would be installed around the support column construction areas. As such, installation of the guideway support columns would not be expected to result in adverse effects on aquatic resources, such as elevated levels of turbidity or contaminants.

Short-term adverse effects that could result from work for the improvements to Bear Creek include harassment and harm of fish when the existing stream channel is dewatered (before which fish would be excluded from the affected channel segment), as well as elevated levels of turbidity when water is introduced to the new channel. The potential for these activities to affect fish—ESA-listed fish species in particular—would be minimized or avoided altogether by conducting fish exclusion and flow reintroduction during the period when adults and juveniles of salmonid species are least likely to be present in the project area. This period generally coincides with the summer low-flow period.

Of the fish that are present in the stream while work is underway, many would likely move out of the affected stream segment to avoid the activity and turbidity associated with the project work, or they would not be present due to natural migration movements. Fish that remain in the affected stream segment would be at risk of harassment or harm during fish exclusion; fish in Bear Creek immediately downstream of the new channel would be exposed to elevated levels of turbidity when flow is introduced to that channel. Based on analyses completed for the Lower Bear Creek Restoration Project (see Section 3.1.1.2 for a summary of that project), it is unlikely that the effects of elevated turbidity levels would be lethal to adult or juvenile salmonids (NMFS 2009).

Potential short-term adverse effects associated with installation of the new stormwater outfalls in the Sammamish River would consist of elevated levels of turbidity due to disturbance of substrates below the OHWM. The potential for adverse effects on fish would be minimized or avoided altogether by conducting the work when adults and juveniles of salmonid species are least likely to be present in the project area. Where ground-disturbing work below the OHWM is necessary, cofferdams would be used to isolate work areas from the river. Based on the anticipated implementation of these impact avoidance and minimization measures, the potential for adverse effects on aquatic resources, including fish, would be minimal.

Riparian vegetation is anticipated to be removed near the Sammamish River, its unnamed tributary, and Bear Creek. The project would temporarily remove 0.52 acre of riparian habitat along the Sammamish River, 0.57 acre along the unnamed tributary, and 1.54 acres along Bear Creek. Appendix H3 to the 2011 East Link Final EIS did not present estimates for the acreage of riparian vegetation disturbance near the Sammamish River and Bear Creek; therefore, a direct comparison to the effects described in that document is not possible. That document did, however, include the following assumptions: (1) a 100-foot-wide corridor through existing riparian vegetation would be cleared within the stream buffer of the Sammamish River to construct the elevated cast-in-place guideway, and (2) no riparian vegetation would need to be cleared near Bear Creek (Sound Transit 2011). The first assumption on corridor width is consistent with the current plans. With the design refinements that have reduced the height of the guideway at the Bear Creek crossing, the second assumption is no longer valid.

The riparian vegetation to be removed is primarily a mixture of native and non-native shrubs. In addition, approximately 86 trees would be removed from the Sammamish River and Bear Creek riparian areas. Specifically, 26 trees would be removed from the Sammamish River riparian area, 15 of which are significant trees (over 6 inches dbh) according to City of Redmond Code. Sixty trees would be removed from the Bear Creek riparian area, 28 of which are significant trees according to City of Redmond Code. The arborist's report for this project provides more details about the type and size of trees that would be affected. Removal of trees and shrubs would result in temporary reductions in riparian vegetation functions, such as nutrient inputs, LWD recruitment, and shade provision. These functions would gradually return to pre-construction levels as vegetation regrows. In the interim, the functions would continue to be provided by vegetation that remains in nearby riparian areas.

Following construction, all temporarily disturbed areas would be restored with appropriate native vegetation, consistent with the conceptual mitigation approach (Sound Transit 2011) and anticipated local permit requirements.

4.1.2 Permanent Operational Impacts

The presence of support structures below the OHWM of Bear Creek would reduce the amount of habitat available to aquatic species. Based on the location of these structures—more than 10 feet from the defined channel—combined with the fact that the stream remains within the defined channel under almost all flow conditions, the potential for adverse effects would be minimal. In addition, by increasing

the amount of aquatic habitat in the stream channel (through the construction of a wider channel), the project would result in a net increase in the amount of aquatic habitat in the study area. The reconfigured channel through the site of the existing railroad bridge would match the width of the existing channel upstream and downstream—i.e., 35 to 40 feet instead of its current width of approximately 30 feet. Pullback of the railroad fill prism would increase the amount of stream channel area by approximately 1,000 square feet.

Potential impacts on floodplain functions, including flood storage, are discussed in the technical report addendum for Water Resources. Broadly, by reconfiguring the stream channel and removing the flow constraints associated with the former railroad crossing, the project would be expected to reduce the amount of fill in the floodplain and to reduce the extent of the floodplain upstream of the Bear Creek crossing.

Over the long term, the proposed habitat improvements in Bear Creek would benefit aquatic species by increasing the amount of available habitat, improving habitat complexity, maintaining riparian cover and water quality, and increasing the prey base. See Section 1.1 for a discussion of the work proposed at Bear Creek.

The Bear Creek restoration work would be designed to establish a compositionally and structurally complex ecosystem with attributes important for supporting fish and wildlife. The channel reconfiguration would also reduce the floodplain stages upstream of the existing railroad bridge. The end result would tie into the restoration that was completed downstream of the study area for the SR 520, I-5 to Medina Bridge Replacement and HOV project. The floodplain would change in configuration with the removal of past floodplain encroachments. No unmitigated floodplain storage or floodway fill impacts are proposed.

The Proposed Design Refinements would construct a culverted crossing at the unnamed tributary just north of NE 60th Street (LLID 1221262476704), which is not fish bearing. This approximately 3,000-foot-long tributary is primarily conveyed by underground stormwater pipes between NE 60th Street to its discharge point at the Sammamish River. No stormwater features would discharge to this stream. The culvert would have been required for the 2011 Project, but the stream had not been mapped at the time.

Minor impacts to the channels of the Sammamish River are anticipated as a result of the project. A new stormwater outfall would be installed below the OHWM, altering existing bank habitat. The project would result in a permanent loss of 0.07 acre of riparian forested habitat along the Sammamish River, 0.06 acre along its tributary, and 0.56 acre along Bear Creek. In addition, the new bridges spanning the Sammamish River and Bear Creek would shade the channel and banks, modifying fish habitat and limiting re-establishment of vegetation in shaded areas.

Permanent project-related impacts on riparian habitat would occur where the elevated guideway spans areas of riparian vegetation. Trees and other tall vegetation underneath and within 15 feet of all elevated guideways would be permanently cleared for safety. In addition, construction of the elevated guideway above vegetation would reduce the amount of water the vegetation receives from precipitation. Finally, guideways with low clearance (generally, less than 15 feet) may limit sunlight. In some areas, vegetation cleared from beneath elevated guideways may not grow back. The presence of elevated guideways would preclude the development of mature forest habitat in such areas, reducing the potential for the recruitment of LWD to the stream.

Because the elevated guideway structures would be relatively narrow and generally more than 15 feet above the ground surface, shading impacts on riparian vegetation would be limited in most areas, although some impacts would result from shading and water interception. As learned from the Sound Transit Central Link project, herbaceous plants and shrubs are generally able to grow beneath narrow guideways that are at least 15 feet above the ground (Sound Transit 2011). Based on the nature and location of buffer impacts,

as well as the current condition of vegetation within the buffers, no substantial degradation of riparian functions (e.g., fish and wildlife habitat, food chain support, or water temperature maintenance) or processes is expected to result from project-related clearing.

Operation of the light rail system is not expected to result in any increases in nighttime illumination of fish-bearing waters (which could increase the risk of predation on juvenile salmonids) because the tracks would have no overhead lighting and the train headlights would be directed parallel to the tracks. Treatment of stormwater runoff from the project is expected to minimize the water quality effects of the project on aquatic resources. Near the SE Redmond Station, several stormwater facilities would be created to infiltrate runoff from the guideway. Some of the facilities may be open ponds, while others may be underground infiltration galleries or other suitable methods. Because water from these facilities would be infiltrated, it would not affect water quality or flows in any streams in the study area.

Stormwater runoff from the guideways would discharge to uplands, existing drainage systems, wetlands, and stormwater facilities. To minimize site-specific impacts, multiple outfalls would be used, and outfall protection would be installed at each one. Runoff from guideways would also discharge to new outfalls in the Sammamish River. The addition of these new stormwater outfalls would not affect water quality in the river because all runoff would be from non-pollution-generating surfaces. No changes in flow regime, including peak flows and base flows of the Sammamish River, would be expected because the volume of runoff from the small amount of added impervious surface would be miniscule compared to the magnitude of stream flows in the river.

4.2 Vegetation and Wildlife Resources

Construction of the light rail extension would result in temporary and permanent impacts to vegetation and wildlife. Table 4-2 summarizes temporary and permanent impacts to vegetation and wildlife habitats.

Table 4-2. Summary of Temporary Construction and Permanent Operational Impacts on Vegetation and Wildlife Habitats

Cover/Habitat Type	Temporary Construction Impact Area (acres)	Permanent Operational Impact Area (acres)
Developed—Commercial	6.03	9.41
Developed—Residential	0.84	0.60
Roadside Right-of-way	1.11	4.92
Unvegetated and Road	0.44	6.09
Mown grass	0.45	2.61
Grassland	1.06	0.59
Brush	0.02	0.62
Upland Forest	1.40	6.31
Riparian Forest	2.63	0.69
Riparian Shrub	0	0
Forested Wetland	0.67	0.61
Scrub-shrub Wetland	0.15	0.69
Emergent Wetland	0	0.37
Stream Channels	0.22	<0.01
Stormwater Ponds	0.06	0.35
TOTAL	**15.13**	**33.97**

4.2.1 Temporary Construction Impacts

The nature of temporary (construction-related) impacts on vegetation and wildlife would be as described in the 2011 East Link Ecosystems Technical Report. The extent of those impacts would be similar. A direct comparison of affected areas is not possible, however, because the characterization of the affected areas has been modified from what was used for that analysis.

Project construction would require temporary clearing and removal of vegetation from within the construction limits. A total of 15.13 acres would be temporarily cleared to build the project. Of this area, 0.44 acres are roadways or otherwise unvegetated; 1.11 acres are disturbed roadside right-of-way; and 6.87 acres are already developed. Table 4-1 summarizes the area of each cover type that would be temporarily removed by the project. Within some of these areas trees will be removed. A total of 651 trees is estimated to be removed for the project for construction access, including 425 significant trees (over 6 inches dbh) and 30 landmark trees (over 30 inches dbh). Most of the tree removal will occur in upland forest areas (approximately 600). Thirty-two trees will be removed from wetlands (including 20 significant and 2 landmark trees), and 60 trees from wetland buffers (including 40 significant trees and 1 landmark tree). Impacts to trees in riparian areas are discussed above in Section 4.1.1.

Construction activities would also temporarily affect wildlife in the general area. Impacts would occur from vegetation and habitat loss, disruption of travel corridors, noise impacts, and displacement of wildlife into potentially less suitable habitats where they might not thrive. Wildlife would likely be displaced when construction begins. Species displaced by construction noise would likely return after construction is complete. However, re-establishing native vegetation would require 2 to 4 years for herbaceous upland and wetland types, and decades for mature forest types.

As discussed in the 2011 East Link Final EIS, other temporary impacts to vegetation include the spread of noxious weeds and the impacts of noise and human impacts on wildlife.

4.2.2 Permanent Operational Impacts

As with temporary impacts, the nature of permanent (operational) impacts on vegetation and wildlife would be as described in the 2011 East Link Ecosystems Technical Report; however, although the extent of those impacts would be similar, a direct comparison of affected areas is not possible.

The permanent displacement of vegetated areas results in the overall regional long-term degradation of vegetation and wildlife habitats. A total of 33.97 acres would be permanently displaced by the project through conversion, including the location of 1,321 trees, of which 863 are significant and 15 are landmark trees. In addition to the permanent impact area, 651 trees will be removed for construction (as discussed above in Section 4.2.1). Of the permanent impact area, 6.09 acres are roadway or otherwise unvegetated; 4.92 acres are disturbed roadside right-of-way; and 10.01 acres are already developed. Table 4-1 summarizes the area of each cover type that would be permanently removed by the project.

4.3 Wetland Resources

Temporary construction and permanent operational impacts to wetlands resulting from construction of the light rail extension are listed in Table 4-1 and discussed in the sections above.

Approximately 0.86 acre of wetlands would be temporarily affected during construction and 1.59 acres of wetland would be permanently filled. The effects to individual wetlands and their buffers are presented in Table 4-3.

Table 4-3. Temporary and Permanent Impacts to Wetlands and their Buffers

Wetland	Vegetation Type	Rating	Temporary Impacts	Permanent Impacts	Temporary Buffer Impacts	Permanent Buffer Impacts
WKC-1	PSS	III	0	0	0	0
WKC-2	PFO/PSS	III	0	0	0	0
WKC-3	PFO/PSS/PEM	III	0.08	0.90	0.02	0.77
WRE-1	PEM	IV	0	0	0	0
WRE-2	PSS	IV	0	0.07	0	0
WRE-3	PFO	IV	0	0	0	0
WRE-4	PEM	III	0.08	0	0.79	0
WRE-5	PFO/PSS	I	0.467	0.07	0.22	0.25
WRE-6	PFO/PSS/PEM	I	0.23	0.05	0.48	0.18
WRE-7	PFO/PSS	I	0	0	0.25	0
WRE-8	PFO/PSS/PEM	II	0	0.50	1.90	0.64
WRE-9	PFO	III	0	0	0	0
Total			0.86	1.59	0.97[1]	1.42[1]

[1] Note: Some buffer areas overlap; therefore, a total buffer impact area is estimated based on merging of individual buffers.

5 POTENTIAL MITIGATION MEASURES

The Downtown Redmond Link Extension is being designed to comply with all federal, state, and local regulations. The project will use a mitigation sequencing approach based on a hierarchy of avoiding and minimizing adverse impacts through careful design, implementing BMPs, and rectifying temporary impacts. Applicable BMPs that were developed for the East Link Project would be implemented during project construction and operation.

BMPs and potential mitigation measures were identified in Appendix H3, Ecosystems Technical Report, of the 2011 East Link Final EIS. These measures would be implemented to minimize temporary impacts of the project. Terrestrial and aquatic habitats disturbed during construction would be restored after construction.

Unavoidable permanent impacts are expected to Bear Creek and 1.59 acre of wetland resources. Compensatory mitigation for these resources would be further developed concurrent with design refinements and permit applications. The impacts to Bear Creek would also include the removal of an artificial constriction and creosote-treated timber at the current bridge location, both of which would enhance Bear Creek habitat conditions.

The loss of terrestrial wildlife habitat would be mitigated by replanting selected areas within the project area. These areas would be selected and a planting plan developed in later stages of the design project.

Advanced mitigation, mitigation banks, traditional compensatory mitigation, and in-lieu fee programs that Sound Transit could propose to use for mitigation would also be included in the review of mitigation opportunities. Conceptual mitigation measures would be identified that are intended to avoid, minimize, rectify, or compensate for adverse impacts on the ecosystem resources covered in the NEPA/SEPA re-evaluation. Mitigation would be implemented in the same jurisdiction where the impact occurs.

If these off-site mitigation options are not available, sufficient, or suitable for the project, then permittee-responsible mitigation would be designed in the vicinity of the project corridor.

Mitigation measures would include specific goals and objectives and would specify monitoring criteria against which proposed mitigation measures can be compared. Mitigation measures would be generally described in enough detail so that reviewing agencies can determine the likelihood of the proposed mitigation succeeding and meeting all stated objectives. Compensatory wetland mitigation would be located and described in sufficient detail to demonstrate compensation for lost wetland functions and values.

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