INTERSTATE 5 COLUMBIA RIVER CROSSING

Ecosystems Technical Report

May 2008

Columbia River CROSSING

TO: Readers of the CRC Technical Reports

FROM: CRC Project Team

SUBJECT: Differences between CRC DEIS and Technical Reports

The I-5 Columbia River Crossing (CRC) Draft Environmental Impact Statement (DEIS) presents information summarized from numerous technical documents. Most of these documents are discipline-specific technical reports (e.g., archeology, noise and vibration, navigation, etc.). These reports include a detailed explanation of the data gathering and analytical methods used by each discipline team. The methodologies were reviewed by federal, state and local agencies before analysis began. The technical reports are longer and more detailed than the DEIS and should be referred to for information beyond that which is presented in the DEIS. For example, findings summarized in the DEIS are supported by analysis in the technical reports and their appendices.

The DEIS organizes the range of alternatives differently than the technical reports. Although the information contained in the DEIS was derived from the analyses documented in the technical reports, this information is organized differently in the DEIS than in the reports. The following explains these differences. The following details the significant differences between how alternatives are described, terminology, and how impacts are organized in the DEIS and in most technical reports so that readers of the DEIS can understand where to look for information in the technical reports. Some technical reports do not exhibit all these differences from the DEIS.

Difference #1: Description of Alternatives

The first difference readers of the technical reports are likely to discover is that the full alternatives are packaged differently than in the DEIS. The primary difference is that the DEIS includes all four transit terminus options (Kiggins Bowl, Lincoln, Clark College Minimum Operable Segment (MOS), and Mill Plain MOS) with each build alternative. In contrast, the alternatives in the technical reports assume a single transit terminus:

- Alternatives 2 and 3 both include the Kiggins Bowl terminus
- Alternatives 4 and 5 both include the Lincoln terminus

In the technical reports, the Clark College MOS and Mill Plain MOS are evaluated and discussed from the standpoint of how they would differ from the full-length Kiggins Bowl and Lincoln terminus options.

Difference #2: Terminology

Several elements of the project alternatives are described using different terms in the DEIS than in the technical reports. The following table shows the major differences in terminology.

DEIS terms	Technical report terms
Kiggins Bowl terminus	I-5 alignment
Lincoln terminus	Vancouver alignment
Efficient transit operations	Standard transit operations
Increased transit operations	Enhanced transit operations

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Difference #3: Analysis of Alternatives

The most significant difference between most of the technical reports and the DEIS is how each structures its discussion of impacts of the alternatives. Both the reports and the DEIS introduce long-term effects of the full alternatives first. However, the technical reports then discuss "segment-level options," "other project elements," and "system-level choices." The technical reports used segment-level analyses to focus on specific and consistent geographic regions. This enabled a robust analysis of the choices on Hayden Island, in downtown Vancouver, etc. The system-level analysis allowed for a comparative evaluation of major project components (replacement versus supplemental bridge, light rail versus bus rapid transit, etc). The key findings of these analyses are summarized in the DEIS; they are simply organized in only two general areas: impacts by each full alternative, and impacts of the individual "components" that comprise the alternatives (e.g. transit mode).

Difference #4: Updates

The draft technical reports were largely completed in late 2007. Some data in these reports have been updated since then and are reflected in the DEIS. However, not all changes have been incorporated into the technical reports. The DEIS reflects more recent public and agency input than is included in the technical reports. Some of the options and potential mitigation measures developed after the technical reports were drafted are included in the DEIS, but not in the technical reports. For example, Chapter 5 of the DEIS (Section 4(f) evaluation) includes a range of potential "minimization measures" that are being considered to reduce impacts to historic and public park and recreation resources. These are generally not included in the technical reports. Also, impacts related to the stacked transit/highway bridge (STHB) design for the replacement river crossing are not discussed in the individual technical reports, but are consolidated into a single technical memorandum.

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Cover Sheet

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Submitted By:

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List of Exhibits

ACRONYMS

Acronym	Description
ADA	Americans with Disabilities Act
ADT	Average Daily Traffic
AFS	American Fisheries Society
APE	Area of Potential Effect
API	Area of Potential Impact
AQMA	Air Quality Management Area
AST	Above Ground Storage Tank
BLM	Bureau of Land Management
BMP	Best Management Practice
BNSF	Burlington Northern Santa Fe Railroad
BPA	Bonneville Power Administration
BRT	Bus Rapid Transit
C	Candidate
CAA	Clean Air Act
CBD	Central Business District
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CFR	Code of Federal Regulations
CIR	Color Infrared
CMP	Corrugated Metal Pipe
CO	Carbon Monoxide
USACE	U.S. Army Corps of Engineers
CRC	Columbia River Crossing
CRL	Confirmed Release List and Inventory
CTWSRO	Confederated Tribes of the Warm Springs Reservation of Oregon
dB	Decibel
dBA	A-weighted decibel
DBH	Diameter at Breast Height
DCNP	Depressional, Closed-Non Permanently Flooded
DEIS	Draft Environmental Impact Statement
DEQ	Oregon Department of Environmental Quality
DLCD	Department of Land Conservation and Development
DO	Dissolved Oxygen
DOGAMI	Oregon Department of Geology and Mineral Industries
DOI	U.S. Department of Interior
DRG	Digital Raster Graphic
DSL	Oregon Department of State Lands
EA	Environmental Assessment
ECSI	Environmental Cleanup Site Information System
EDR	Environmental Data Resources, Inc.
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency

Acronym	Description
ERNS	Emergency Response Notification System
ESA	Endangered Species Act
ESEE	Economic Social Environmental and Energy Analysis
ESH	Essential Salmonid Habitat
ESU	Evolutionarily Significant Unit
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIFRA	Federal Insecticide, Fungicide and Rodenticide Act
FINDS	Facility Index System/Facility Identification Initiative Program Summary Report
FIRM	Flood Insurance Rate Maps
FONSI	Finding of No Significant Impact
FRS	Facility Registry System
Ft	feet/foot
FTA	Federal Transit Administration
FTTS	FIFRA/TSCA Tracking System
GA	General Authorization
GIS	Geographic Information System
GMA	Growth Management Act
GPS	Global Positioning System
HAZMAT	Hazardous Materials/Incidents
HCT	High-Capacity Transit
HGM	Hydrogeomorphic
HMIRS	Hazardous Materials Information Reporting System
HSIS	Hazardous Substance Information Survey
HUC	Hydrological Unit Code
InterCEP	Interstate Collaborative Environmental Process
L_{dn}	24-hour, Time Weighted, A-weighted Sound Levels
LE	Listed Endangered
L_{eq}	Energy Average Sound Levels
L_{max}	Maximum Noise Levels
LOS	Level of Service
LRS	Linear Referencing System
LRT	Light Rail Transit
LT	Listed Threatened
LUST	Leaking Underground Storage Tank
Mgd	million gallons per day
Mi	mile
Min	minute
MOA	Memorandum of Agreement
MOS	Minimum Operable Segment
MP	Milepost
Mph	Miles per hour
MPO	Metropolitan Planning Organization

Acronym	Description
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MTCA	Model Toxics Control Act
MTIP	Metropolitan Transportation Improvement Plan
MTP	Metropolitan Transportation Plan
NAAQS	National Ambient Air Quality Standards
NB	Northbound
NEPA	National Environmental Policy Act
NFA	No Further Action
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	National Oceanic and Atmospheric Administration for Fisheries
NO_x	Nitrous Oxide
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
OAR	Oregon Administrative Rule
ODA	Oregon Department of Agriculture
ODFW	Oregon Department of Fish & Wildlife
ODOT	Oregon Department of Transportation
OHP	Oregon Highway Plan
OHW	Ordinary High Water Line
ONHP	Oregon Natural Heritage Program
OR-GAP	Oregon Gap Analysis Project
ORNHIC	Oregon Natural Heritage Information Center
ORS	Oregon Revised Statutes
PCBs	Polychlorinated Biphenyls
PE	Proposed Endangered
PEMC	Palustrine Emergent Seasonally Flooded
PM_{10}	Particulate Matter (10 microns or less in size)
PPM	Parts Per Million
PT	Proposed Threatened
RCRA	Resource Conservation and Recovery Act
RCRIS	Resource Conservation and Recovery Information System
RCW	Revised Code of Washington
REA	Revised Environmental Assessment
REO	Regional Ecosystem Office
RLIS	Regional Land Information System
ROD	Record of Decision
ROW	right-of-way
RPC	Rare Plant Crew
RTC	Regional Transportation Commission
RTP	Regional Transportation Plan
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users

Acronym	Description
SB	Southbound
SEPA	State Environmental Policy Act
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SMA	Shoreline Management Act
SNR	Sensitive Noise Receptors
SOC	Federal Species of Concern
SOI	Species of Interest
SPILLS	Spill Data
SRA	Sensitive Resource Areas
SRSAM	Salmon Resource Sensitive Area Mapping project
SSTS	Section 7 (FIFRA) Tracking System
STIP	State Transportation Improvement Plan
SWF/LF	Solid Waste Facilities List
TAZ	Transportation Analysis Zone
TCP	Traditional Cultural Properties
TDM	Transportation Demand Management
TEA-21	Transportation Equity Act for the 21st Century
TIP	Transportation Improvement Program
TPR	Transportation Planning Rule
TSCA	Toxic Substances and Control Act
TSP	Transportation System Management
UGA	Urban Growth Area
UGB	Urban Growth Boundary
UPRR	Union Pacific Railroad
UPSP	Union Pacific-Southern Pacific
USBR	U.S. Bureau of Reclamation
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	Underground Storage Tank
V/C	Volume to Capacity Ratio
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compounds
WDFW	Washington Department of Fish and Wildlife
WRD	Oregon Department of Water Resources
WSDOT	Washington State Department of Transportation

1. Summary

1.1 Introduction

For this report, ecosystem resources include fish, wildlife, and plants, and their habitats, within the I-5 CRC project area. The key issues that are addressed in this report are listed below:

- The potential for impacts to special-status species.
- The potential for impacts to habitats that support fish, wildlife, and plants.
- The potential for impacts to protected habitats.
- The potential for impacts to other ecosystem resources, including migratory birds, marine mammals, rare plants, and noxious weeds.

Impacts and effects may be beneficial or adverse. This report addresses how each alternative may differ in its effect on ecosystems, as well as how regional conditions may be affected by the project overall.

1.2 Description of the Alternatives

The alternatives being considered for the CRC project consist of a diverse range of highway, transit and other transportation choices. Some of these choices – such as the number of traffic lanes across the river – could affect transportation performance and impacts throughout the bridge influence area or beyond. These are referred to as "system-level choices." Other choices – such as whether to run high-capacity transit (HCT) on Washington Street or Washington and Broadway Streets – have little impact beyond the area immediately surrounding that proposed change and no measurable effect on regional impacts or performance. These are called "segment-level choices." This report discusses the impacts from both system- and segment-level choices, as well as "full alternatives." The full alternatives combine system-level and segment-level choices for highway, transit, pedestrian, and bicycle transportation. They are representative examples of how project elements may be combined. Other combinations of specific elements are possible. Analyzing the full alternatives allows us to understand the combined performance and impacts that would result from multimodal improvements spanning the bridge influence area.

Following are brief descriptions of the alternatives being evaluated in this report, which include:

- System-level choices,
- Segment-level choices, and
- Full alternatives.

1.2.1 System-Level Choices

System-level choices have potentially broad influence on the magnitude and type of benefits and impacts produced by this project. These options may influence physical or operational characteristics throughout the project area and can affect transportation and other elements outside the project corridor as well. The system-level choices include:

- River crossing type (replacement or supplemental)
- High-capacity transit mode (bus rapid transit or light rail transit)
- Tolling (no toll, I-5 only, I-5 and I-205, standard toll, higher toll)

This report compares replacement and supplemental river crossing options. A replacement river crossing would remove the existing highway bridge structures across the Columbia River and replace them with three new parallel structures – one for I-5 northbound traffic, another for I-5 southbound traffic, and a third for HCT, bicycles, and pedestrians. A supplemental river crossing would build a new bridge span downstream of the existing I-5 bridge. The new supplemental bridge would carry southbound I-5 traffic and HCT, while the existing I-5 bridge would carry northbound I-5 traffic, bicycles, and pedestrians. The replacement crossing would include three through-lanes and two auxiliary lanes for I-5 traffic in each direction. The supplemental crossing would include three through-lanes and one auxiliary lane in each direction.

Two types of HCT are being considered – bus rapid transit and light rail transit. Both would operate in an exclusive right-of-way through the project area, and are being evaluated for the same alignments and station locations. The HCT mode – LRT or BRT – is evaluated as a system-level choice. Alignment options and station locations are discussed as segment-level choices. BRT would use 60-foot or 80-foot long articulated buses in lanes separated from other traffic. LRT would use one- and two-car trains in an extension of the MAX line that currently ends at the Expo Center in Portland.

Under the efficient operating scenario, LRT trains would run at approximately 7.5 minute headways during the peak periods. BRT would run at headways between 2.5 and 10 minutes depending on the location in the corridor. BRT would need to run at more frequent headways to match the passenger-carrying capacity of the LRT trains. This report also evaluates performance and impacts for an increased operations scenario that would double the number of BRT vehicles or the number of LRT trains during the peak periods.

1.2.2 Segment-Level Choices

1.2.2.1 Transit Alignments

The transit alignment choices are organized into three corridor segments. Within each segment the alignment choices can be selected relatively independently of the choices in the other segments. These alignment variations generally do not affect overall system performance but could have important differences in the impacts and benefits that occur in each segment. The three segments are:

- Segment A1 – Delta Park to South Vancouver

- Segment A2 – South Vancouver to Mill Plain District
- Segment B – Mill Plain District to North Vancouver

In Segment A1 there are two general transit alignment options - offset from, or adjacent to, I-5. An offset HCT guideway would place HCT approximately 450 to 650 feet west of I-5 on Hayden Island. An adjacent HCT guideway across Hayden Island would locate HCT immediately west of I-5. The alignment of I-5, and thus the alignment of an adjacent HCT guideway, on Hayden Island would vary slightly depending upon the river crossing and highway alignment, whereas an offset HCT guideway would retain the same station location regardless of the I-5 bridge alignment.

HCT would touch down in downtown Vancouver at Sixth Street and Washington Street with a replacement river crossing. A supplemental crossing would push the touch down location north to Seventh Street. Once in downtown Vancouver, there are two alignment options for HCT: a two-way guideway on Washington Street or a couplet design that would place southbound HCT on Washington Street and northbound HCT on Broadway. Both options would have stations at Seventh Street, 12th Street, and at the Mill Plain Transit Center between 15th and 16th Streets.

From downtown Vancouver, HCT could either continue north on local streets or turn east and then north adjacent to I-5. Continuing north on local streets, HCT could either use a two-way guideway on Broadway or a couplet on Main Street and Broadway. At 29th Street, both of these options would merge to a two-way guideway on Main Street and end at the Lincoln Park and Ride located at the current WSDOT maintenance facility. Once out of downtown Vancouver, transit has two options if connecting to an I-5 alignment: head east on 16th Street and then through a new tunnel under I-5, or head east on McLoughlin Street and then through the existing underpass beneath I-5. With either option HCT would connect with the Clark College Park and Ride on the east side of I-5, then head north along I-5 to about SR 500 where it would cross back over I-5 to end at the Kiggins Bowl Park and Ride.

There is also an option, referred to as the minimum operable segments (MOS), which would end the HCT line at either the Mill Plain station or Clark College. The MOS options provide a lower cost, lower performance alternative in the event that the full length HCT lines could not be funded in a single phase of construction and financing.

1.2.2.2 Highway and Bridge Alignments

This analysis divides the highway and bridge options into two corridor segments, including:

- Segment A – Delta Park to Mill Plain District
- Segment B – Mill Plain District to North Vancouver

Segment A has several independent highway and bridge alignment options. Differences in highway alignment in Segment B are caused by transit alignment, and are not treated as independent options.

The Replacement crossing would be located downstream of the existing I-5 bridge. At the SR 14 interchange there are two basic configurations being considered. A traditional configuration would use ramps looping around both sides of the mainline to provide direct connection between I-5 and SR 14. A less traditional design could reduce right-of-way requirements by using a "left loop" that would stack both ramps on the west side of the I-5 mainline.

1.2.3 Full Alternatives

Full alternatives represent combinations of system-level and segment-level options. These alternatives have been assembled to represent the range of possibilities and total impacts at the project and regional level. Packaging different configurations of highway, transit, river crossing, tolling and other improvements into full alternatives allows project staff to evaluate comprehensive traffic and transit performance, environmental impacts and costs.

Exhibit 1-1 summarizes how the options discussed above have been packaged into representative full alternatives.

Exhibit 1-1. Full Alternatives

	Packaged Options				
Full Alternative	River Crossing Type	HCT Mode	Northern Transit Alignment	TDM/TSM Type	Tolling Method[a]
1	Existing	None	N/A	Existing	None
2	Replacement	BRT	I-5	Aggressive	Standard Rate
3	Replacement	LRT	I-5	Aggressive	Two options[b]
4	Supplemental	BRT	Vancouver	Very Aggressive	Higher rate
5	Supplemental	LRT	Vancouver	Very Aggressive	Higher rate

[a] In addition to different tolling rates, this report evaluates options that would toll only the I-5 river crossing and options that would toll both the I-5 and the I-205 crossings.

[b] Alternative 3 is evaluated with two different tolling scenarios, tolling and non-tolling.

Modeling software used to assess alternatives' performance does not distinguish between smaller details, such as most segment-level transit alignments. However, the geographic difference between the Vancouver and I-5 transit alignments is significant enough to warrant including this variable in the model. All alternatives include Transportation Demand Management (TDM) and Transportation System Management (TSM) measures designed to improve efficient use of the transportation network and encourage alternative transportation options to commuters such as carpools, flexible work hours, and telecommuting. Alternatives 4 and 5 assume higher funding levels for some of these measures.

Alternative 1: The National Environmental Policy Act (NEPA) requires the evaluation of a No-Build or "No Action" alternative for comparison with the build alternatives. The No-Build analysis includes the same 2030 population and employment projections and the same reasonably foreseeable projects assumed in the build alternatives. It does not

include any of the I-5 CRC related improvements. It provides a baseline for comparing the build alternatives, and for understanding what will happen without construction of the I-5 CRC project.

Alternative 2: This alternative would replace the existing I-5 bridge with three new bridge structures downstream of the existing bridge. These new bridge structures would carry Interstate traffic, BRT, bicycles, and pedestrians. There would be three through-lanes and two auxiliary lanes for I-5 traffic in each direction. Transit would include a BRT system that would operate in an exclusive guideway from Kiggins Bowl in Vancouver to the Expo Center station in Portland. Express bus service and local and feeder bus service would increase to serve the added transit capacity. BRT buses would turn around at the existing Expo Station in Portland, where riders could transfer to the MAX Yellow Line.

Alternative 3: This is similar to Alternative 2 except that LRT would be used instead of BRT. This alternative is analyzed both with a toll collected from vehicles crossing the Columbia River on the new I-5 bridge, and with no toll. LRT would use the same transit alignment and station locations. Transit operations, such as headways, would differ, and LRT would connect with the existing MAX Yellow Line without requiring riders to transfer.

Alternative 4: This alternative would retain the existing I-5 bridge structures for northbound Interstate traffic, bicycles, and pedestrians. A new crossing would carry southbound Interstate traffic and BRT. The existing I-5 bridges would be re-striped to provide two lanes on each structure and allow for an outside safety shoulder for disabled vehicles. A new, wider bicycle and pedestrian facility would be cantilevered from the eastern side of the existing northbound (eastern) bridge. A new downstream supplemental bridge would carry four southbound I-5 lanes (three through-lanes and one auxiliary lane) and BRT. BRT buses would turn around at the existing Expo Station in Portland, where riders could transfer to the MAX Yellow Line. Compared to Alternative 2, increased transit service would provide more frequent service. Express bus service and local and feeder bus service would increase to serve the added transit capacity.

Alternative 5: This is similar to Alternative 4 except that LRT would be used instead of BRT. LRT would have the same alignment options, and similar station locations and requirements. LRT service would be more frequent (approximately 3.5 minute headways during the peak period) compared to 7.5 minutes with Alternative 3. LRT would connect with the existing MAX Yellow Line without requiring riders to transfer.

1.3 Long-Term Effects

Aquatic Resources. Long-term impacts to ecosystem resources as a result of the CRC project are likely for aquatic resources, including federally listed fish species and riverine habitat in the Columbia River and North Portland Harbor. Each design option requires concrete piers of considerable volume in the main channel of the Columbia River (see Section 5.4.1), which would affect river currents and fish usage of the area to some extent. Bridge piers constructed in the channel may provide refugia via shade and protection from the river current for piscivorous fish species that could feed on out-

migrating juvenile salmonids, thereby impacting overall juvenile survival rates. Bridge deck shading may contribute to this refugia effect. Long-term effects to listed salmonids would be consistent with current conditions with respect to the presence of man-made structures in a highly modified urban setting; that is, the continued presence of bridge piers in the river and a major highway system over the river that may contribute pollutants to waterways through stormwater runoff. Bridge piers in the river, particularly in near-shore and shallow areas, can have long-term impacts to aquatic habitat and channel dynamics as a result of sediment deposition and alteration of flow patterns. Depending on the final bridge design, aquatic habitat quality could conceivably be improved from current conditions if the new bridge design includes fewer piers in the mainstem river and therefore fewer modifications to riverine habitat. Preliminary bridge pier designs suggest that for most alternatives, no piers will be in water that is 20 feet or shallower: for example, the Replacement bridge would have one northbound pier and one southbound pier with less than a 20-foot clearance from the bottom of the pile cap to the river bottom. In the Replacement alternative, none of the piers for the transit bridge would be in less than 20 feet of water.

Water Quality. Long-term impacts to water quality will also affect aquatic habitat and species. As discussed in the Water Quality Technical Report, contaminants that may be present in stormwater runoff associated with highways include suspended sediments, nutrients, polynuclear aromatic hydrocarbons (PAHs), oils and grease, antifreeze from leaks, cadmium and zinc from tire wear, and copper from wear and tear from brake pads, bearings, metal plating, and engine parts. Current plans for stormwater management indicate that project-generated runoff from several sections of new or modified roadway that would normally drain to the Columbia River watershed would instead be conveyed, treated, and discharged to the Columbia Slough. All other runoff generated by the project would be discharged within the watershed in which it is generated. Stormwater treatment methods will include bioswales, wet ponds, and municipal facilities.

This transfer of stormwater from the Columbia River to the Columbia Slough has the effect of decreasing dissolved copper loads in the Columbia River, but raising dissolved copper loads in the Columbia Slough above loads anticipated under the No-Build Alternative from approximately 1.9 lbs/year to up to 2.4 lbs/year. Alternatives 2 and 3 (Replacement crossing) may raise dissolved copper levels to approximately 2.4 lbs/year while levels estimated for Alternatives 4 and 5 (Supplemental crossing) may rise to approximately 2.0 lbs/year due to increased impervious surface area (however, it should be noted that this analysis is ongoing and total contaminant loads may change as bridge design details are finalized). Loads of dissolved zinc are also expected to increase in runoff to the Columbia Slough; however, the project-related loads of all other roadway pollutants would decline within the Columbia River and the Columbia Slough compared to the loads expected under the No-Build Alternative because stormwater treatment would be provided where treatment would otherwise not exist. Refer to the Water Quality Technical Report for additional details.

Terrestrial Resources. Long-term effects to terrestrial resources may occur if riparian buffer habitat at Burnt Bridge Creek is impacted by transit alignments. Potential long-term effects to peregrine falcon habitat may occur if the existing bridge is removed and structures that are currently used by this species are demolished; however, nest boxes and

other replacement habitat elements could be included in new bridge design. See Section 5 for additional effects analysis.

Botanical Resources. No long-term effects are expected to botanical resources.

1.3.1 Regional Effects

Long-term regional effects under any of the design options would be seen primarily in effects to listed fish and aquatic habitat, especially water quality. The Columbia River in the project area is a major waterway through which at least twelve salmonid stocks, as well as lamprey, sturgeon, and other native fish, pass during various portions of their life cycles. Salmonids are present in the project area during adult migration upriver to spawn, juvenile outmigration, and rearing; therefore, impacts to these species at these life stages could have substantial implications for survival and reproduction of these populations of salmonids. However, long-term impacts from project activities are likely to be consistent with existing conditions for aquatic species (i.e., the presence of a major artificial structure in the mainstem of the river), and depending on the design option implemented, conditions could improve slightly if few bridge piers are part of the final design. Water quality could conceivably be improved through improvements to stormwater collection and treatment, depending on the final bridge design. Refer to the Water Quality Technical Report for additional details on effects to water quality from the different bridge design options.

Long-term regional effects to terrestrial species and habitats are likely to be consistent with existing conditions. Migratory birds will likely use the new bridge designs and the natural habitat in the project area for roosting, foraging, and potentially for nesting similar to their use of the existing elements. Wildlife passage is likely to remain limited in the project area due to the highly urbanized setting.

Regional traffic patterns are also likely to change as a result of improvements to the I-5 bridge crossing, potentially resulting in additional impacts to water quality and other ecosystem resources in some areas and reductions of impacts to water quality in other areas. These effects will be addressed in Indirect impacts (see Section 5) when traffic modeling data are available.

1.3.2 Segment-level Effects

See Exhibit 1-2 for a map of the project area and segment boundaries.

In Segment A, the presence of the bridge structures in the Columbia River and North Portland Harbor will affect aquatic habitat and species by altering stream flow, providing refugia for non-native and piscivorous fish species, and potentially allowing highway-related contaminants to enter the river. Long-term negative effects to peregrine falcons could occur if habitat is removed and new habitat options are not provided.

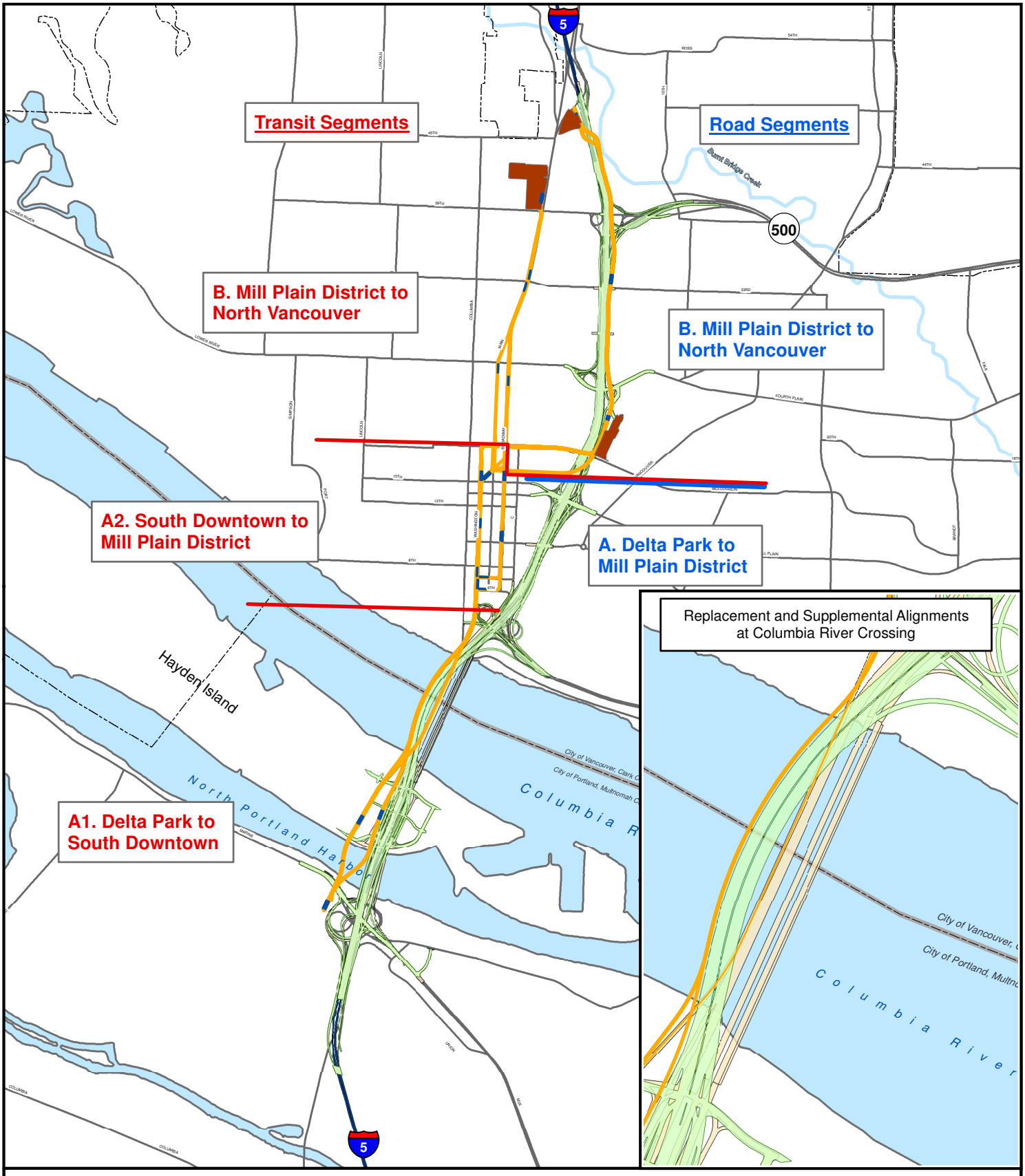

Exhibit 1-2: Project Area and Alternatives

Columbia River CROSSING

Analysis by J. Koloszar; Analysis Date: Aug.-2007; Plot Date: Dec.-2007; File Name: JH_014_8x11.mxd

In Segment B, terrestrial and aquatic habitat in and along Burnt Bridge Creek could be affected if riparian buffer habitat is impacted by transit alignment options. Increases in runoff volumes to Burnt Bridge Creek are possible. Runoff will be treated in stormwater conveyance and detention facilities, such as ponds and swales. Park and ride facilities planned in Segment B are on sites that are already developed for urban use and will not contribute to additional impervious surface. The amount of increase in impervious surface area for the Build Alternatives ranges from 27.7 to 42.7 additional acres (existing impervious surface area from roads and highways is approximately 175-195 acres). The Replacement crossing would have more impervious surface than the Supplemental crossing. Changes in traffic patterns and urban growth that result from the highway improvements of the project will be discussed under Indirect Impacts in Section 5.

1.4 Temporary Effects

Aquatic Resources. Temporary impacts to aquatic and terrestrial resources would be expected to occur under any of the build alternatives. In-water work to deconstruct, retrofit, install, or otherwise construct bridge piers may require any of the following construction methods: localized dewatering (e.g., at pier footings), installation and removal of cofferdams, use of pile driving equipment, and other methods with potential adverse noise, contaminant, hydrological, and physical displacement impacts to aquatic habitat and listed fish species. Fish may be harassed, injured, or killed by project activities. Water quality could be adversely impacted by accidental contaminant spills (e.g., barge and heavy equipment fuel, oil), erosion, turbidity, and sediment. Current riparian vegetative structure provides negligible benefits for regulating water temperature in the Columbia River and North Portland Harbor; only small amounts of riparian vegetation may be removed during the project and are not expected to affect aquatic habitats. See Section 6 for additional effects analysis.

Terrestrial Resources. Temporary impacts to terrestrial resources, specifically to migratory birds and peregrine falcons, are likely to occur under any design option as construction noise may disturb or prevent nesting. See Section 6 for additional effects analysis.

Botanical Resources. Temporary impacts to vegetation in the primary API may result from grading, staging, realignment of the main bridge structure, and other project-related activities. No effects to sensitive plant species are expected because no sensitive plants are known to occur within the primary API. See Section 6 for additional effects analysis.

1.5 Mitigation

Mitigation for impacts to aquatic, terrestrial, and botanical resources include best management practices (BMPs), conservation measures, and avoidance and minimization measures.

All build alternatives would impact listed fish species by the presence of large piers in the river that could provide habitat for piscivorous fish, and that could alter stream flow. In addition, riparian fringe habitat may be altered. Mitigation measures to address these

impacts include impact avoidance and impact minimization. Revegetation of riparian areas and limited use of riprap will be employed to limit negative long-term effects. Long-term impacts to terrestrial resources, such as migratory birds, are relatively minimal and would not require extensive mitigation.

During construction, all build alternatives would impact listed fish species through in-water work that could result in increased turbidity, in-water noise, temporary localized dewatering, and potential contaminant spills. Mitigation measures to address these impacts include impact avoidance and impact minimization. Impact avoidance has been addressed through project design alternatives that were considered but not advanced due to impacts to ecosystem and other resources. Certain design alternatives have also been modified to reduce impacts to resources. As project design and implementation continues, additional efforts to avoid adverse impacts to ecosystem resources will be incorporated into project planning. Impact minimization will be addressed through implementing BMPs (e.g., sediment and erosion control, no-work zones, appropriate flagging and fencing), monitoring project activities, timing in-water work to occur outside of critical fish migration seasons, using coffer dams around select in-water work sites, and using bubble curtains around impact pile driving that may cause adverse impacts from noise.

All build alternatives will impact terrestrial resources, such as migratory birds and species of interest, through noise impacts and removal or degradation of habitat. Mitigation measures to address these impacts include impact avoidance and impact minimization. Demolition of existing structures, if necessary, would also be scheduled outside of nesting seasons for peregrine falcons and other migratory birds to avoid direct impacts to active nests.

Stormwater collections and treatment will occur to treat for metals and biosolids. Methods used will be more effective and efficient than current treatment, and should result in improved water quality in the project area. To some extent, stormwater treatment will address mitigation needs for new impervious surfaces in the project area. For additional details on stormwater treatment, refer to the Water Quality Technical Report.

Additional mitigation measures will be discussed with regulatory agencies and project sponsors during ESA consultation procedures.

2. Methods

2.1 Introduction

Methods used to collect data and analyze effects included: collecting a list of potential species of interest and their habitats from local, state, and federal resource and management agencies; determining species life history and habitat requirements; conducting field surveys with accepted protocols during appropriate seasons; examining existing Geographical Information Systems (GIS) data layers; and discussing potential impacts to resources with species experts, local resource managers, and agency biologists. Refer also to the Ecosystems Methods and Data Report for additional details.

2.2 Study Area

This evaluation used two study areas for environmental effects: the primary and secondary areas of potential impact (APIs). The APIs are shown in Exhibit 2-1 and are described below.

The primary API is defined as the area most likely to experience direct impacts from construction and operation of proposed project alternatives. The primary API extends approximately five miles from north to south, beginning at the I-5/SR 500 interchange in Washington, and extending just south of the I-5/Marine Drive interchange in Oregon. At its northern end the API expands west into downtown Vancouver, and east near Clark College to include potential high-capacity transit alignments and park and ride locations. Heading south along the existing bridge alignment, the primary API extends 0.25 mile from either side of the existing I-5 river crossing. South of the river crossing, this width narrows to 300 feet on either side of the I-5 right-of-way. Most physical project changes would occur in this area, though mitigation could still occur outside of it.

The secondary API represents the area where indirect impacts (e.g., traffic and development changes) may occur from the proposed project alternatives. The study team relied primarily on secondary data to evaluate indirect project impacts. Within the secondary API data from historical record databases were analyzed for listed fish, wildlife and plant species. Standard regional practice is to collect data from state resource agencies within a one-mile radius of the project location for compliance with the federal Endangered Species Act (ESA). In this case the secondary API includes a one-mile radius within the area encompassed by the primary API. The secondary API is over 15 miles long and extends from one mile north of the I-5/I-205 interchange to near the I-5/I-84 interchange. The secondary API also extends one mile east and west of the I-5 right-of-way.

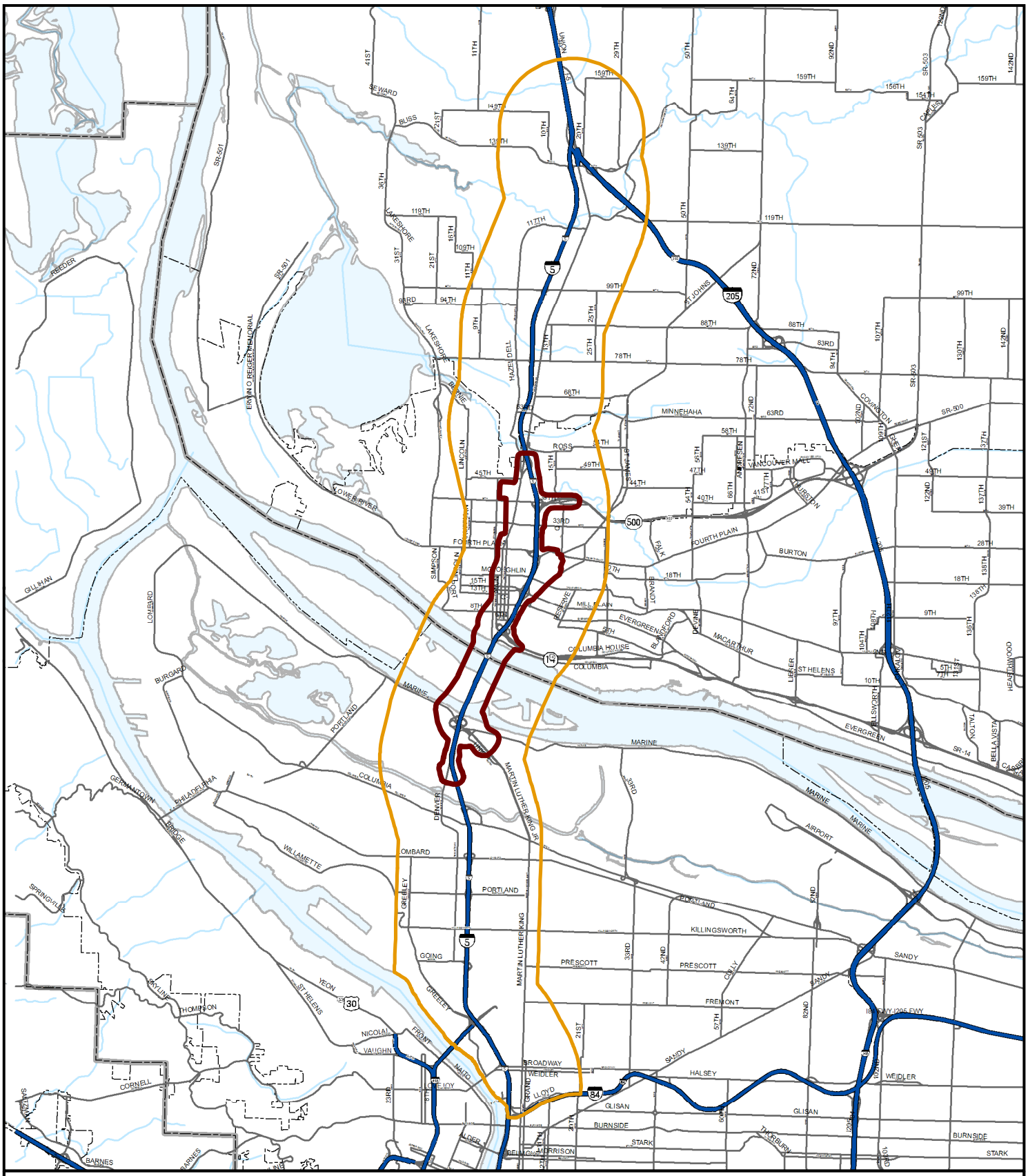

Exhibit 2-1: Project Corridor

Columbia River CROSSING

2.3 Effects Guidelines

Local, state, and federal agencies provide guidance in determining impacts to ecosystem resources. The impact assessment considered effects to species and habitats, taking into consideration federal and state protected status, impacts to species' ecology and critical life stages (e.g., breeding), primary constituent elements where applicable (i.e., critical habitat), and other relevant factors. The following factors were considered in determining the type and degree of impacts:

- Effects to listed species analyzed in Section 7 ESA consultations conducted with the U.S. Fish and Wildlife Service (USFWS) and/or National Marine Fisheries Service (NMFS); consultations will be initiated by FHWA/FTA/ODOT/WSDOT once the project details are further defined;
- Effects to Essential Fish Habitat (EFH) under the Magnuson-Stevens Fishery Conservation Management Act (MSFCMA);
- Effects to threatened or endangered species recovery potential as described in a USFWS or NMFS recovery plan, or other guidance if a recovery plan is not available;
- Extent of impacts to existing wildlife corridors (which could be either further degraded or improved by this project);
- Impacts to fish passage for all life stages of listed and non-listed native fish (e.g., physical barriers);
- Effects to high quality habitat, such as fragmentation, degradation, or impairment that would reduce its capacity to provide vital functions for species; "high quality" habitat is defined in Oregon Department of Fish and Wildlife's (ODFW) Habitat Mitigation Policy and Washington Department of Fish and Wildlife's (WDFW) Priority Habitats;
- Effects to migratory birds, as defined under the Migratory Bird Treaty Act (MBTA), such as take of active nests and/or eggs, and effects to nesting habitat;
- Effects to marine mammals, as defined under the Marine Mammal Protection Act (MMPA), such as direct take;
- Effects to species under state regulatory statutes governing "take," such as the Oregon Endangered Species Act;
- Effects to state and locally protected habitats (e.g., impacts that would remove or degrade habitats to the point that they can no longer provide vital functions for the species dependent on these habitats).

2.4 Data Collection Methods

The team conducted field reviews of species of interest and aquatic, riparian, and terrestrial habitat features and conditions within the primary API. Within the secondary

API, the team relied largely on integrating existing data, including previously prepared environmental reviews.

2.4.1 Primary API

The following process was used to collect fish, wildlife, and botanical resource data within the primary API:

1. Collected a list of potential species of interest and their habitats. These data were obtained from the Oregon Natural Heritage Information Center (ORNHIC), USFWS, NMFS, WDFW, and the Washington Department of Natural Resources, Natural Heritage Program (WDNR-NHP).
    - Contacted federal, state, and local agencies, and local biologists and experts.
    - Examined studies, plans and reports prepared by local, state, and federal agencies and private organizations for information on species and habitats that may occur within the primary API. These studies included the Oregon Department of Transportation (ODOT) Peregrine Falcon Management Plan 2002-2007 and the Lower Columbia Salmon Recovery and Fish and Wildlife Subbasin Plan.
2. Determined species of interest habitat requirements.
    - Examined studies, plans, and reports and consulted with local biologists and federal, state, and local agencies.
    - Determined if critical habitat has been designated for listed species potentially found within the primary API. Examined Primary Constituent Elements (PCEs) for species with designated critical habitat.
3. Determined potential habitat types and their associated species.
    - Obtained aerial photography to identify habitat types.
    - Obtained GIS maps of habitats, documented species locations, locally protected zones, critical habitats, and other ecological features. Such resource classifications include essential fish habitat (NMFS), regionally significant habitat (Metro[1]), essential salmonid habitat (Oregon Department of State Lands [DSL]), priority habitats (WDFW), critical area ordinances (City of Vancouver and Clark County) and environmental zones (City of Portland).
4. Conducted field reconnaissance in the appropriate season assessing the presence of listed species and their associated habitats within the primary API; and if present, the role the habitats play in the species' life histories.
    - Ground-truthed habitat types and boundaries. Quantified habitat types within the primary API based on GIS data.

[1] Metro is the directly elected regional government that serves the residents of Clackamas, Multnomah and Washington counties, and the 25 cities in the Portland, Oregon, metropolitan area.

- Used Johnson and O'Neil's (2001) species/habitat matrix to determine the species most likely to be present in these habitats.
- Determined species of interest habitat use within the primary API and identified wildlife passage opportunities.
- Conducted rare plant surveys using the intuitive controlled method (BLM 1998). Conducted noxious weed surveys and mapped results based on Oregon Department of Agriculture (ODA) and Washington Noxious Weed Control Board (WNWCB) status.
- Inspected bridges for bridge-nesting species, and identified potential migratory bird habitat. Visual inspections for these species were conducted during nesting seasons.

5. Characterized aquatic and terrestrial habitats found during field surveys for features important to fish, wildlife, and plants. All species seen during field surveys were recorded.
   - Aquatic characteristics of interest included water quality, substrate composition, bank stability, channel condition, fish passage, and riparian conditions. Streams were evaluated for their potential to support fish and other aquatic resources.
   - Riparian corridors were surveyed for fish and wildlife habitat elements at the I-5 crossings of the Columbia River, North Portland Harbor, and Columbia Slough. Burnt Bridge Creek was surveyed where it runs parallel to I-5 at the northern boundary of the primary API. Surveyed habitat elements include vegetation type and density, stream characteristics, and piers, footings, riprap, and other structures below the ordinary high water line (OHW).
   - Terrestrial characteristics of interest included opportunities for wildlife passage, habitat distribution, structure, and composition, and habitat fragmentation and connectivity.
6. Compiled lists and maps of observed species of interest, habitats, protected habitats, rare plants, and noxious weeds.
7. Analyzed data to determine potential project impacts on ecosystem resources.
   - Used agency-approved documents to determine the potential impacts from proposed alternatives on ecosystem resources.
   - Determined potential impacts to listed species and designated critical habitat.
   - Identified other resources, such as species of interest or protected habitats, which might be impacted.
   - Identified habitats that provide connectivity at a landscape scale.

2.4.2 Secondary API

Disturbance within the secondary API will be limited to indirect impacts caused by construction and operation of the project. Steps 1-3 above were conducted for both APIs. The following additional steps were taken in the secondary API.

1. Conducted windshield surveys for habitats classified as non-urban based on the Johnson and O'Neil's (2001) species/habitat matrix. Special consideration was given to habitats that provide connectivity with the primary API. Used species/habitat matrix to determine the species most likely to be present in habitats identified from existing data.

2. Compiled a list of observed habitats and potential species of interest, rare plants, and noxious weeds.

3. Analyzed data to determine the potential for indirect impacts to ecosystem resources.
    - Determined potential indirect impacts to listed species and designated critical habitat.
    - Identified other resources, such as species of interest or protected habitats, that might be indirectly impacted.
    - Identified habitats that provide connectivity at a landscape scale.

2.5 Analysis Methods

Potential cumulative effects from this project are evaluated in the Cumulative Effects Technical Report. Please refer to this report for an evaluation of possible cumulative effects.

The approach to short-term and long-term operation impacts was the same for the primary and secondary APIs, with the exception that field surveys occurred within the primary API, while existing information was used for the secondary API.

2.5.1 Aquatic Resource Impacts

The following process was used to determine short-term and long-term operational impacts on aquatic resources:

- Evaluated and quantified impacts to fish passage by comparing current fish distribution to that under the proposed alternative.
- Used maps of protected habitats to determine sensitive areas that may be impacted by the project and to quantify the impact area relative to undisturbed habitat.
- Evaluated and quantified the potential for destruction or adverse modification of critical habitat, suitable habitat, or "take" of listed fish.

2.5.2 Terrestrial Resource Impacts

The following process was used to determine short-term and long-term operational impacts on terrestrial resources, including botanical resources:

- Evaluated and quantified the potential for destruction or adverse modification of critical habitat, suitable habitat, or "take" of listed wildlife and plants.
- Evaluated and quantified impacts to species and resources not listed under the ESA based on the amount of habitat modification, destruction, or increased levels of disturbance from project operation.
- Evaluated and quantified impacts to wildlife passage based on changes to existing wildlife corridors or fragmentation of existing habitat.
- Used maps of protected habitats to determine sensitive areas that may be impacted by the project and to quantify the impact area relative to undisturbed habitat.

2.5.3 Species of Interest Impacts

The following process was used to determine long-term operational impacts on special-status species:

- Evaluated the potential for adverse effects to listed species under the federal ESA.
- Used maps of special-status species locations to determine habitats that may be impacted by the project and to quantify the impact area relative to undisturbed habitat.

In addition, local, state, and federal biologists were interviewed and beneficial impacts were identified and evaluated.

2.5.4 Mitigation Measures Approach

Bi-state coordination is occurring to best mitigate for impacts to ecosystem resources. The intent is to provide mitigation measures that are consistent with the mitigation policies of local, state, and federal governments. The mitigation measures approach was guided by the following actions:

- Avoiding impact through design modification or by not taking a certain action or parts of the action.
- Identifying and evaluating ways to minimize impacts to ecosystem resources.
- Researching and identifying BMPs.
- Discussing BMPs and potential mitigation needs with local, state, and federal agencies.
- Rectifying temporary impacts by repairing, rehabilitating, or restoring the affected resource.
- Reducing or eliminating the impact over time by preservation and maintenance operations.

- Compensating for permanent impacts by replacing, enhancing, or providing substitute resources or environments. Compensation for unavoidable impacts is consistent with state and federal mitigation rules and guidance. Priority was placed on on-site compensatory mitigation first, but considers off-site mitigation options where appropriate. In choosing between mitigation options, the likelihood for success, ecological sustainability, practicability of long-term monitoring and maintenance, and relative costs is evaluated. The mitigation goal is to fully replace ecosystem functions lost or impaired as a result of the project.
- As discussed in the Water Quality Technical Report, short-term impacts to water quality will be addressed through a Stormwater Pollution Prevention Plan, which will include construction Best Management Practices (BMPs), such as appropriate measures to prevent accidental spills of chemicals and materials and ways to minimize vegetation removal and/or replant disturbed areas.
- Long-term impacts to water quality will be addressed through local, state, and federal requirements for the prevention of increases to pollutant loads and for standards and requirement for stormwater treatment.
- Refer to the Wetlands Technical Report for further details on wetland mitigation needs and requirements.

3. Coordination

This technical report was developed in collaboration with federal, state, and local agencies, including the Environmental Protection Agency (EPA), USFWS, NMFS, ODFW, WDFW, DSL, Ecology, the City of Vancouver, Metro, and the City of Portland. Regular meetings were held, beginning in 2005, with representatives from the federal and state environmental regulatory agencies (a group formed specifically to provide input on this project, and known as the Interstate Collaborative Environmental Process [InterCEP]).

Ad hoc meetings of working groups for fisheries and water quality were also held to discuss specific project elements. These occurred sporadically in 2006 and 2007.

Native American tribes with resource interests relevant to this project also provided input and guidance in developing this report.

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4. Affected Environment

4.1 Introduction

The I-5 bridge connects two major metropolitan areas and the surrounding landscape is characterized by urban development interspersed with remnant natural habitat areas in the form of riparian buffers, open space and parks, and the mainstem Columbia River. All natural areas have been modified to suit the urban landscape and the needs of the urban population. Fish and wildlife species that utilize the project appear to have become relatively habituated to ambient levels of noise, light, and pollution associated with large urban centers, at least for portions of their life cycles. City and county zoning and planning for habitat protection have maintained areas of aquatic and riparian habitat that support listed fish, sensitive reptiles and amphibians, and migratory birds.

4.2 Regional Conditions

Compared to historical conditions, the availability and quality of fish, wildlife, and plant habitat in the project area has been reduced by human settlement and development.

4.2.1 Regional Aquatic Conditions

The Columbia River and its tributaries are the dominant aquatic system in the Pacific Northwest. The Columbia River originates on the west slope of the Rocky Mountains in Canada and flows approximately 1200 miles to the Pacific Ocean, draining an area of approximately 219,000 square miles in Washington, Oregon, Idaho, Montana, Wyoming, Nevada, and Utah. The ocean influence reaches 23 miles upstream from the river mouth in the form of salt water intrusion from the Columbia River estuary. Coastal tides influence the flow rate and river level up to Bonneville Dam at river mile (RM) 146.1 (USACE 1989). Dams built on the river between the 1930s and 1970s have significantly altered hydrologic flow and reduced abundance and quality of fish and wildlife habitat. The lower Columbia River is used for transport of commercial goods, irrigation, power generation, and recreation. The banks in many portions, particularly those in the urbanized area around the project area, have been armored for flood and erosion control. Channel dredging occurs periodically to ensure passage for commercial vessels.

Aquatic resources in the project area, in general, support populations of native, non-native, and listed fish species in rivers, backwater areas, small creeks, ponds, and sloughs. Aquatic habitats have been subject to human modifications (e.g., dredging, filling, armoring) to accommodate commercial and residential development, and few (if any) of these habitats are in pristine condition. The North Portland Harbor connects to the mainstem Columbia River and shares many of the same attributes. Additional aquatic habitats of note in the project area include Burnt Bridge Creek, Cold Creek, Whipple Creek, Cougar Creek, Salmon Creek, Cold Canyon, Smith Lake, and the Columbia Slough.

4.2.2 Regional Terrestrial Conditions

The region is classified within the western forest ecoregion (Omernik 1987), with elevations ranging from 0 to 11,240 feet. The Pacific Northwest temperate rainforest is one of the most productive forest regions in the world. Forest types of this ecoregion include old-growth conifer (e.g., Douglas-fir, spruce, hemlock), remnant hardwoods (e.g., Oregon oak woodlands), alpine communities (e.g., montane grasslands), and riparian, wetland, and aquatic systems. The project area was historically closed upland forest/woodland with patches of grassland savannah and prairie in lowland areas near water (e.g., present-day Hayden Island) (Hulse et al. 2002).

The suite of wildlife species originally inhabiting the area included at least 18 amphibian species (e.g., Pacific treefrog), 15 reptile species (e.g., western pond turtles), 154 bird species (woodpeckers, owls, songbirds, waterfowl), and 69 mammal species (e.g., elk, cougar, coyote, bobcat) (Hulse et al. 2002). The project area is located within the Pacific Flyway, the major north-south route for migratory birds that extends from Patagonia to Alaska. Migratory birds use the area for resting, feeding, and breeding. Species that once occurred in the area but have since been extirpated, largely due to human influence, include the grizzly bear, California condor, and gray wolf. Abundance and distribution of other species have sharply declined, some to the point of requiring legal protection (e.g., northern spotted owl, marbled murrelet). Other species have adapted to the conversion in land and habitat cover, persisting or even benefiting (e.g., raccoons, red-tailed hawks).

Native Americans lived in the region for 11,000 years before the arrival of Euro-American settlers; however, human populations were very low in the region prior to settlement (Hulse et al. 2002). As the area became settled by mineral and timber prospectors in the 1840-1850s and grew as a major West Coast port, urban areas gradually displaced wildlife habitat. Current urbanized conditions preclude the persistence of most large mammals and many native amphibians, reptiles, birds, and other wildlife that were once common in the project area.

Terrestrial species that currently occur in the project area, for example bald eagles and peregrine falcons, have adapted to some extent to the urban environment and are able to nest and forage near the project area. Large mammal populations (e.g., ungulates, carnivores) may occasionally be seen near these urban environments, and some have adapted to living in developed urban areas (e.g., red fox, raccoons); however, for the most part, these species no longer occur in the project area. Terrestrial habitat is limited to relatively small, patchy areas protected by city and/or county regulations (e.g., wetlands, forested park areas, open spaces, and riparian buffers) and currently support species with relatively small home ranges and restricted habitat requirements (e.g., turtles). Portions of the region adjacent to the project area (e.g., Forest Park, the western end of Hayden Island) retain forested and wetland habitats capable of supporting native wildlife.

4.2.3 Regional Botanical Conditions

Due to the highly urbanized character of the project area, most natural habitat for native plants has been lost or highly degraded through land use conversion from natural to urban

use. Remaining habitat for botanical resources, particularly for rare plants, is restricted to open space, wetlands, riparian buffers, and park lands managed under protective mandate. These habitats tend to be relatively small and isolated from each other, limiting the distribution of native plants. Non-native and noxious weeds are ubiquitous in the project area and further limit the ability of native plants to persist in most of the remaining suitable habitat.

4.3 Segment A Delta Park to Mill Plain District

The following discussion of ecosystem resources focuses on those occurring in the primary API, where direct project impacts are expected; please see Section 4.5 for a discussion of resources in the secondary API, which was designated to address indirect impacts.

4.3.1 Aquatic Resources

Aquatic resources in this technical report refer primarily to fish species and their habitat. Wetlands are discussed in the terrestrial habitat section and in the Wetlands Technical Report. Water quality is an important component of habitat for listed and non-listed aquatic (and terrestrial) species. Water quality may be compromised by the presence of biosolids, heavy metals, fecal coliform, elevated temperatures, turbidity, and other contaminants associated with urban environments and roads. Of these, dissolved copper is of particular concern for listed and non-listed fish, is known to be present in the API, and is associated with roads and vehicle usage.

Copper is a neurotoxicant that damages the sensory abilities of fish, including salmonids. It is found in several forms in the aquatic environment, including dissolved, its most bioavailable form. Its effects, which include disrupting chemical cues that are important in avoiding predators and finding food, can occur after brief exposures to low concentrations (Hecht et al. 2007). Depending on the exposure concentration and dose period, effects can persist for several weeks.

Runoff from transportation facilities typically is associated with a suite of pollutants, including copper, which comes from brake pad wear and vehicle exhaust. The concentration of copper found in runoff can be affected by a number of factors, including traffic volume, congestion, adjacent land uses, air quality, and the frequency and duration of storms. Dissolved copper concentrations typically found in road runoff are within the range shown to affect predator avoidance and other behaviors (Hecht et al. 2007).

Long-term trends in copper levels and their effects to fish in the project area have not been well documented; however, dissolved copper is known to be present in the primary API in the Columbia River and the North Portland Harbor. Estimates of conditions in the primary API indicate that current concentrations could be approximately 5-8 µg/L.[2]

[2] WSDOT monitoring has estimated treated runoff from high traffic highways (with ADT > 60,000) to have an expected average concentration of 5.0 µg/L (*2005 NPDES Progress Report for the Cedar-Green, Island-Snohomish, and South Puget Sound Water Quality Management Areas*. Washington State Department of Transportation. September 2005.); NPDES monitoring in 1995 showed mean dissolved copper concentrations of 8 µg/L in the Portland area.

Recent NMFS guidance on dissolved copper indicated that a concentration of 5µg/L or less was sufficient to cause impaired olfactory senses of young salmonids.[3] Oregon and Washington acute criteria for dissolved copper in freshwater are 4.3[4] and 5.5[5] µg/L, respectively, for a hardness of 30 mg/L. As discussed in the Water Quality Technical Report, NMFS guidance on dissolved copper thresholds for listed fish is in development. When available, the final guidance criteria will help determine best management practices and the design of stormwater facilities as project details are finalized.

4.3.1.1 Summary of Aquatic Habitats

Within Segment A, I-5 crosses the Columbia River and the North Portland Harbor (Exhibits 4-1 and 4-2).[6] These aquatic resources are perennial watercourses. Refer to the Water Quality Technical Report for a map of the sub-watersheds of these water bodies. These water bodies are 303(d) listed for a number of parameters, including temperature and chemical contaminants. In addition to point and non-point sources of contaminant input from outside the project area, water quality may be compromised by local sources of contaminants associated with the highway and bridge, such as oil and other vehicle fluids; copper (e.g., dissolved copper from brake pad wear); flaking bridge paint containing lead and other heavy metals; and chemicals and toxins associated with washing, painting, and maintaining the existing structures. As discussed in the Water Quality Technical Report, continuous curbs and concrete barriers generally confine runoff from I-5 to the highway, and closed (pipe) drainage systems convey flows to surface water outfalls. Runoff from the bridges across the North Portland Harbor and Columbia River drains through scuppers to water surface or ground below. Refer to the Water Quality Technical Report for details on the stormwater outfalls to these water bodies.

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[3] *Endangered Species Act – Section 7 Consultation Biological Opinion & Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation, I-5 Delta Park: Victory Boulevard to Lombard Section Project, Columbia Slough, Multnomah County, Oregon*. National Marine Fisheries Service, Northwest Region. November 15, 2006.

[4] *Oregon Administrative Rules, Division 41, Table 33B, Water Quality Criteria Summary*. Oregon Department of Environmental Quality. The acute criterion for dissolved copper is (0.960)*(e(0.9422[ln(hardness)] - 1.700)), and the value provided assumes a hardness of 30 mg/L.

[5] *Water Quality Standards for Surface Waters of the State of Washington Chapter 173-201A WAC*. Washington State Department of Ecology. Publication Number 06-10-091. Amended November 20, 2006. The acute criterion from Table 240(3) for dissolved copper is (0.960)*(e(0.9422[ln(hardness)] - 1.464)), and the value provided is for a hardness of 30 mg/L.

[6] The Columbia Slough basin receives stormwater from portions of I-5 within Segment A, and will continue to do so under the Build Alternatives. The Columbia Slough waterbody is not within the primary API, however. The Columbia Slough and potential effects from stormwater input are discussed in the Secondary API and indirect effects sections of this document.

Exhibit 4-1. Aquatic Habitats Occurring Within Segment A

Aquatic Resource Name Stream Classification/ Resource Type	Fish Bearing Status	I-5 Bridge Crosses Aquatic Resource	Bridge Piers Below OHW [a]
Columbia River Perennial watercourse	Anadromous/Resident	Yes	Yes
North Portland Harbor Perennial watercourse	Anadromous/Resident	Yes	Yes

[a] Ordinary High Water Mark

4.3.1.1.1 Columbia River

The I-5 bridge is located at RM 106 of the Columbia River. The river in the vicinity of the API is a broad channel constrained by surrounding land use (i.e., urbanized development). The stream slope in this area approaches 0 percent. Channel stability is indeterminate as there is no generalized pattern of degrading or aggrading conditions. Both the left and right banks are armored upstream and downstream of the bridge. No evidence of recent flooding was present during site visits; upstream from the secondary API, hydropower dams and flood control reservoirs control flows and flooding.

The nearshore dominant substrate is characterized by fines/silt/organics, with a subdominant substrate of sand. Field surveys indicate that glide habitat is the dominant stream habitat type within the primary API. The broad, sandy riverbed historically had few shallow side channels, and was characterized by a broad, sandy riverbed with generally flat side slopes (USACE 2001). Shallow and near-shore habitat is present in the project area on both the Oregon and Washington shores and is influenced by flow and sediment input from tributaries and the mainstem river, which eventually settles to form shoals and shallow flats. This shallow water habitat is used extensively by juvenile and adult salmonids for migrating, feeding, and holding. Phytoplankton, microdetritus, and macroinvertebrates are present in shallow areas and serve as the prey base for salmonids (USACE 2001).

Ten bridge footings are currently located within the Ordinary High Water Line (OHW). Landform and bridge footings are the dominant and subdominant floodplain constrictions, respectively. Compared to historical conditions, habitat forming processes (e.g., sediment transport and deposition, erosion, flooding) in the Columbia River are restricted by flood control, flow regulation, upstream dams and levees, and channel dredging; therefore, habitat complexity is reduced and shallow habitat areas, such as shoals, are prevented from establishing. Sandy beaches that are created by dredge disposal are also present in the Columbia; shoreline erosion rates are likely slower than they were historically due to flow regulation. The river channel is deeper and narrower than historical conditions. Backwater and side channel habitat with high quality wetland and riparian vegetative components, such as emergent plants and low herbaceous shrubs, are present in Columbia River along portions of the riverbank and near undeveloped islands (USACE 2001). The riparian area within the project area is relatively degraded and provides shallow water habitat with sparse vegetative cover (see Exhibit 4-4 below).

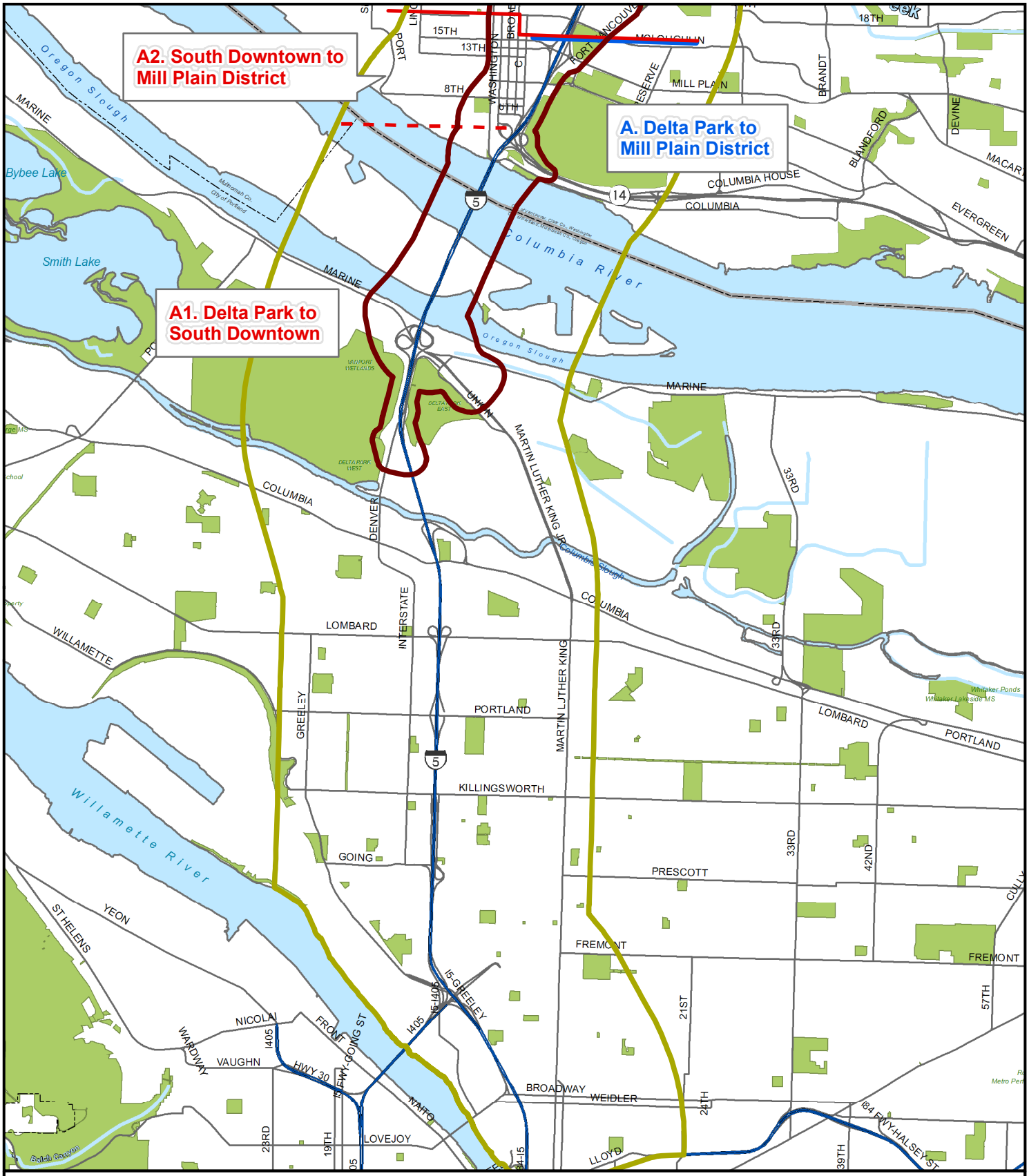


Exhibit 4-2: Streams A

Columbia River CROSSING

Analysis by J. Koloszar; Analysis Date: Aug-2007; Plot Date: Aug-2007; File Name: Streams_JL088.mxd

The substrate of the river within the project area is predominantly composed of sand, with relatively small percentages of fine sediments and organic material (David Evans and Associates 2006, NMFS 2002). A bathymetric study completed in 2006 found significant scouring on the upstream side of each bridge pier, and scour channels on the downstream side (David Evans and Associates 2006). The scouring ranged from approximately 10-15 feet deep. Bedload transport patterns were evident in the form of sandwaves, a natural feature of the river bottom that indicate the influence of the currents and that continuously move and shift with the currents. The sandwaves observed in this study were especially distinct on the downstream side of the bridge. The sandwaves in the middle of the river were regular, while the sandwaves on the northern downstream side were larger and more irregular. The northern upstream side of the bridge was relatively smooth and had few to no sandwaves, while the southern upstream side had irregular sandwaves. Average river depth was approximately 27 feet. Shallow water habitat (defined as 20 feet deep or less) is present along both banks, but is more abundant along the Oregon bank (see Exhibit 4-3). Additional details necessary for further analysis of impacts of bents will be addressed in the BA as data are available.

Riparian vegetation estimates for the Columbia River are shown in Exhibit 4-4. Data were collected from the banks of the stream within 500 feet upstream and downstream of the bridge crossing (1000 feet total). The riparian vegetation was visually surveyed. The table gives a typical representation of the riparian areas.

The riparian vegetation along the Columbia River within both the primary and secondary APIs provides little potential for future large wood recruitment. Fish cover elements are generally sparse to absent, although some boulders and artificial structures are present. Within the secondary API, the river is known to provide holding and migration habitat for coho salmon, chum salmon, sockeye salmon, steelhead trout, and Chinook salmon, and may support bull trout as well as SOC such as coastal cutthroat trout and Pacific lamprey.

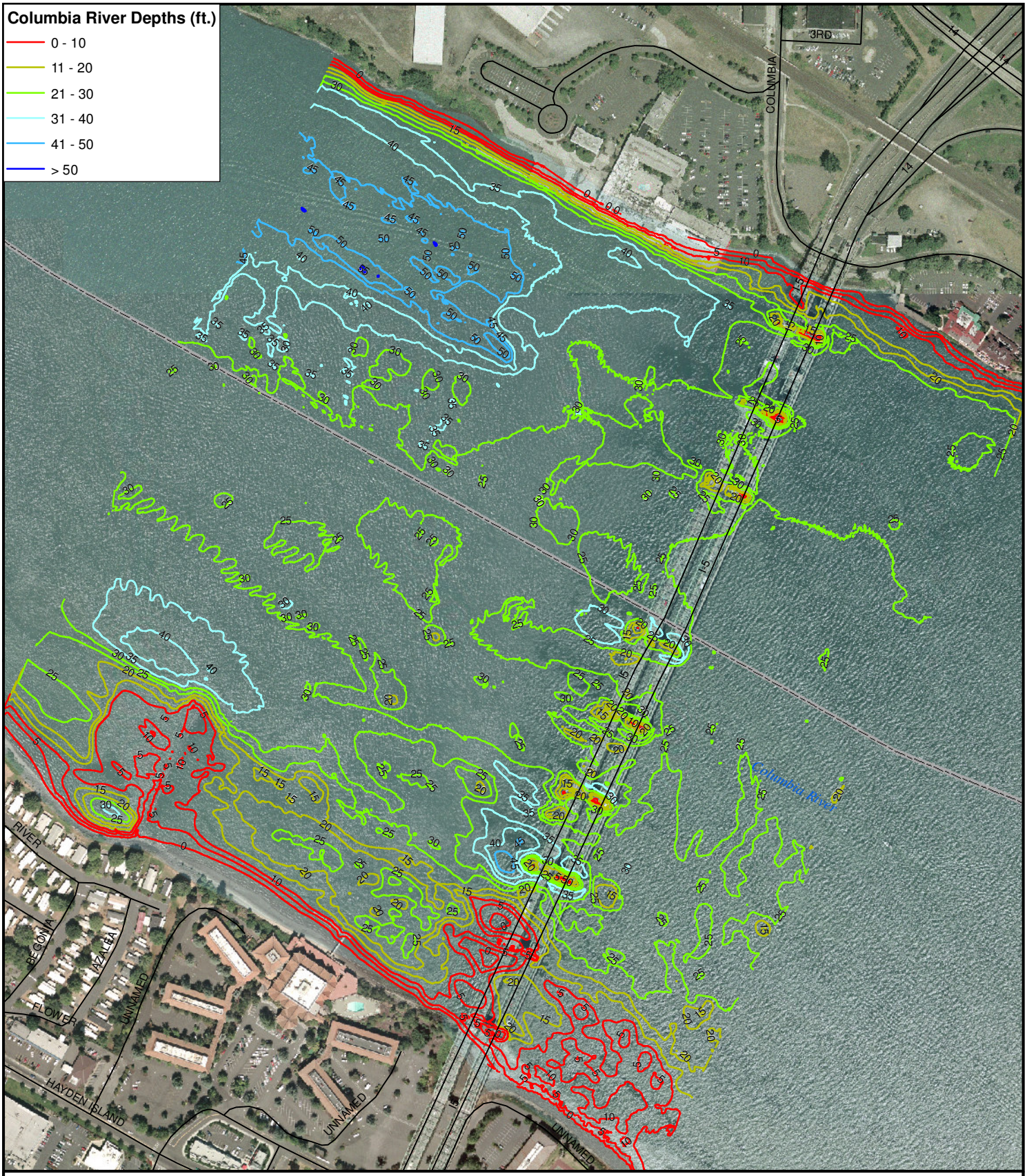


Exhibit 4-3: Columbia River Water Depth Maps (CRD)

Columbia River CROSSING

Analysis by J. Koloszar; Analysis Date: 11/15/2007; Plot Date: 12/6/2007; File Name: bathymetry.mxd

Exhibit 4-4. Riparian Vegetation Cover Estimate within Segment A in the Primary API for the Columbia River

	Vegetation Type and Density			
	North Bank Upstream	North Bank Downstream	South Bank Upstream	South Bank Downstream
Canopy (> 15 ft high)				
Vegetation Type	None	Deciduous	Deciduous	None
Big trees (Trunk > 1 ft dbh)	Absent (0%)	Absent (0%)	Absent (0%)	Absent (0%)
Small trees (Trunk < 1 ft dbh)	Absent (0%)	Sparse (< 10%)	Sparse (< 10%)	Absent (0%)
Understory (1.5 to 15 ft high)				
Vegetation Type	Mixed	Mixed	Mixed	Mixed
Woody Shrubs & Saplings	Sparse (< 10%)	Sparse (< 10%)	Sparse (< 10%)	Sparse (< 10%)
Non-Woody Herbs, Grasses & Forbs	Sparse (< 10%)	Sparse (< 10%)	Sparse (< 10%)	Sparse (< 10%)
Invasive Species	Heavy (40-75%)	Heavy (40-75%)	Heavy (40-75%)	Heavy (40-75%)
Ground Cover (0.0 to 1.5 ft high)				
Vegetation Type	Mixed	Mixed	Deciduous	Mixed
Woody Shrubs & Saplings	Sparse (< 10%)	Sparse (< 10%)	Sparse (< 10%)	Sparse (< 10%)
Non-Woody Herbs, Grasses & Forbs	Sparse (< 10%)	Sparse (< 10%)	Sparse (< 10%)	Sparse (< 10%)
Barren, Bare Dirt, or Duff	Heavy (40-75%)	Heavy (40-75%)	Heavy (40-75%)	Heavy (40-75%)
Invasive Species	Moderate (10-40%)	Moderate (10-40%)	Sparse (< 10%)	Moderate (10-40%)

Tree canopy is generally absent or sparse. Where present, typical canopy dominants include native willow (*Salix* sp.) and cottonwood (*Populus balsamifera*) species and non-native species such as ailanthus (*Ailanthus altissima*). The understory is typically dominated by non-native species such as Himalayan blackberry and ailanthus, and native species such as roses (*Rosa* sp.) and willows (*Salix* sp.). Ground cover is typically dominated by non-natives such as English ivy (*Hedera helix*), reed canarygrass (*Phalaris arundinacea*) and Himalayan blackberry (*Rubus discolor*).

Water temperatures at Washougal, Washington range from approximately 6ºC in early spring to approximately 22ºC in late summer (USGS 2007). Temperatures in the project area are assumed to be similar. Desirable water temperatures for young salmonids during downstream migration range from 6.7 to 13.3ºC. In freshwater, temperatures greater than 23ºC are lethal for juvenile salmonids, and temperatures greater than 21ºC are lethal for adult salmonids (USACE 2001).

As discussed in the Water Quality Technical Report, the Columbia River does not meet Oregon Department of Environmental Quality (DEQ) standards (and is 303(d) listed) for the following parameters: temperature, PCBs, PAHs, DDT metabolites (DDE), and arsenic (DEQ 2007). DEQ does not differentiate between the North Portland Harbor and Columbia River when compiling the 303(d) list; therefore, these listings also apply to the North Portland Harbor. The Columbia River is not on Washington State's 303(d) list for any parameters (Ecology 2007). In addition to the 303(d) listings, EPA has approved TMDLs for the Columbia River for dioxin and total dissolved gas (DEQ 1991 and 2002).

As discussed in the Water Quality Technical Report, runoff from I-5 on Hayden Island discharges directly to the Columbia River. Stormwater from the I-5 Bridge discharges directly to the river through roadside grates located along the entire span. Runoff from the bridge is not treated prior to release to the river.

Refer to the Water Quality Technical Report for a description of the Columbia River floodplain, hydrology, and specific details on stormwater outfalls.

4.3.1.1.2 North Portland Harbor

The North Portland Harbor, also known as the North Portland Harbor, is a large side channel of the Columbia River located along the southern banks of Hayden Island. The slough branches off the Columbia River just upstream (east) of the secondary API boundary, and flows approximately five miles downstream (west) before rejoining the mainstem Columbia. I-5 crosses the North Portland Harbor at approximately RM 4.

The aquatic description of the Columbia River also applies to the slough. Much of the fish cover provided in the slough consists of permanently moored floating homes and boathouses. Landform and bridge footings are the dominant and subdominant floodplain constrictions, respectively.

The substrate of the slough within the project area is predominantly composed of sand, with relatively small percentages of fine sediments and organic material. A bathymetric study completed in 2006 (David Evans and Associates 2006) found deep scouring near the ends of the downstream piers on the north bank of the slough, with scour holes approximately 8-10 feet deep. Scouring around the upstream piers was approximately 3-7 feet. Scouring was more pronounced around the northern piers than the southern piers. A particularly deep (approximately 21 feet) area on the south side of the channel, downstream of the existing bridge, is indicative of a fast-moving current through the slough. The average depth of the slough was approximately 14 feet. Shallow water habitat (defined as 20 feet deep or less) is present throughout the project area in the slough (see Exhibit 4-5). Additional details necessary for further analysis of impacts of piers will be addressed in the BA as data are available.

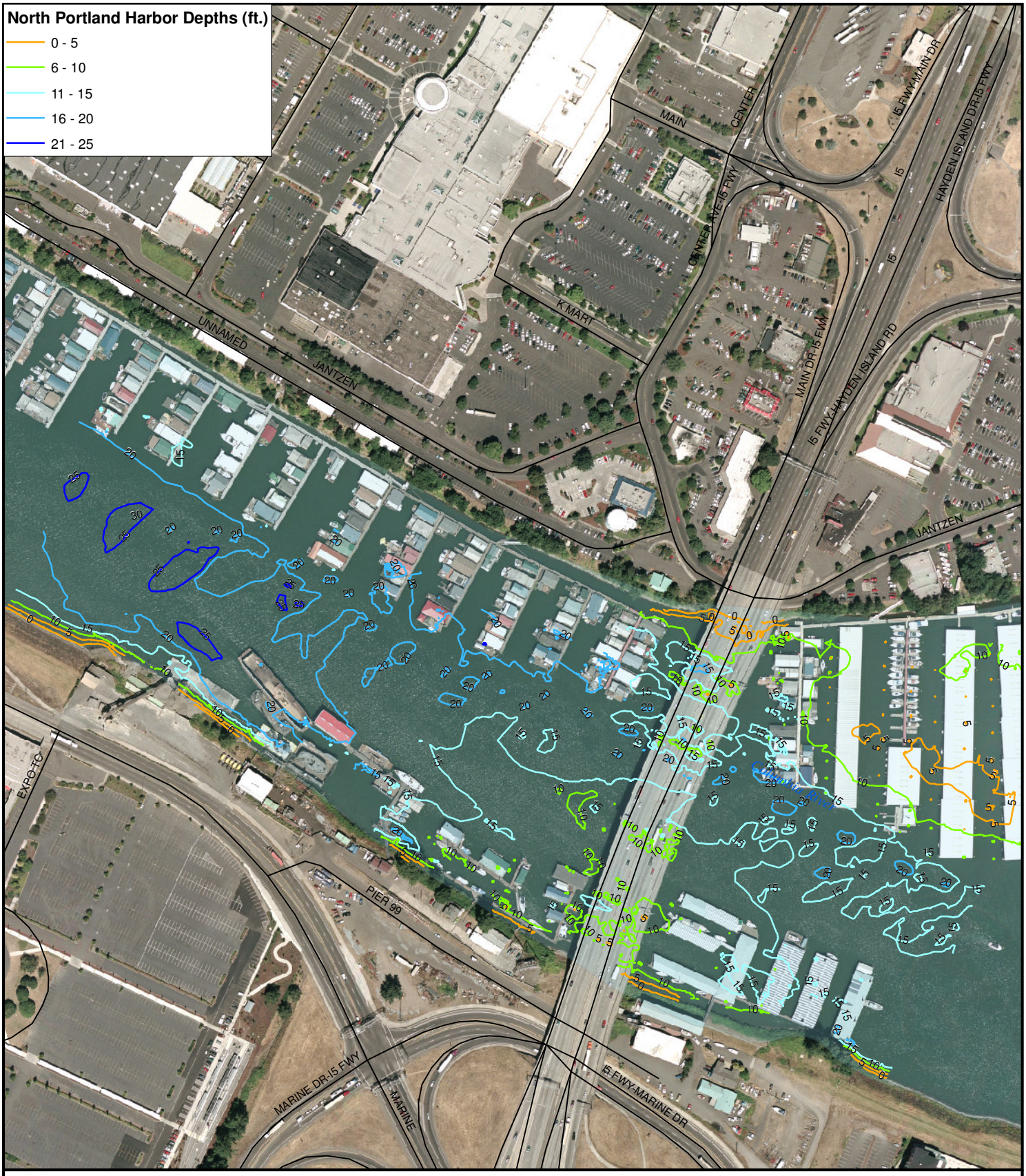


Exhibit 4-5: North Portland Harbor Water Depth (CRD)

Columbia River CROSSING

Analysis by J. Koloszar; Analysis Date: 11/15/2007; Plot Date: 12/6/2007; File Name: bathymetry.mxd

Riparian vegetation estimates for the North Portland Harbor are shown in Exhibit 4-6. Data were collected from the banks of the stream within 500 feet upstream and downstream of the bridge crossing (1000 feet total). The riparian vegetation was visually surveyed. The table is meant to give an average representation of the riparian areas.

Exhibit 4-6. Riparian Vegetation Cover Estimate within Segment A in the Primary API for the North Portland Harbor

	Vegetation Type and Density			
	North Bank Upstream	North Bank Upstream	South Bank Downstream	South Bank Downstream
Canopy (> 15 ft high)				
Vegetation Type	Deciduous	None	Mixed	Deciduous
Big trees (Trunk > 1 ft dbh[a])	Sparse (< 10%)	Absent (0%)	Sparse (< 10%)	Sparse (< 10%)
Small trees (Trunk < 1 ft dbh)	Moderate (10-40%)	Absent (0%)	Sparse (< 10%)	Sparse (< 10%)
Understory (1.5 to 15 ft high)				
Vegetation Type	Deciduous	Mixed	Mixed	Mixed
Woody Shrubs & Saplings	Sparse (< 10%)	Heavy (40-75%)	Sparse (< 10%)	Sparse (< 10%)
Non-Woody Herbs, Grasses & Forbs	Sparse (< 10%)	Sparse (< 10%)	Sparse (< 10%)	Sparse (< 10%)
Invasive Species	Sparse (< 10%)	Heavy (40-75%)	Moderate (10-40%)	Moderate (10-40%)
Ground Cover (0.0 to 1.5 ft high)				
Vegetation Type	Mixed	Mixed	Mixed	Mixed
Woody Shrubs & Saplings	Sparse (< 10%)	Sparse (< 10%)	Sparse (< 10%)	Sparse (< 10%)
Non-Woody Herbs, Grasses & Forbs	Sparse (< 10%)	Sparse (< 10%)	Sparse (< 10%)	Sparse (< 10%)
Barren, Bare Dirt, or Duff	Moderate (10-40%)	Moderate (10-40%)	Moderate (10-40%)	Moderate (10-40%)
Invasive Species	Moderate (10-40%)	Moderate (10-40%)	Moderate (10-40%)	Moderate (10-40%)

[a] Diameter at breast height.

Canopy on the North Portland Harbor is typically sparse. Typical dominant vegetation in the canopy includes native trees such as cottonwood (*Populus balsamifera)* and big-leaf maple (*Acer macrophyllum)*, and non-native species such as ornamental maples (*Acer* sp.) and pines (*Pinus* sp.). In the understory, typical vegetation includes non-native Himalayan blackberry (*Rubus discolor)* and native willow (*Salix* sp.). Typical ground cover vegetation includes non-native species such as English ivy (*Hedera helix)* and Himalayan blackberry (*Rubus discolor)*.

Refer to the water quality discussion in Section 4.3.1.1.1 (Columbia River) above for a description of DEQ and EPA water quality parameters and 303(d) listings. Refer to the Water Quality Technical Report for a description of the Columbia River/North Portland Harbor floodplain, hydrology, and specific details on stormwater outfalls.

4.3.1.2 Threatened, Endangered, and Proposed Species

"Listed" species refer to those with federal and/or state threatened, endangered, or proposed status. Data on listed species were obtained from NMFS, USFWS, ORNHIC, WDNR-NHP, and WDFW-PHS. The Columbia River and North Portland Harbor are known to support listed anadromous salmonids, including Chinook salmon (*Oncorhynchus tshawytscha*), chum salmon (*O. keta*), sockeye salmon (*O. nerka*), steelhead trout (*O. mykiss*), and coho salmon (*O. kisutch*), as well as species of concern (SOC) such as lamprey (*Lampetra* species), Coastal cutthroat trout (*Oncorhynchus clarki clarki*), and the northern distinct population segment of green sturgeon (*Acipenser medirostris*) (NMFS 2008a). Habitat use for these species is primarily migration, holding, and rearing. Chum salmon are known to spawn in the Columbia River upstream of the project area, near the mouth of Camas Creek (B. Meyer, pers. comm.).

Bull trout (*Salvelinus confluentus*) are federally threatened and have been documented in the Lower Columbia River at very low abundance (S. Gray, pers. comm.). Bull trout use of the Lower Columbia may include overwintering and feeding; the Bull Trout Lower Columbia Recovery Team considers the mainstem Columbia to contain core habitat necessary for full recovery of the species (USFWS 2002).

NMFS has determined that the southern DPS of green sturgeon may occur in Washington coastal waters (NMFS 2008a). Northern and southern DPSs were delineated in 2003; in 2006, the southern DPS was listed as threatened, while the northern DPS was classified as a species of concern. Southern green sturgeon spawn in the Sacramento River, California, while northern green sturgeon spawn in the Klamath and Rogue Rivers. Genetic and tagging data indicate that the stocks co-mingle in the Columbia River estuary during the summer as sub-adults and adults.

Northern (Steller) sea lions are listed as threatened under the federal ESA as well as by both Oregon and Washington (Exhibit 4-7). California sea lions (*Zalophus californianus*) are not listed under the ESA, but like the Steller sea lions, they are protected under the Marine Mammal Protection Act (MMPA).

Exhibit 4-7. Protected Aquatic/Fish Species Potentially Occurring within Segment A

ESU/DPS (Where Appropriate)[a] Species Common Name *Species Scientific Name*	Federal Status[b]	OR Status[c]	WA Status[d]	Critical Habitat Present	EFH Present in Primary API[e]	ESH Present in Primary API[f]	Presence Documented in Primary API[g]	Habitat Use within Primary API[h]
Lower Columbia River ESU **Chinook salmon** *Oncorhynchus tshawytscha*	LT	SC	SC	Yes	Yes	No	Yes	M/H
Upper Columbia River-Spring Run **Chinook salmon** *Oncorhynchus tshawytscha*	LE	N/A	SC	Yes	Yes	No	Yes	M/H
Snake River Fall-Run **Chinook salmon** *Oncorhynchus tshawytscha*	LT	LT	SC	Yes	Yes	No	Yes	M/H
Snake River Spring/Summer-Run **Chinook salmon** *Oncorhynchus tshawytscha*	LT	LT	SC	Yes	Yes	No	Yes	M/H
Lower Columbia River DPS **Steelhead trout** *Oncorhynchus mykiss*	LT	SC	SC	Yes	No	No	Yes	M/H
Middle Columbia River **Steelhead trout** *Oncorhynchus mykiss*	LT	SC	SC	Yes	No	No	Yes	M/H
Upper Columbia River **Steelhead trout** *Oncorhynchus mykiss*	LE	N/A	SC	Yes	No	No	Yes	M/H
Snake River Basin **Steelhead trout** *Oncorhynchus mykiss*	LT	SV	SC	Yes	No	No	Yes	M/H
Snake River **Sockeye salmon** *Oncorhynchus nerka*	LE	None	SC	Yes	No	No	Yes	M/H
Lower Columbia River **Coho salmon** *Oncorhynchus kisutch*	LT	LE	None	N/A	Yes	No	Yes	M/H
Columbia River ESU **Chum salmon** *Oncorhynchus keta*	LT	SC	SC	Yes	No	No	Yes	M/H
Southwestern Washington/Columbia River **Coastal cutthroat trout** *Oncorhynchus clarki clarki*	SOC	SC	N/A	N/A	N/A	No	Yes	Unknown
Columbia River DPS **Bull trout** *Salvelinus confluentus*	LT	SC	SC	No	N/A	No	Yes	Unknown; potentially overwintering and feeding
Pacific lamprey *Lampetra tridentata*	SOC	SV	N/A	N/A	N/A	N/A	Yes	Unknown

ESU/DPS (Where Appropriate)[a] Species Common Name *Species Scientific Name*	Federal Status[b]	OR Status[c]	WA Status[d]	Critical Habitat Present	EFH Present in Primary API[e]	ESH Present in Primary API[f]	Presence Documented in Primary API[g]	Habitat Use within Primary API[h]
River lamprey *Lampetra ayresi*	SOC	None	SC	N/A	N/A	N/A	Unconfirmed	Unknown
Northern DPS **Green sturgeon** *Acipenser medirostris*	SOC	None	N/A	N/A	N/A	N/A	Unconfirmed	Unknown
Southern DPS **Green sturgeon** *Acipenser medirostris*	LT	None	N/A	N/A	N/A	N/A	Unconfirmed	Unknown
Northern (Steller) sea lion *Eumetopias jubatus*	LT	LT	LT	No	N/A	N/A	Yes	Feeding, Resting
California sea lion *Zalophus californianus*	Protected (MMPA)	None	None	N/A	N/A	N/A	Yes	Feeding, Resting

[a] ESU = Evolutionarily Significant Unit; DPS = Distinct Population Segment (USFWS 2008).
[b] Federal status: LT = Listed Threatened, LE = Listed Endangered, P = Proposed, C = Candidate, SOC = Species of Concern, N/A = Not Applicable (USFWS 2008).
[c] OR State status: LT = Listed Threatened, SC = Sensitive Critical, SV = Sensitive Vulnerable, N/A = Not Applicable (Oregon Threatened and Endangered Species List).
[d] WA state status: SC=state candidate, N/A = Not Applicable (WDFW-PHS).
[e] EFH = Essential Fish Habitat, per the MSFCMA.
[f] ESH = Essential Salmonid Habitat, per DSL and ODFW.
[g] Source = StreamNet (2005).
[h] Habitat uses: S = Spawning, R = Rearing, M/H = Migration/Holding, O-C = Off-Channel (StreamNet 2005).

NMFS has designated critical habitat for several of the listed salmonid evolutionarily significant units (ESUs) (or distinct population segments [DPS] for steelhead) that occur in the Columbia River and North Portland Harbor (NMFS 2008a). Chinook and coho salmon habitat is also managed under the MSFCMA. The MSFCMA requires cooperation among NMFS, the Regional Fishery Management Councils, fishing participants, federal and state agencies, and others in achieving the essential fish habitat (EFH) goals of habitat protection, conservation, and enhancement. EFH comprises those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity, and includes the Columbia River and North Portland Harbor (NMFS 2008b).

DSL also designates essential salmonid habitat (ESH). ESH is the habitat necessary to prevent the depletion of native salmon species during their life history stages of spawning and rearing (OAR 141-102-0000). Aquatic habitats within the primary API are not designated as ESH.

Consultation under Section 7 of the ESA will be initiated with NMFS and USFWS to analyze effects to listed species and EFH once project design details are further refined.

In addition to federal and state protected aquatic species, the Columbia River, North Portland Harbor, and small creeks in the API support a community of native aquatic species, including but not limited to Pacific smelt (*Spirinchus thaleichthys*), trout (*Oncorhynchus* spp.), sculpin (*Cottus* spp.), suckers (*Catostomus* spp.), dace (*Rhinichthys*

spp.), shiners (*Richardsonius* spp.), white sturgeon (*Acipenser transmontanus*), mussels (e.g., *Anodonta* spp.), and amphibians and reptile such as salamanders, frogs, toads, and turtles (see Section 4.3.2.1, Terrestrial Resources). Many of these species are discussed in the Species of Interest (SOI) section (refer to Section 4.3.4). Aquatic organisms that constitute the prey base for salmonids and other fish in the lower Columbia include invertebrates such as sand shrimp, mysids, crabs, zooplankton (e.g., daphnids, chironomid larvae), and floating insect larvae and adults. Native species share aquatic habitat with listed salmonids and other aquatic species; therefore, habitat description, habitat quality parameters, and project impacts described for listed aquatic species also apply to populations of non-listed native species that occur within the primary and secondary API.

4.3.1.3 Fish Passage

There are no known fish passage barriers within the primary API. Several barriers to fish passage are present on tributaries to the Columbia River along its entire length, and dams are present on the river upstream of the project area. Off-channel habitat along the North Portland Harbor is extremely limited compared to likely historic conditions, and has been degraded along most of the North Portland Harbor within the secondary API.

4.3.2 Terrestrial Resources

4.3.2.1 Summary of Terrestrial Resources

Two recently federally delisted species that may occur in Segment A of the primary API are bald eagles (*Haliaeetus leucocephalus*) and peregrine falcons (*Falco peregrinus anatum*). Although both species have been delisted from the federal ESA, the bald eagle is still listed as threatened by Oregon and Washington, and both species' populations will be closely monitored in the near future. Bald eagles will continue to be protected by Washington and Oregon, as well as by the federal Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. No known or potential bald eagle nesting or communal roosting areas exist within Segment A in the primary API. Bald eagles likely forage along the Columbia River and North Portland Harbor.

The peregrine falcon was federally delisted in August 1999, and was delisted by the state of Oregon in April 2007. The species is listed by the state of Washington as sensitive. Peregrine falcons are known to occur on the I-5 bridge. In addition to being protected under state law, the peregrine falcon is protected by the MBTA. The State of Oregon has not prepared a conservation plan for the peregrine falcon, although ODOT has monitored their presence on the I-5 bridge for several years.

Bridges are also home to other species of interest, including native birds such as swallows (also protected under the MBTA) and bats. Any construction activities need to take these species into consideration. A survey of the I-5 bridge in 2003 found no evidence of roosting bats or nesting swallow. However, in 2007 two remnant mud nests were found on the south end of the I-5 bridge over the Columbia River.

Five habitat types exist within Segment A in the primary API. These are described further in Section 4.3.5 Habitat Occurrence. Two of these habitat types, Westside Riparian Wetland and Herbaceous Wetlands, are priority habitats for the area (Johnson and O'Neil 2001). In addition to protecting species, local, state, and federal laws protect species' habitats (see Section 2.3).

Exhibit 4-8 lists the habitat types with local and regionally significant classifications occurring in the Segment A portion of the primary API and the southern portion of the secondary API.

Exhibit 4-8. Acres of Habitat Classification within Segment A

	Primary API	Secondary API
Johnson and O'Neil classifications:		
Westside Lowland Conifer-Hardwood Forest	5.89	59.27
Lakes, Rivers, Ponds, and Reservoirs	251.01	1,062.58
Herbaceous Wetlands	15.50	53.35
Westside Riparian – Wetlands	17.36	125.79
Urban and Mixed Environs	683.65	8,109.85
Washington Priority Habitats	112.01	443.72
Vancouver Critical Areas	123.58	540.40
Metro Goal 5	483.04	2,315.25
City of Portland E-Zones	242.52	1,294.82
Total	**1,934.56**	**14,005.05**

The terrestrial habitats in the primary and secondary APIs support rare species (see Section 4.3.3) as well as more common native mammals, birds, amphibians, and reptiles, including but not limited to salamanders (e.g., *Batrachoseps* spp.), frogs (*Rana* spp.), painted turtles (*Chrysemys picta*), pond turtles (*Emys marmorata*), ospreys (*Pandion haliaetus*), red-tailed hawks (*Buteo jamaicensis*), grebes (*Aechmophorus* spp.), finches (*Carpodacus* spp.), blackbirds (*Agelaius* spp.), geese (*Branta* spp.), squirrels (*Sciurus* spp.), and raccoons (*Procyon lotor*). Many of these species are discussed under Species of Interest (see Section 4.3.4), for example, the migratory birds.

4.3.3 Habitat Occurrence

Habitat is the area where wildlife nest, feed, roost, and raise their young. The analysis in this document uses Johnson & O'Neil (2001) Habitat Types classification to classify the different habitats located within the primary API. Segment A contains five habitat types (Exhibit 4-9):

- Open Water - Lakes, Rivers, and Streams
- Urban and Mixed Environs
- Westside Lowlands Conifer-Hardwood Forest
- Herbaceous Wetlands
- Westside Riparian – Wetlands

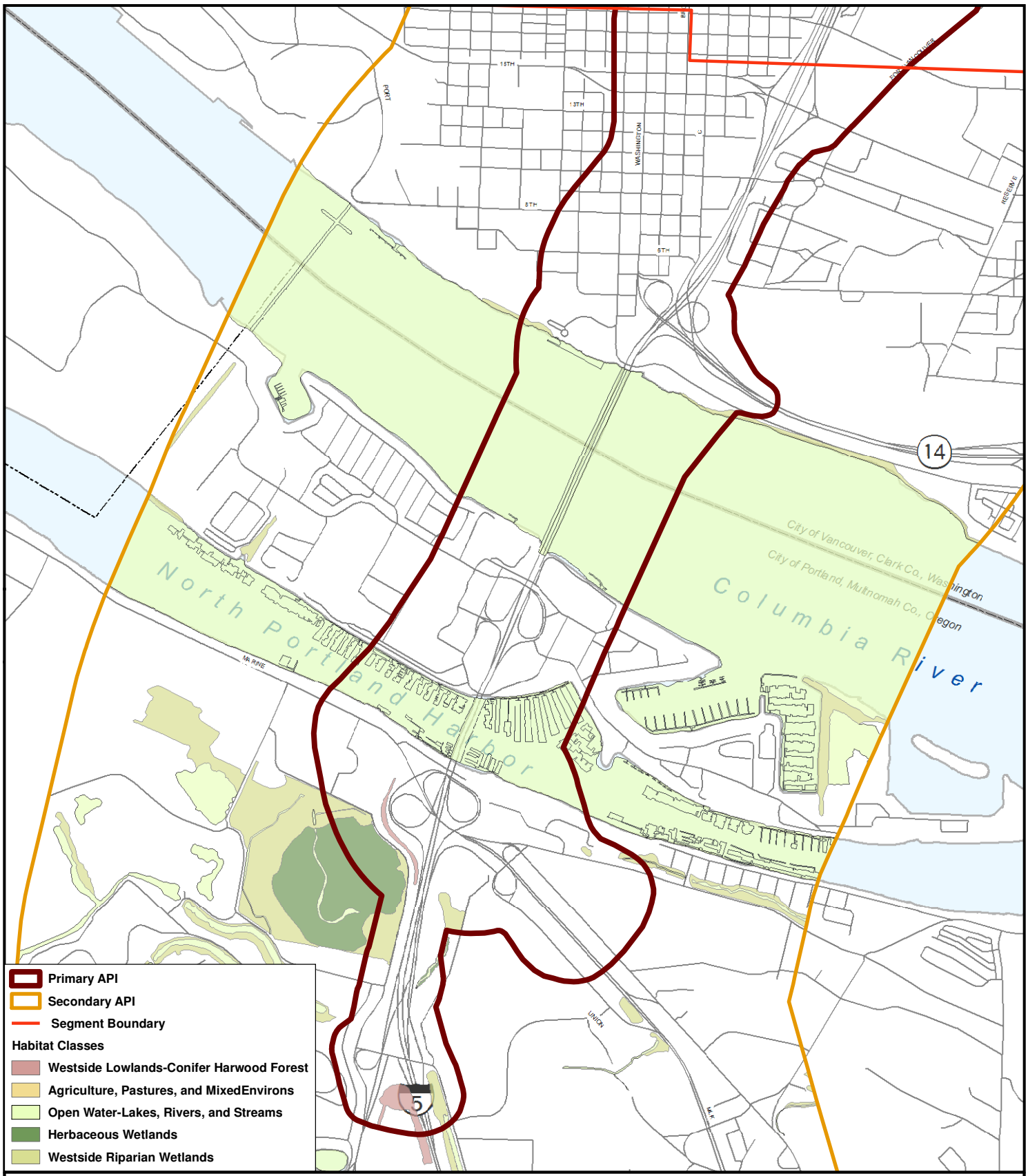


Exhibit 4-9: Habitat Classifications
Segment A

Columbia River CROSSING

Analysis by Analyst name; Analysis Date: Aug.-2007; Plot Date: Aug.-2007; File Name: Exhibit4_HabClas_JL083.mxd

Each of the five habitat types provide nesting, breeding, foraging, and/or dispersal habitat for migratory birds, small mammals, amphibians, reptiles, and other native species (Johnson and O'Neil 2001).

4.3.3.1 Open Water – Lakes, Rivers, and Streams

This habitat includes all areas of open freshwater and shorelines, gravel bars, and sand bars associated with these habitats throughout the region (Johnson and O'Neil 2001). Examples of species of interest associated with this habitat type include the bald eagle, peregrine falcon, osprey, geese and other waterfowl, migratory songbirds, Townsend's big-eared bat, purple martin, Pacific pond turtle, and northern painted turtle (Johnson and O'Neil 2001).

Within the primary API, this habitat type includes the Columbia River and the North Portland Harbor.

4.3.3.2 Urban and Mixed Environs (High Density)

This habitat type consists of land containing built structures and impervious surfaces such as buildings, houses, parking lots, and roads. This habitat type is found throughout the primary API and occurs within or adjacent to nearly every other habitat type. Land use types may include a mix of commercial, residential, and transportation developments. Many vegetative structural features typical of the historical vegetation have been removed; however, some remaining vegetative structures can provide habitat for nesting or roosting, and landscaping may provide foraging or nesting opportunities. High-density urban landscapes are covered with 60 to 100 percent impervious surfaces. Examples of species of interest associated with this habitat type include the bald eagle, peregrine falcon, red-tailed hawk, migratory songbirds, kingfishers, and Townsend's big-eared bat (Johnson and O'Neil 2001).

These environs include core downtown areas, commercial areas, shopping malls, industrial areas, high-density housing, and transportation corridors such as I-5 (Johnson and O'Neil 2001).

4.3.3.3 Westside Lowlands Conifer-Hardwood Forest

This lowland to low montane upland forest occurs over most of western Washington, the Coast Range of Oregon, the western slopes of the Cascades in Oregon, and around the margins of the Willamette Valley. This forest is dominated by one or more of the following species: Western hemlock, Western red cedar, Douglas-fir, Sitka spruce, red alder, Port-Orford cedar, and bigleaf maple. This habitat type does not include dry Douglas-fir forests where western hemlock is not able to grow (Johnson and O'Neil 2001). Examples of species of interest associated with this habitat type include the bald eagle, peregrine falcon, migratory songbirds, and Townsend's big-eared bat, and, historically, the yellow-billed cuckoo and purple martin (Johnson and O'Neil 2001).

Only a small portion of the project area is composed of the Westside Lowlands Conifer-Hardwood Forest habitat type; this portion consists of very small, isolated patches surrounded by urban and mixed environs.

4.3.3.4 Herbaceous Wetlands

This habitat type is composed of wet meadows, marshes, fens, and aquatic beds. These habitats are wetlands or riverine floodplains that are dominated by herbaceous vegetation. Common dominants include cattails, sedges, grasses, bulrushes, and various forbs. Aquatic rooted plants that extend to the surface or floating aquatic plants are also dominants (Johnson and O'Neil 2001). Examples of species of interest associated with this habitat type include the bald eagle, peregrine falcon, Townsend's big-eared bat, purple martin, tri-colored blackbird, and painted turtle (Johnson and O'Neil 2001).

The Herbaceous Wetlands habitat type can be found at the Vanport Wetlands complex, located west of I-5 and south of Marine Drive; immediately surrounding the open water pond/wetland system east of I-5 Delta Park, and the closed slough east of I-5 along Whitaker Road. Please refer to the Wetlands Technical Report for more detailed information on wetlands in the project area.

4.3.3.5 Westside Riparian-Wetlands

This habitat includes all freshwater wetlands and riverine floodplains that are dominated by trees or shrubs at low elevations on the west side of the Cascades. Typical dominant species include Sitka spruce, Western red cedar, Western hemlock, red alder, black cottonwood, Oregon ash, willows, and spirea. Also included are all sphagnum bogs (forested, shrub, and herb-dominated) (Johnson and O'Neil 2001). Species of interest associated with this habitat type include the bald eagle, peregrine falcon, Townsend's big-eared bat, purple martin, migratory songbirds, pond turtles, and painted turtle (Johnson and O'Neil 2001).

The Westside Riparian - Wetlands habitat type is found scattered in small patches along the Columbia River and North Portland Harbor, and along the Oregon side of the Columbia River. This habitat type can also be found within the Vanport Wetlands complex. Very little riparian vegetation exists along the Columbia River. Human activities, urban development, and the absence of a riparian corridor cause the riparian area along the Columbia River to be highly disturbed. Please refer to the Wetlands Technical Report for more detailed information on wetlands in the project area.

4.3.4 Regional and Local Resource Protection

This project is located within several governmental jurisdictions, and resource protection regulations vary with each jurisdiction. With the exception of Multnomah County, each of these jurisdictions has established habitat classifications that include lands within the primary API. A summary of regional and local resource protection is found in Exhibit 4-10. Refer to Section 9 for permits and approvals that may be associated with these resource protection areas.

Exhibit 4-10. Regional and Local Resource Protection in Segment A

Agency	Jurisdiction	Program	Habitat Protected	Acres in Primary API	Acres in Secondary API
WDFW	Washington State	Priority Habitats	Riparian, Urban Natural Open Space, Oak Woodland	112.01	443.72
City of Vancouver	City of Vancouver	Critical Areas Protection Ordinance	Fish and wildlife habitat conservation areas, wetlands, frequently flooded areas, critical aquifer recharge areas, and geologic hazard areas	123.58	540.40
Clark County	Unincorporated areas of Clark County	Critical Areas Protection Ordinance	Riparian Priority Habitat, Other Priority Habitats and Species, and Locally Important Habitats and Species	See City of Vancouver acres above	See City of Vancouver acres above[a]
City of Portland	City of Portland	Environmental Zones	Important natural resource areas	242.52	1,294.82
Metro	Portland metropolitan area	Goal 5	Regionally significant fish and wildlife habitat; Riparian habitat; Upland habitat	483.04	2,315.25

[a] City of Vancouver and Clark County critical lands are merged for mapping purposes; these figures represent critical areas for both City of Vancouver and Clark County.

4.3.4.1 Washington

Washington Department of Fish and Wildlife: Though WDFW is responsible for protecting fish and wildlife species, it does not have far-reaching authority to protect the habitats on which they depend. In order to address the protection of these habitats, they publish a Priority Habitats and Species List that identifies those habitats and species that should be a priority for management and conservation. This list is largely created to inform the management and conservation efforts of landowners, agencies, governments, and members of the public, who according to WDFW "have a shared responsibility to protect and maintain these resources" (WDFW 2007).

Priority habitats are those habitats with "unique or significant value to a diverse assemblage of species," including, but not limited to a "unique vegetation type or dominant plant species, a described successional stage, or a specific structural element." One or more of the following habitat characteristics are used by WDFW to identify a priority habitat:

- comparatively high fish and wildlife density
- comparatively high fish and wildlife species diversity
- important fish and wildlife breeding habitat
- important fish and wildlife seasonal ranges
- important fish and wildlife movement corridors
- limited availability

- high vulnerability to habitat alteration
- unique or dependent species

Washington classifies 18 priority habitat types, several of which occur within Segment A in the primary API: Riparian, Urban Natural Open Space, and Oak Woodland. These are mapped in Exhibit 4-11 as riparian and non-riparian conservation areas. These priority habitats were not field-verified during the September 2005 surveys. There are a total of 106.19 acres of Riparian priority habitat along the Columbia River within Segment A of the primary API.

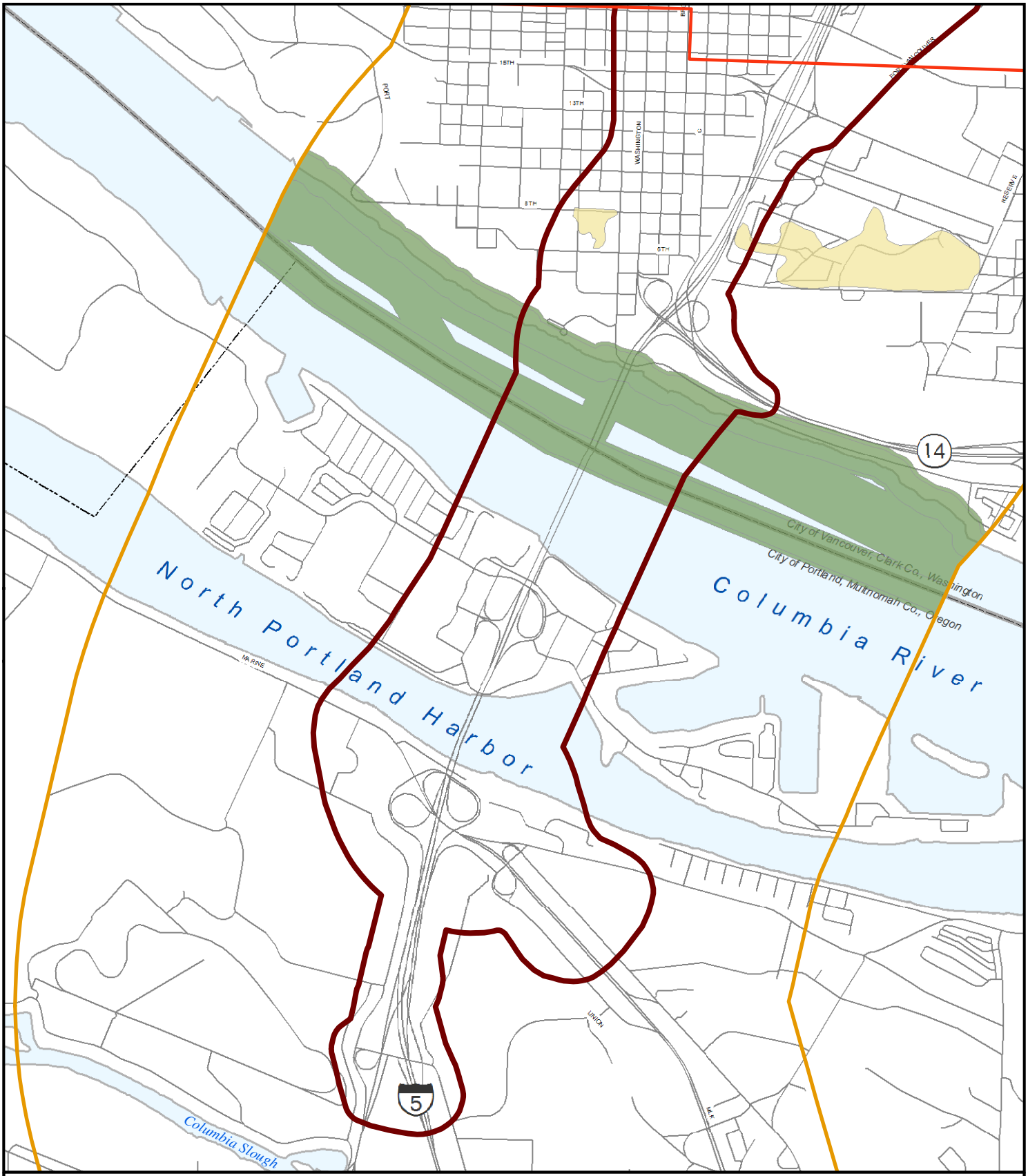
City of Vancouver: As mandated by the Growth Management Act (GMA) (RCW 36.70A), the City of Vancouver designates and protects ecologically sensitive and hazardous areas, termed here "critical areas," as well as their functions and values. Critical areas include wetlands, fish and wildlife habitat conservation areas, geologically hazardous areas, frequently flooded areas, and areas with critical effects on aquifers providing potable water.

Fish and wildlife habitat conservation areas include lakes, streams, rivers, naturally occurring ponds, riparian buffers, and any habitat that serves any life stage of state of federally designated endangered, threatened, and sensitive fish and wildlife species. These conservation areas can also include habitats of Local Importance; habitats that are not designated as Priority Habitat by WDFW, but serve a local importance as recognized by the City.

Frequently flooded areas have been identified as having special flood hazards by the Federal Insurance Administration and the Federal Emergency Management Agency in scientific and engineering reports entitled, *The Flood Insurance Study for the City of Vancouver, Washington, Clark County,* 1981, and *The Flood Insurance Study for Clark County, Washington,* 1991, respectively, and accompanying Flood Insurance Rate Maps and Flood Boundary-Floodway Maps, and any revisions thereto.

Geologic Hazard areas include landslide, seismic, and erosion hazard areas. Landslide hazard areas include where slopes on the property are greater than 25 percent, or areas of historic or active landslides, potential instability, or older landslide debris. Seismic hazard areas include liquefaction or dynamic, ground shaking amplification, and fault rupture hazard areas as identified in previous scientific studies. Erosion hazard areas include areas of potential severe soil or bank erosion as determined by previous NRCS studies and lacustrine or fluvial dynamics.

The critical area ordinance requires that development in these critical areas result in no net loss of function, including, but not limited to, water quality protection and enhancement, fish and wildlife habitat, and ground water recharge and discharge. This critical area ordinance is also intended to "protect residents from hazards and minimize risk of injury or property damage" (City of Vancouver, Municipal Code, Chapter 20.740).



N
W E
S

0 500 1,000
Feet

Primary API
Secondary API
Segment Boundary

Priority Habitat Classes
Non-riparian Habitat Conservation Area
Riparian Habitat Conservation Area
Species

Exhibit 4-11: Washington Department of Fish and Wildlife Priority Habitat and Species Areas

Clark County - Segment A

Columbia River CROSSING

Analysis by Analyst name; Analysis Date: Aug.-2007; Plot Date: Aug.-2007; File Name: Exhibit7_PHS_JL083.mxd

A small portion of the primary API is identified as Critical Sensitive Lands. Along the Columbia River in Washington, the riparian area is designated as a critical area. There are 123.58 acres of Vancouver critical areas within Segment A of the primary API (Exhibit 4-12). In addition, under Vancouver Municipal Code 14.26, (Water Resources Protection), the entire City is considered a critical area for the purpose of keeping the City's water resources from being contaminated. The City of Vancouver has jurisdiction over critical areas within the City boundaries; Clark County has jurisdiction over critical areas in the unincorporated area of the County; this discussion of critical areas refers to critical areas within the City of Vancouver.

4.3.4.2 Oregon

City of Portland: The City of Portland applies two environmental overlay zones, protection and conservation, to sites throughout the city to protect natural resources. The Environmental Conservation and Protection zones (or E-zones) are defined in Title 33, Planning and Zoning Chapter 33.430 of the Municipal Code (City of Portland 2007). These E-zones are in place to limit development in "resource areas" that contain significant resources and functional values (values provided by the resources) and the transition areas that buffer them from surrounding pressures. The transition area is defined as the first 25 feet from an E-zone boundary.

Environmental protection zones provide the highest level of protection for resource areas deemed highly valuable through a detailed inventory and economic, social, environmental, and energy (ESEE) analysis. Development is largely prevented in these areas. Conservation areas are also considered valuable, but can be protected while allowing "environmentally sensitive urban development."

The application of the environmental zones is limited to areas that have undergone a thorough inventory of resources and functional value, in addition to an ESEE analysis. Environmental zoning applies to all development and site disturbance activities. The Columbia River, North Portland Harbor, and Columbia Slough are zoned conservation within Segment A (See Exhibit 4-13). Within the primary API, 242.52 acres are designated as environmental conservation zone. No lands within Segment A are designated as a preservation zone.

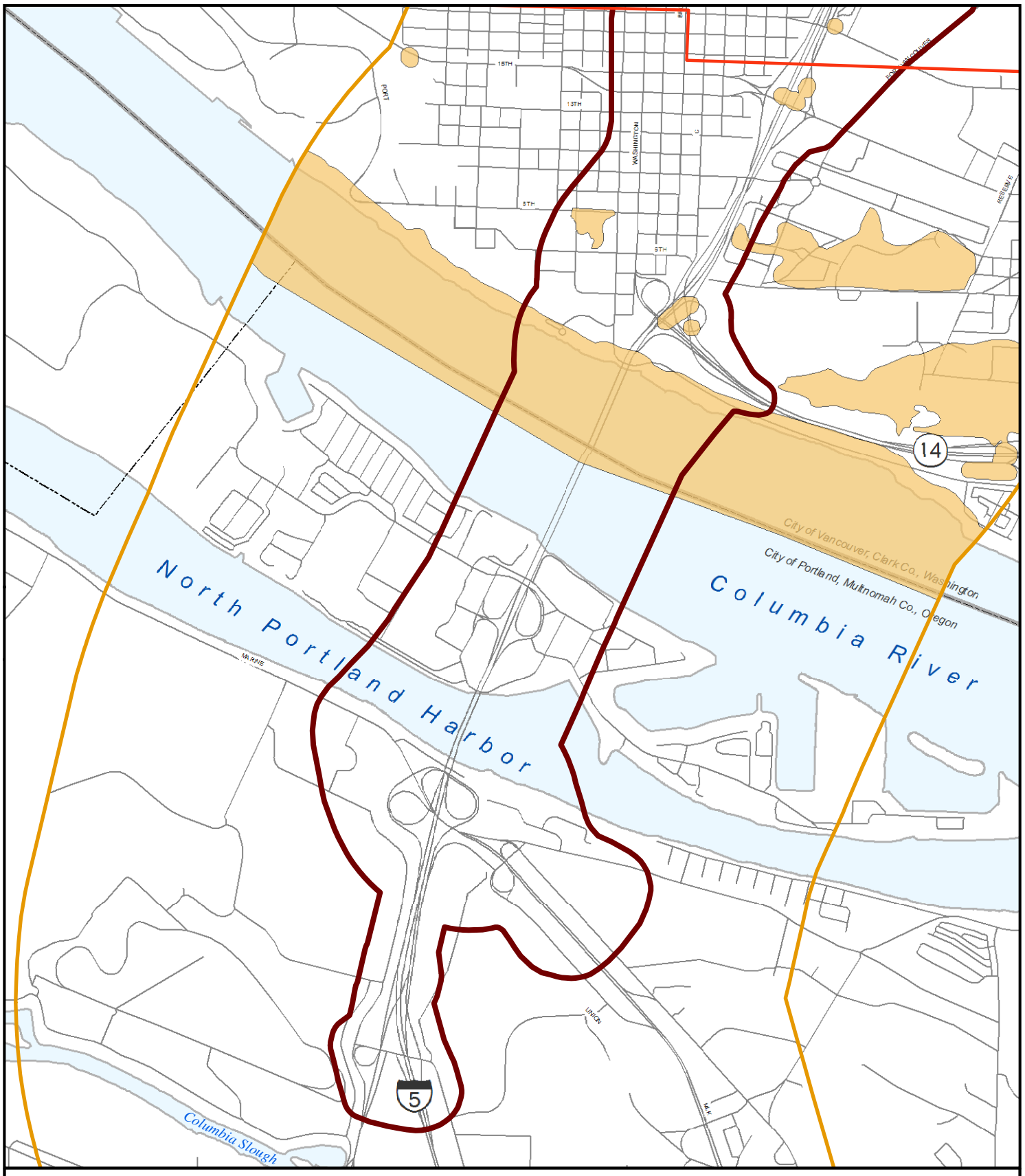


Exhibit 4-12: Critical Lands
Clark County - Segment A

Columbia River CROSSING

Analysis by Analyst name; Analysis Date: Aug.-2007; Plot Date: Aug.-2007; File Name: Exhibit7_CAO_JL083.mxd

Exhibit 4-13. Summary of Metro Habitat Protections in Segment A

Metro Habitat Protections	Acres in Primary API	Acres in Secondary API
Riparian Wildlife Habitat Class I	271.85	1,264.25
Riparian Wildlife Habitat Class II	34.07	255.03
Riparian Wildlife Habitat Class III	10.82	129.46
Upland Wildlife Habitat Class A	4.37	38.26
Upland Wildlife Habitat Class B	0.54	0.64
Upland Wildlife Habitat Class C	0.65	15.73
Impact Area	160.74	611.88
Total	**483.04**	**2,315.25**

Metro: Statewide Planning Goal 5: Natural Resources, Scenic and Historic Areas, and Open Spaces is enforced at a regional level through Metro's Nature in Neighborhood initiative. In order to achieve the conservation goals mandated by this initiative, Metro adopted a methodology to inventory fish and wildlife habitat and conserve the most highly valued of this habitat. Metro established 6 classes of habitat inventory for "regionally significant habitat": Riparian Classes I, II, and III, and Upland Wildlife Classes A, B, and C. Highly ranked riparian and upland habitat are identified as "habitat conservation areas" in order to increase protection of these valuable areas from developmental pressures. Generally, these habitat conservation areas are selected based on two criteria: "habitat value or quality…, and urban development value." The regionally significant habitat classes are defined as follows on Metro's website:

- Riparian class I is of the highest value and includes rivers, streams, wetlands, undeveloped floodplains, forested areas within 100 feet of streams or within 200 feet of streams in steep areas and unique, rare or at-risk streamside habitats.
- Riparian class II is of moderate value and includes rivers, streams, areas within 50 feet of developed streams, areas with trees and other vegetation within 200 feet of streams and portions of undeveloped floodplains. These areas provide fewer ecological values than class I areas but are still considered important for stream health.
- Riparian class III is of the lowest value and includes developed floodplains, grassy areas within 300 feet of streams, and small, forested areas that are farther away from streams but still influence them. Many Riparian class III areas are degraded due to development, but still provide some important ecological values and opportunities for restoration.
- Upland wildlife class A is of the highest value and includes very large forested areas and rare or at-risk upland habitats that are farther away from streams, lakes or wetlands.
- Upland wildlife class B is of moderate value and includes medium-sized and large forested areas that are not rare or at-risk habitats, and non-forested habitat areas that allow wildlife to access water or move from one habitat area to another.

- Upland wildlife class C is of the lowest value and includes smaller forested areas, as well as smaller non-forested areas somewhat near, but no more than 300 feet from, and streams and rivers that allow wildlife to move from one area to another.
- Impact areas include non-habitat areas (i.e., areas that do not provide food and shelter for fish and wildlife) within 150 feet of streams and wetlands, or within 25 feet of remaining habitat areas where land uses may influence the quality of the habitat" (Metro 2007).

A summary of habitats protected by Metro is shown in Exhibit 4-13. Exhibit 4-14 shows the locations of E-zones and Goal 5 habitat in Segment A.

Riparian class III habitat has been designated on both sides of I-5 south of the Columbia River. In addition, the south bank of the Columbia River is designated Riparian class II.

On the west side of I-5, a portion of the Vanport Wetlands complex is designated as Riparian class I and Upland class A habitat. A small area on the southwest edge of the Marine Drive interchange is designated Riparian class I; and the southern bank of the North Portland Harbor is designated as Riparian class III.

On the east side of I-5, a pond/wetland system between I-5 and Delta Park is designated Riparian class I and class II, and Upland class B. A closed slough system between Delta Park and the Columbia Slough and parallel to I-5, is designated as Upland class C, Riparian classes I, II, and III. A portion of this designated habitat extends to the east side of I-5 as well.

Many of these areas designated as Wildlife Habitat (Upland and Riparian Corridors) are also designated by Metro as habitat conservation areas. Habitat conservation areas are subject to performance standards and best management practices (Metro 2005).

Metro habitat conservation areas are rated as high, moderate, or low importance. Within the primary API, the north shore of the North Portland Harbor is mapped as a low conservation importance area. Various portions of the closed slough system paralleling the east side of I-5 are identified as low and moderate conservation priorities. An open pond/wetland system between I-5 and Delta Park is mapped as a high conservation priority. An area on the southwest side of the Marine Drive interchange and the Vanport Wetlands complex is mapped as a moderate conservation priority.

Metro maps a number of these habitat conservation areas as habitat areas of concern and classifies them as Riparian class I. Within Segment A, the southwest side of the Vanport Wetlands complex is designated by Metro as a habitat area of concern.

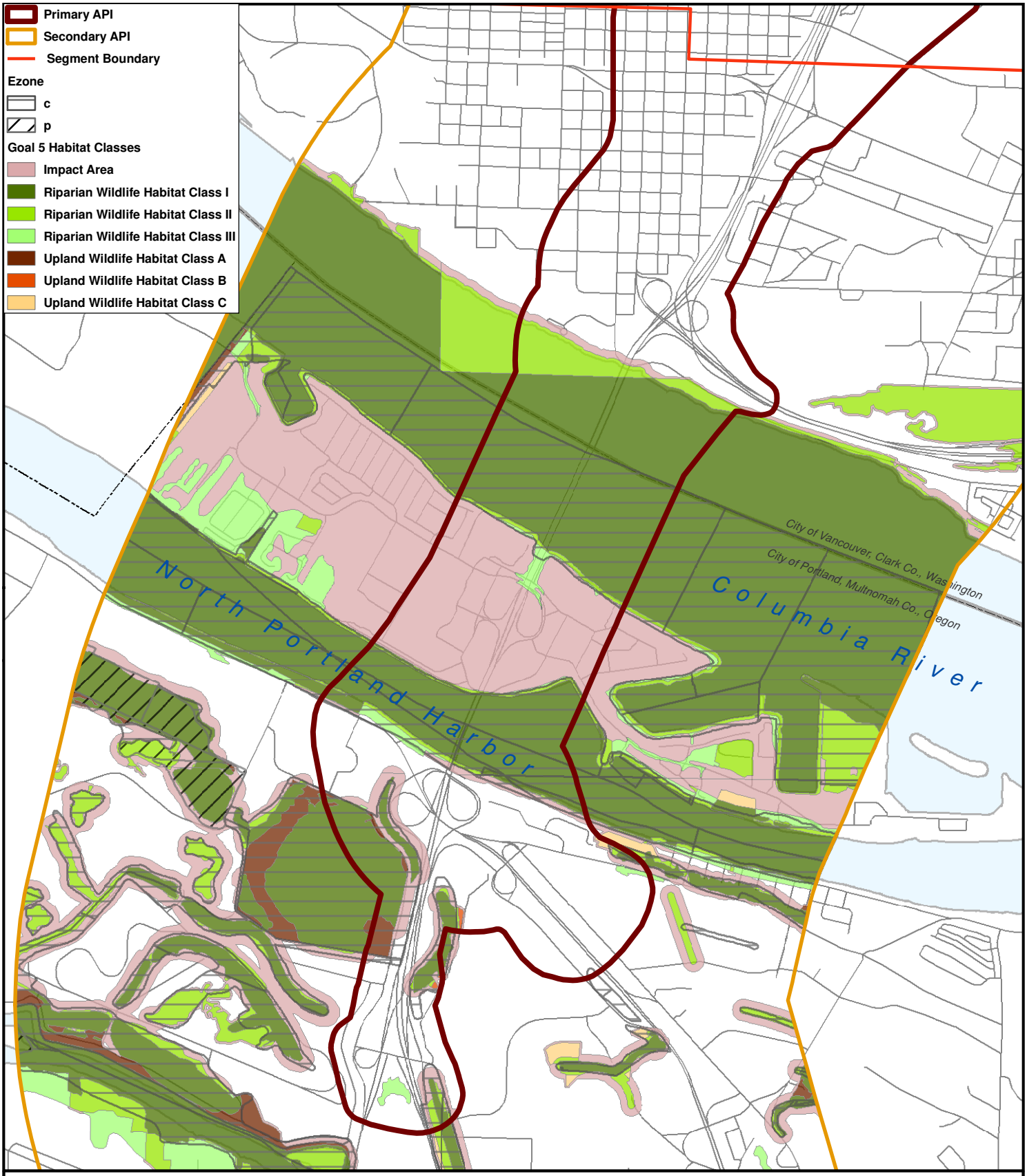


Exhibit 4-14: E-Zones and Goal 5 Habitats

Columbia River CROSSING

Analysis by Analyst name; Analysis Date: Aug.-2007; Plot Date: Aug.-2007; File Name: Exhibit7_EZ_Goal5_JL083.mxd

4.3.5 Threatened, Endangered, and Proposed Species

"Listed" species refer to those with federal and/or state threatened, endangered, or proposed status. Data on listed species were obtained from USFWS, ORNHIC, WDNR-NHP, and WDFW-PHS. The bald eagle is a state-listed species in Oregon and Washington (see Exhibit 4-15). See Section 4.3.6 for a discussion of peregrine falcons, which have delisted federally and in Oregon, but retain Sensitive status in Washington.

Exhibit 4-15. Listed Wildlife Species Known to Occur Within the Primary and Secondary APIs

Species Common Name *Species Scientific Name*[a]	Federal Status[b]	OR State Status[c]	WA State Status[d]	Critical Habitat Present	Habitat Present in Primary API[e]	Habitat Type
Bald eagle *Haliaeetus leucocephalus*	Delisted	LT	LT	N/A	Yes	Open water; Westside riparian wetlands
Northern (Steller) sea lion *Eumetopias jubatus*	LT	LT	LT	No	Yes	Open water

[a] Source: ORNHIC (2003).
[b] Federal status: LT = Listed Threatened, LE = Listed Endangered, P = Proposed, C = Candidate, SOC = Species of Concern, N/A = Not Applicable (ORNHIC 2003; USFWS 2003).
[c] Oregon status: LT = Threatened, LE = Endangered, SC = Sensitive Critical, SV = Sensitive Vulnerable, SP = Sensitive Peripheral, SU = Sensitive Undetermined Status, N/A = Not Applicable (ORNHIC 2003; USFWS 2003).
[d] Washington status: LT = Listed Threatened, LE = Listed Endangered, C = Candidate, SS = State Sensitive (WDFW 2005).
[e] Source: Project Biologist Observations.

Bald eagles are associated with coastal environments, lakes, rivers, and marshes. They feed primarily on fish but also eat carrion, various water birds, and small mammals. Bald eagles typically nest in tall trees with strong branching structure near large water bodies. Nests are often constructed in the largest tree in a stand with an open view of the surrounding environment. Nest trees are usually near water and have large horizontal limbs. Snags and dead-topped live trees also provide perch and roost sites. Bald eagles may use urban environments for breeding and feeding. In northwestern Oregon and southwestern Washington, the bald eagle breeding season lasts from January 1 to August 31. Egg laying takes place mid-February to April, hatching in late March to May, and fledging in late May to mid-August.

Based on a review of aerial and field photographs and topographic maps, viable bald eagle foraging and migration habitat exists within the primary and secondary APIs. No eagle nests or communal roosts were identified in or adjacent to the primary API during the September 2005 field survey. The Columbia River has sufficient fisheries resources to support bald eagles in the vicinity of the primary API. Three bald eagle nesting territories are located within one mile of the secondary API boundary near Vancouver Lake, Smith Lake, and the Columbia River (Isaacs & Anthony 2004, ORNHIC 2007). During limited field surveys in 2003, 2005, 2006, 2007, and 2008, no bald eagles were observed within the primary API.

Northern (Steller) sea lions are usually found in coastal waters near shore and in ocean waters over the continental shelf approximately 35 kilometers off shore, and seasonally up to several hundred kilometers off shore (NatureServe 2007). Northern sea lions use terrestrial rookeries and haul out locations such as beaches, rocks, jetties, reefs, floating docks, and other structures for breeding, pupping, and resting. They occur year-round at the mouth of the Columbia River, and will occasionally enter rivers in pursuit of prey. Northern sea lions feed opportunistically on fish (approximately 10-30 percent of which are salmon), squid, and invertebrates (NOAA 2007). Northern sea lions have been observed in the Columbia River as far inland as Bonneville Dam (NOAA 2007).

4.3.6 Species of Interest

In addition to species protected by federal and state law, Species of Interest (SOI) (defined as locally rare or with special habitat requirements) are associated with habitat types in the primary API. These include migratory birds, marine mammals, certain terrestrial mammals (e.g., bats), and other species requiring special consideration for habitat and management, but which may not be protected under federal or state statutes. Migratory birds protected under the MBTA use habitat components (e.g., bridge structures, vegetation, riparian habitat) in the primary API for nesting, roosting, foraging, and/or dispersing. Impacts to all migratory birds are considered in this report. Exhibit 4-16 lists examples of SOI that may occur in the primary and secondary APIs. This list is not meant to be comprehensive but rather presents species groups that require special consideration in the course of the CRC project.

Exhibit 4-16. Examples of Species of Interest Associated with Habitat Types within the API

	Federal Status[a]	OR State Status[b]	WA State Status[c]
Migratory Birds[d]			
Peregrine falcon *(Falco peregrinus anatum)*	Delisted	Delisted	S
Purple martin *(Progne subis)*	SOC	SC	C
Yellow-billed cuckoo *(Coccyzus americanus)*	C	SC	C
Osprey *(Pandion haliaetus)*	N/A	N/A	M
Barn owl *(Tyto alba)*	N/A	N/A	N/A
Belted kingfisher *(Ceryle alcyon)*	N/A	N/A	N/A
Cliff swallow *(Petrochelidon pyrrhonota)*	N/A	N/A	N/A
Barn swallow *(Hirundo rustica)*	N/A	N/A	N/A
American dipper *(Cinclus mexicanus)*	N/A	N/A	N/A
Geese *(Branta* spp.*)*	N/A	N/A	N/A
Grebes *(Aechmophorus* spp.*)*	N/A	N/A	N/A
Mammals			
Long-legged myotis *(Myotis volans)*	SOC	SU	M
Fringed myotis *(Myotis thysanodes)*	SOC	SV	M
Long-eared myotis *(Myotis evotis)*	SOC	SU	M
Townsend's big-eared bat *(Corynorhinus townsendii)*	SOC	SC	C
Silver-haired bat *(Lasionycteris noctivagans)*	SOC	SU	N/A

	Federal Status[a]	OR State Status[b]	WA State Status[c]
California myotis *(Myotis californicus)*	N/A	N/A	N/A
Yuma myotis *(Myotis yumanensis)*	N/A	N/A	N/A
California sea lion (*Zalophus californianus*)	N/A[e]	N/A	N/A
Little brown myotis *(Myotis lucifugus)*	N/A	N/A	N/A
Big brown bat *(Eptesicus fuscus)*	N/A	N/A	N/A
Bushy-tailed woodrat *(Neotoma cinerea)*	N/A	N/A	N/A
Reptiles			
Western Pond turtle (*Emys marmorata*)	SOC	SC	LE
Painted turtles (*Chrysemys picta*)	N/A	SC	N/A

[a] Federal status: C = Candidate, SOC = Species of Concern, N/A = Not Applicable (ORNHIC 2003; USFWS 2003).

[b] Oregon status: LT = Threatened, LE = Endangered, SC = Sensitive Critical, SV = Sensitive Vulnerable, SU = Sensitive Undetermined Status, N/A = Not Applicable (ORNHIC 2003; USFWS 2003).

[c] Washington status: LT = Listed Threatened, LE = Listed Endangered, C = Candidate, S = State Sensitive, M = State Monitor (WDFW 2005).

[d] All migratory birds are protected by the Migratory Bird Treaty Act.

[e] California sea lions are not federally listed; however, they are protected under the Marine Mammal Protection Act.

Peregrine falcon populations in Oregon and Washington include both resident and migratory populations. Peregrines adapt to a wide variety of nesting locations, including bridges. Their primary nesting locations are cliffs overlooking fairly open areas with ample food. Peregrines are known to feed on a wide variety of species, although birds are their primary food source. Rarely, peregrines feed on bats, squirrels, chipmunks, lizards, fish, and insects. Nests can be found near the coast, in marshes, in mountains, and in urban areas. Breeding occurs only if suitable nesting structures such as bridges, buildings, or cliffs are present (Johnson and O'Neil 2001). Adults remain close to the nest sites throughout the year. In the Portland area, courtship lasts from January to March, eggs are typically laid beginning in mid-March, and fledging occurs late May through late June or July (ODOT 2003).

Peregrine falcons are generally associated with open water, where they feed (Johnson and O'Neil 2001). The Columbia River and adjacent open areas provide sufficient resources to support peregrine falcons in and adjacent to the primary API.

During field surveys in 2003, 2005, 2006, 2007, and 2008 peregrine falcons were not observed within the primary API. Peregrine falcons have been observed using the I-5 bridge since 2001.

Field investigations in 2003 failed to find evidence of swallow or bat activity (roosting or nesting) on the bridge structures. Bridges within the primary API were investigated for evidence of swallow or bat activity (roosting or nesting) in April 2007. No occupied bird nests were found in the surveys, and no signs of bat use were observed. Two remnant mud structures were seen on the south side of the I-5 bridge. No birds protected under the MBTA were observed using any of the bridges for nesting within the primary API.

Canada geese and swallows are known to nest on the concrete piers but are not expected on steel structure portions of the bridge.

4.3.7 Wildlife Passage

Due to the highly urbanized nature of the primary API in Segment A, suitable habitat for wildlife passage is fragmented and access is restricted. Interstate 5 and other arterial roads serve as passage barriers for species of interest and urban wildlife. Underpasses, overpasses, and streams serve as potential corridors for crossing I-5. Due to extensive urbanization, the underpasses and overpasses are unsuitable and dangerous corridors for most terrestrial wildlife.

Species most likely to be moving through the primary API, and which are therefore at risk of collisions with vehicles, are migratory birds (particularly waterfowl such as ducks and geese), and small mammals (e.g., raccoons, squirrels). A 2005 study of wildlife-vehicle collisions in northwestern Oregon, including the Portland area, did not identify any roadkill hotspots in or near the primary API (MBG 2005).

The Vanport Wetlands and Delta Park provide limited suitable habitat for small and medium-sized terrestrial species, although the habitats are fragmented by I-5. Throughout the remainder of the primary API in Segment A, wildlife corridors and passage opportunities are hindered by the density of urban structures and human disturbance.

Passage along the banks of the Columbia River and the North Portland Harbor is possible, although the riparian habitat quality is low and riparian vegetation that could provide cover is sparse. Habitat under the bridges primarily consists of riprap. Potential wildlife habitat and passage corridors exist in some portions of the Delta Park area on the Oregon side of the Columbia River. The river itself is considered a wildlife corridor for waterfowl and some mammals that travel in water, such as river otters and beavers (Hennings pers. comm.). Areas where terrestrial wildlife could travel under the highway structures between the east and west sides of I-5 include the Victory Boulevard/Whitaker Road area, and the Marine Drive interchange (Thompson pers. comm.); however, the abundance of roads, traffic, and development make passage quality marginal at best. See Section 4.5 for information on wildlife passage in the secondary API.

4.3.8 Botanical Resources

4.3.8.1 Summary

Listed plant species, including threatened, endangered, proposed, and candidate species, are not known to occur in Segment A within the primary or secondary APIs (ORNHIC 2005; WDNR-NHP 2005). Field visits were conducted on September 1 and September 16, 2005, to survey for potential habitat in the primary API. Field surveys for special-status plants occurred between May and September 2006. No listed plants were found (Parametrix 2005, 2006).

Wapato (*Sagittaria latifolia*) and cattail (*Typha latifolia*), herbaceous wetland plants with important cultural significance as traditional food, craft, and medicinal sources for several Native American tribes, occur in wetland areas in Segment A, including Schmeer Slough (a J-shaped slough that extends under I-5).

4.3.8.2 Rare Plants

Listed species that could potentially occur within the region include Willamette daisy (*Erigeron decumbens* var. *decumbens*), Kincaid's lupine (*Lupinus sulphureus* ssp. *kincaidii*), Water howellia (*Howellia aquatilis*), Bradshaw's lomatium (*Lomatium bradshawii*), and Nelson's checker-mallow (*Sidalcea nelsoniana*) (USFWS 2006) (see Exhibit 4-17). Willamette Daisy and Kincaid's lupine occur in wet prairie, upland prairie, and oak/savannah habitats which were once widely distributed in western Oregon and Washington. Water howellia historically occurred in Multnomah County in small, vernal, freshwater wetlands, or in former river oxbows; it is now thought to be extirpated in Oregon. This species occurs in limited distribution in Clark County, Pierce County, and Lincoln County in eastern Washington (WNHP 2007). Bradshaw's lomatium occurs in Clark County at Lacamas Lake. Nelson's checker-mallow occurs in Oregon ash (*Fraxinus latifolia*) swales, meadows with wet depressions, or along streams. The species also grows in wetlands within remnant prairie grasslands. Bradshaw's lomatium primarily occurs in seasonally saturated or flooded prairies, adjacent to creeks and small rivers. Habitats associated with tall bugbane (*Cimicifuga elata*) and small-flowered trillium (*Trillium parviflorum*) were identified within the primary API in Washington, although no instances of these species have been recorded there. Please refer to the Wetlands Technical Report for more detailed information on wetland plants in the project area.

Exhibit 4-17. Special-Status Plant Species Reported to Occur Within the Primary API

Species	Federal Status	OR Status	WA Status	Habitat Type	Potential Habitat Type Identified in Primary API	Habitat Condition
Bristly sedge *Carex comosa*	N/A	N/A	Sensitive	Marshes, lake shores, wet meadows	Marshes, lake shores, wet meadows	Disturbed
Columbian watermeal *Wolffia columbiana*	N/A	N/A	Review Group 1	Freshwater lakes, ponds, slow-moving streams	Freshwater lakes, ponds, slow-moving streams	Disturbed
Tall bugbane *Cimicifuga elata*	SC	C	Sensitive	Mixed coniferous-deciduous forest margins	Hardwood forest	Disturbed
Small-flowered trillium *Trillium parviflorum*	N/A	N/A	Sensitive	Moist, shady environments dominated by hardwoods	Moist, shady environments dominated by hardwoods	Disturbed

Source: ORNHIC 2005 and WDNR-NHP.

Habitat suitability for rare plants in the primary API in Washington is extremely limited due to severe habitat fragmentation within an urban landscape, degradation by former and/or current land uses, and intense pressure from invasive plant species.

Within the Oregon portion of the primary API, rare plant species are most likely to occur at the Vanport Wetlands, which are actively managed for wildlife habitat and wetland function by the Port of Portland. Vanport Wetlands were not surveyed for rare plants because it was determined that no direct impacts to the site would occur.

4.3.8.3 Noxious weeds

Small amounts of noxious weeds are found in Segment A within most vegetated areas that are not regularly maintained. These include vegetated areas within Washington and Oregon DOT rights-of-way that are infrequently mowed and/or controlled with herbicide applications. Twelve noxious weeds listed by the ODA Noxious Weed Control Program, were identified within the primary API in Oregon. Fourteen noxious weeds identified by the Washington Department of Agriculture – Washington Noxious Weed Control Board (WNWCB) were found within the primary API in Washington (Exhibit 4-18). During the preliminary noxious weed survey, no Class A noxious weeds (i.e., those requiring eradication) were identified within the primary API.

Exhibit 4-18. Noxious Weed Species Occurring within Segment A of the Primary API

Botanical Name	Common Name	ODA Status	WNWCB Status
Agropyron repens	Quackgrass	B	N/A
Centaurea pratensis	Meadow knapweed	B	B
Cirsium arvense	Canada thistle	B	C
Cirsium vulgare	Bull thistle	B	C
Clematis vitalba	Old man's beard	B	C
Conium maculatum	Poison hemlock	B	C
Convolvulus arvensis	Field bindweed	B	C
Cytisus scoparius	Scot's broom	B	B
Daucus carota	Wild carrot	N/A	B
Geranium robertianum	Herb-Robert's	N/A	B
Hedera helix	English ivy	B	C
Hypericum perforatum	St. John's wort	B	C
Phalaris arundinacea	Reed canarygrass	N/A	C
Polygonum cuspidatum	Japanese knotweed	B	B
Rubus discolor	Himalayan blackberry	B	N/A
Verbascum thapsis	Common mullein	N/A	M

ODA Key: A = Non-native species of economic importance with a limited distribution or not known to occur in the state; B = Non-native species of economic importance established only in some regions; T = Target A or B Designated weed for which a statewide management plan will be developed and implemented.

WNWCB Key: Class A = Non-native species with a limited distribution in the state – eradication required by state law; Class B = Established only in some regions – control required by state law in regions where the species is unrecorded or with limited distribution; Class C = Widely established in the state or of interest to agriculture – placed on the weed list so that local control is possible; M (Monitor) = Species being monitored for location, spread, and invasiveness.

N/A: Not Applicable indicates that the species does not have a listing status by either ODA or WNWCB.

4.3.9 Conclusions

4.3.9.1 Aquatic Resources

Due to the urban nature of the aquatic resources within the APIs, the general riparian habitat quality is poor, providing little opportunity for large wood recruitment, nutrient cycling from litter fall, and general fish cover. Several listed fish species and Northern sea lions occur in Segment A, primarily within the Columbia River. Water quality is limited by elevated temperatures, PCBs, PAHs, DDT metabolites (DDE), arsenic, and dissolved copper.

4.3.9.2 Terrestrial Resources

There are no federally listed species that are likely to reside within the primary API. One state listed species, the bald eagle, may use the primary API for foraging. The peregrine falcon, a Washington state sensitive species, is known to occur in the primary API. Any construction activity affecting the existing I-5 bridge has the potential to affect peregrine falcons. Additionally, habitat may be present within the primary API for bald eagle roosting and feeding. However, no bald eagles are known to nest within the primary API. The existing I-5 bridge also provides potential habitat for bats and swallows.

The five habitat types identified in Segment A (Johnson and O'Neil 2001) are found throughout the region. Priority habitats for this area include the Westside Riparian Wetlands and Herbaceous Wetlands. Metro habitat classification in the primary API include riparian and upland wildlife habitat. These habitat types may support species of interest such as pond turtles, migratory birds, and small mammals (e.g., bats).

4.3.9.3 Botanical Resources

Species of Interest are known to occur in Segment A within the secondary API, but no listed species or SOC are recorded within the primary API. Potential habitat for listed species and SOI occurs within the primary API, but is of low quality. This habitat was surveyed for rare plants, but none were found. The Vanport Wetlands is the most likely site for listed species to occur, but was not surveyed due to lack of direct impacts at the site. Noxious weeds are present throughout the primary API in Segment A, although no Class A noxious weeds were detected.

4.4 Segment B Mill Plain District to North Vancouver

4.4.1 Aquatic Resources

4.4.1.1 Summary of Aquatic Habitats

Within Segment B, I-5 crosses Burnt Bridge Creek (Exhibits 4-19 and 4-20).

Exhibit 4-19. Aquatic Habitats Occurring Within Segment B

Aquatic Resource Name Stream Classification/ Resource Type	Fish Bearing Status	I-5 Bridge Crosses Aquatic Resource	Bridge Piers Below OHW[a]
Burnt Bridge Creek Perennial watercourse	Anadromous/ Resident	Yes	No

[a] Ordinary High Water Mark.

Burnt Bridge Creek contains listed salmonids including coho, Chinook salmon, and steelhead (J. Weinheimer, pers. comm.). In addition to federal and state protected aquatic species, Burnt Bridge Creek also supports a community of native aquatic species, including but not limited to sculpin (*Cottus* spp.), suckers (*Catostomus* spp.), dace (*Rhinichthys* spp.), shiners (*Richardsonius* spp.), mussels (e.g., *Anodonta* spp.), and amphibians and reptile such as salamanders, frogs, toads, and turtles. Many of these species are discussed in the Species of Interest (SOI) section (refer to Section 4.3.4). These more common, native species share aquatic habitat with listed salmonids and other aquatic species; therefore, habitat description, habitat quality parameters, and project impacts described for listed aquatic species also apply to populations of non-listed native species that occur within the primary and secondary API.

4.4.1.1.1 Burnt Bridge Creek

Within the secondary API, Burnt Bridge Creek flows from east to west. Within the primary API Burnt Bridge Creek flows north and parallel to I-5. The I-5 bridge is located in the vicinity of river mile (RM) 2 of Burnt Bridge Creek. The stream passes through a valley constrained by surrounding land uses. Stream slope is between 0 and 2 percent. The channel stability is indeterminate as no evidence of aggrading or degrading was observed. Portions of the banks are armored within the primary API. No evidence of recent flooding was present. The dominant substrate was not observed by the field crew as it was obscured by vegetation and no permission to enter the area had been granted. No habitat was observed within the primary API due to the obscured stream reaches. The primary API is heavily urbanized, and residential areas and roadways surround these reaches of the stream. No bridge footings are located within the OHW. Roadbeds and surrounding land uses are the dominant and subdominant floodplain constrictions, respectively. Flow conditions were obscured at the time of survey.

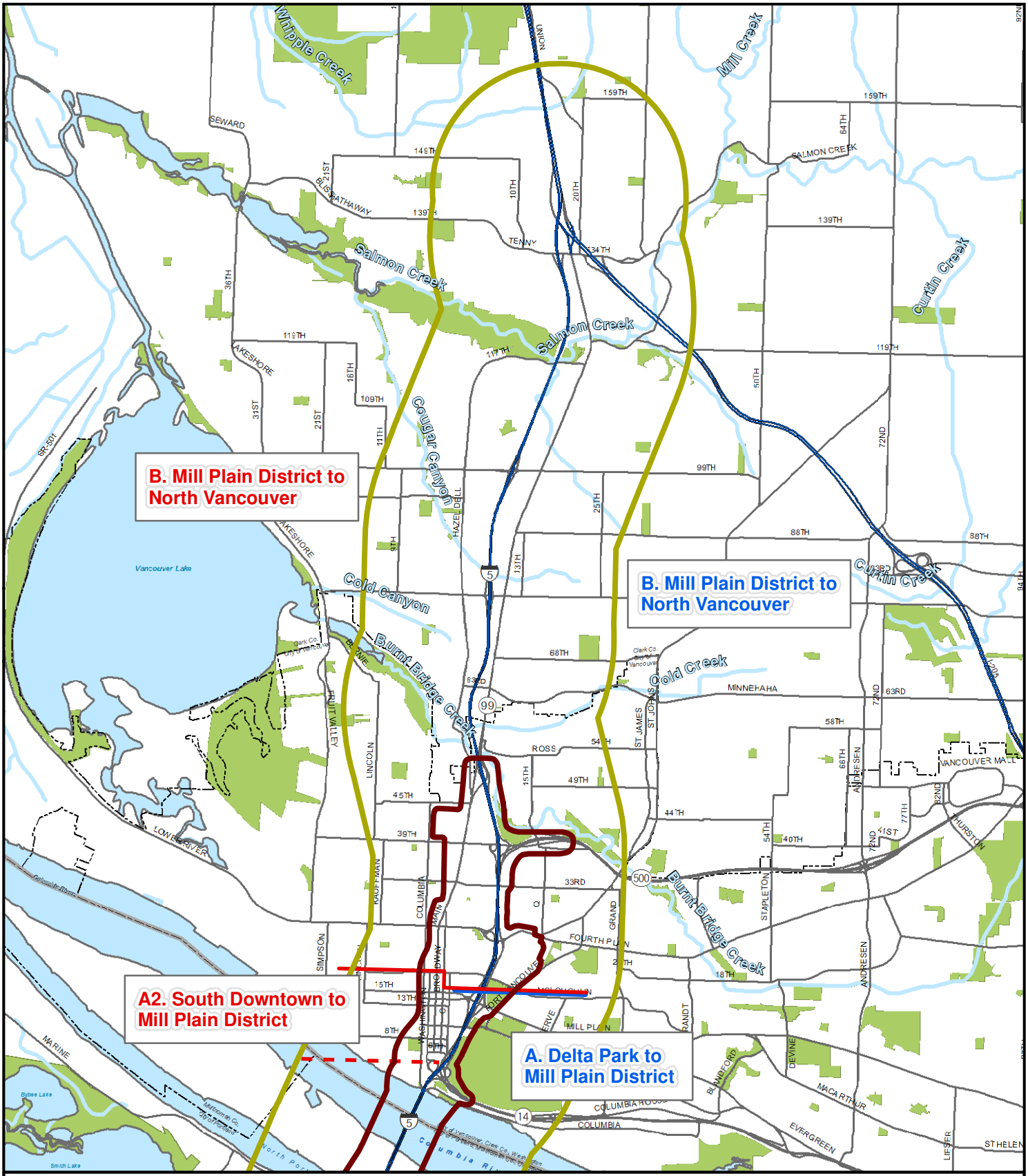


Exhibit 4-20: Streams B

Columbia River CROSSING

Analysis by J. Koloszar; Analysis Date: Aug-2007; Plot Date: Aug-2007; File Name: Streams_JL088.mxd

Riparian vegetation estimates are shown in Exhibit 4-21. Riparian vegetation data were collected within the primary API from a side road along Burnt Bridge Creek as it parallels I-5. The riparian vegetation was surveyed visually. The table depicts an average representation of the riparian areas. The riparian vegetation along Burnt Bridge Creek provides potential for future large wood recruitment. Fish cover elements are generally moderate. Within the primary API, the fish usage of the stream is unknown. It is assumed that anadromous fish may enter the stream for migration or rearing purposes, but are likely to remain in the lower reaches of the stream, outside of the API.

Exhibit 4-21. Riparian Vegetation Cover Estimate within the Primary API for Burnt Bridge Creek

	Vegetation Type and Density Left Bank	Vegetation Type and Density Right Bank
Canopy (> 15 ft high)		
Vegetation Type	Mixed	Mixed
Big trees (Trunk > 1 ft dbh[a])	Moderate (10-40%)	Moderate (10-40%)
Small trees (Trunk < 1 ft dbh)	Moderate (10-40%)	Moderate (10-40%)
Understory (1.5 to 15 ft high)		
Vegetation Type	Mixed	Mixed
Woody Shrubs & Saplings	Very Heavy (> 75%)	Very Heavy (> 75%)
Non-Woody Herbs, Grasses & Forbs	Sparse (< 10%)	Heavy (40-75%)
Invasive Species	Very Heavy (> 75%)	Very Heavy (> 75%)
Ground Cover (0.0 to 1.5 ft high)		
Vegetation Type	Mixed	Mixed
Woody Shrubs & Saplings	Heavy (40-75%)	Heavy (40-75%)
Non-Woody Herbs, Grasses & Forbs	Sparse (< 10%)	Very Heavy (> 75%)
Barren, Bare Dirt, or Duff	Very Heavy (> 75%)	Very Heavy (> 75%)
Invasive Species	Absent (0%)	Absent (0%)

[a] Diameter at breast height.

Canopy cover on Burnt Bridge Creek in the API is typically moderate. Dominant tree species include natives such as Douglas-fir (*Pseudotsuga menziesii*), cottonwood (*Populus balsamifera*), willow (*Salix* sp.), and Ash (*Fraxinus latifolia*). The understory is dominated by the non-native Himalayan blackberry (*Rubus discolor*) and natives such as red alder (*Alnus rubra*), red-osier dogwood (*Cornus sericea*), and beaked hazelnut (*Corylus cornuta*). Ground cover is typically dominated by non-native species such as Himalayan blackberry (*Rubus discolor*), reed canarygrass (*Phalaris arundinacea*), and teasel (*Dipsacus sylvestris*).

Within the API, Burnt Bridge Creek is on DEQ's 303(d) list for fecal coliform and temperature (DEQ 2007). Ecology has not approved any TMDLs for Burnt Bridge Creek. Some stormwater runoff is routed to the creek through pipes and ditches, but most runoff is discharged into the ground through buried infiltration facilities. Three stormwater outfalls from I-5 discharge into Burnt Bridge Creek—one on the eastern side of I-5 and two on the western side of I-5. Runoff from I-5 at the north of the SR 500 interchange

area is routed to a retention pond east of I-5 and south of the Main Street interchange. Retained runoff usually evaporates or infiltrates, and releases to Burnt Bridge Creek only occur during peak runoff events. Runoff from SR 500 east of I-5 flows to a detention pond located at NE 15th Avenue before being released to Burnt Bridge Creek. Refer to the Water Quality Technical Report for a description of the Burnt Bridge Creek floodplain, hydrology, and specific details on stormwater outfalls.

4.4.1.2 Threatened, Endangered, and Proposed Species

Listed fish known to occur in Burnt Bridge Creek include coho and Chinook salmon and winter steelhead, (Clark County 2006, J. Weinheimer, pers. comm.) (refer to Exhibit 4-7 for regulatory status). The extent to which salmonids use Burnt Bridge Creek during various life stages (e.g., spawning, rearing, migrating) is not well documented; however, there are no passage barriers on the creek (Salmonscape 2008) and fish are assumed to have access to the length of the creek, particularly within the primary API, for all freshwater life stages.

Consultation under Section 7 of the ESA will be initiated with NMFS and USFWS to analyze effects to listed species once project design details are further refined.

4.4.1.3 Fish Passage

No fish passage barriers are known to occur on Burnt Bridge Creek (J. Weinheimer, pers. comm., Salmonscape 2008).

4.4.2 Terrestrial Resources

4.4.2.1 Summary of Terrestrial Resources

No listed terrestrial species are known to occur in Segment B of the primary API. This segment is primarily characterized by urban development (Urban and Mixed Environs habitat type under Johnson and O'Neil), but also contains small areas of Westside Riparian Wetland at Burnt Bridge Creek, a priority habitat for the area, and Westside Lowland Conifer-Hardwood Forest. Native mammals (e.g., raccoons, mice, squirrels), migratory songbirds, and some reptiles and amphibians that are adapted to urban environments are likely to occur in Segment B.

4.4.3 Habitat Occurrence

Segment B contains four habitat types (Exhibit 4-22):

- Urban and Mixed Environs
- Westside Lowlands Conifer-Hardwood Forest
- Westside Riparian – Wetlands
- Lakes, Rivers, Ponds, and Reservoirs

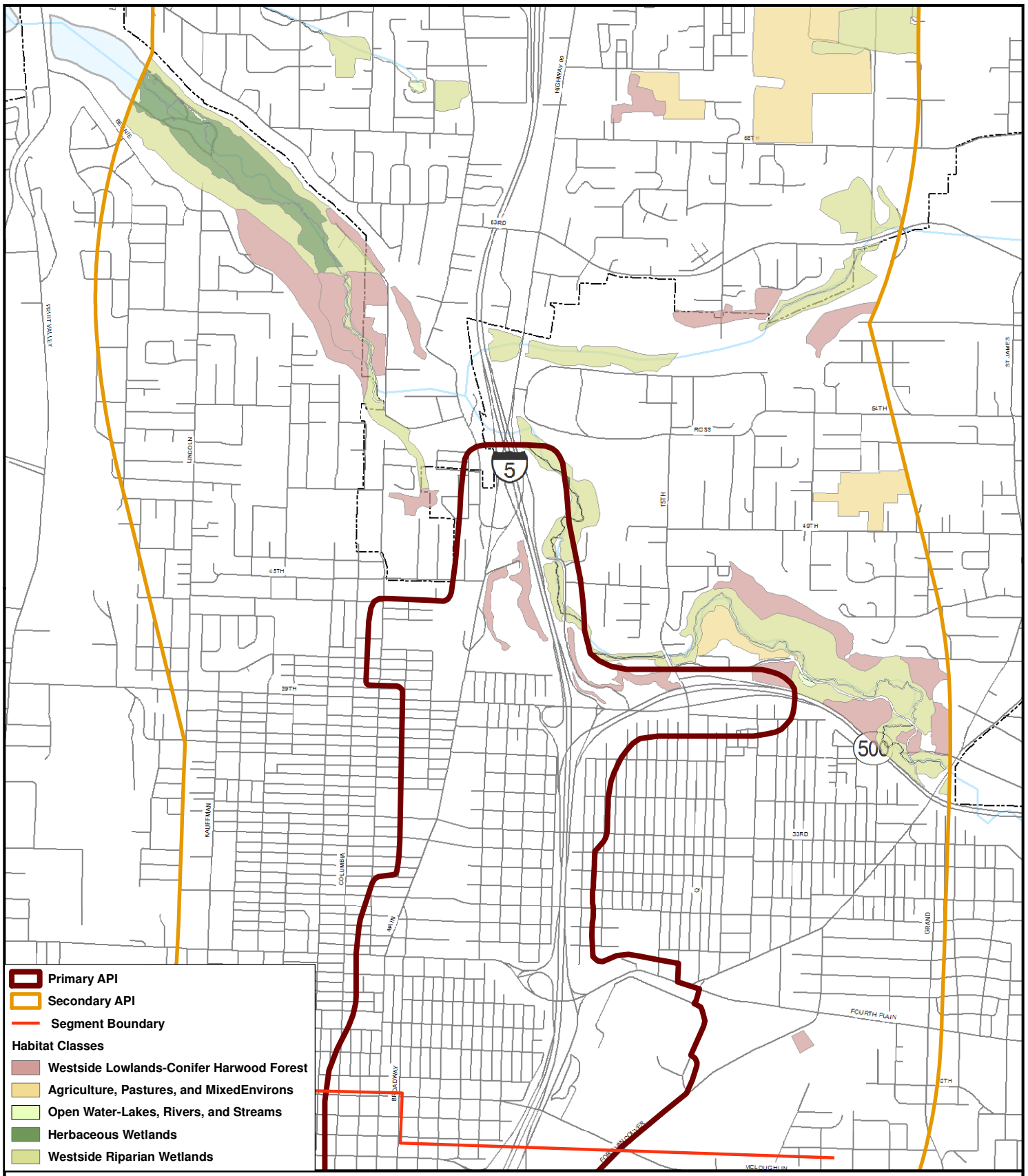


Exhibit 4-22: Habitat Classifications
Segment B

Columbia River CROSSING

Analysis by Analyst name; Analysis Date: Aug.-2007; Plot Date: Aug.-2007; File Name: Exhibit4_HabClas_JL083.mxd

See Section 4.3.5 for a description of each habitat type. These habitats are limited in the urban landscape of the primary and secondary APIs in Segment B. Habitat quality is low due to fragmentation, human alteration of habitat features that affect hydrology and other ecosystem processes, presence of non-native and noxious weeds, and water quality issues associated with urban environments (e.g., contaminants present in surface runoff from roads, residential and commercial development, metals, biosolids). See Exhibit 4-23 for a description of acreage for each habitat type.

Exhibit 4-23. Acres of Habitat Classification within Segment B

	Primary API	Secondary API
Johnson and O'Neil Classifications:		
Westside Lowland Conifer-Hardwood Forest	14.90	204.87
Westside Riparian – Wetlands	11.20	662.88
Herbaceous Wetlands	0	38.70
Urban and Mixed Environs	375.65	8,237.35
Lakes, Rivers, Ponds, and Reservoirs	0.42	63.88
Washington Priority Habitats	76.10	1797.70
Vancouver Critical Areas	118.49	2844.07
Total	**596.77**	**13,849.44**

4.4.4 Regional and Local Resource Protection

4.4.4.1 Washington

Priority Habitats: The Washington Department of Fish and Wildlife (WDFW) has established priority habitat areas within the state. Priority habitats have "unique or significant value to a variety of different species" (WDFW 2006), and may consist of a unique vegetation type or dominant plant species, a described successional stage, or a specific structural element. Washington classifies 18 priority habitat types. Within Segment B, established priority habitats include Riparian, Urban Natural Open Space, and Oak Woodland (See Exhibits 4-24 and 4-25). These priority habitats were not field-verified during the September 2005 surveys.

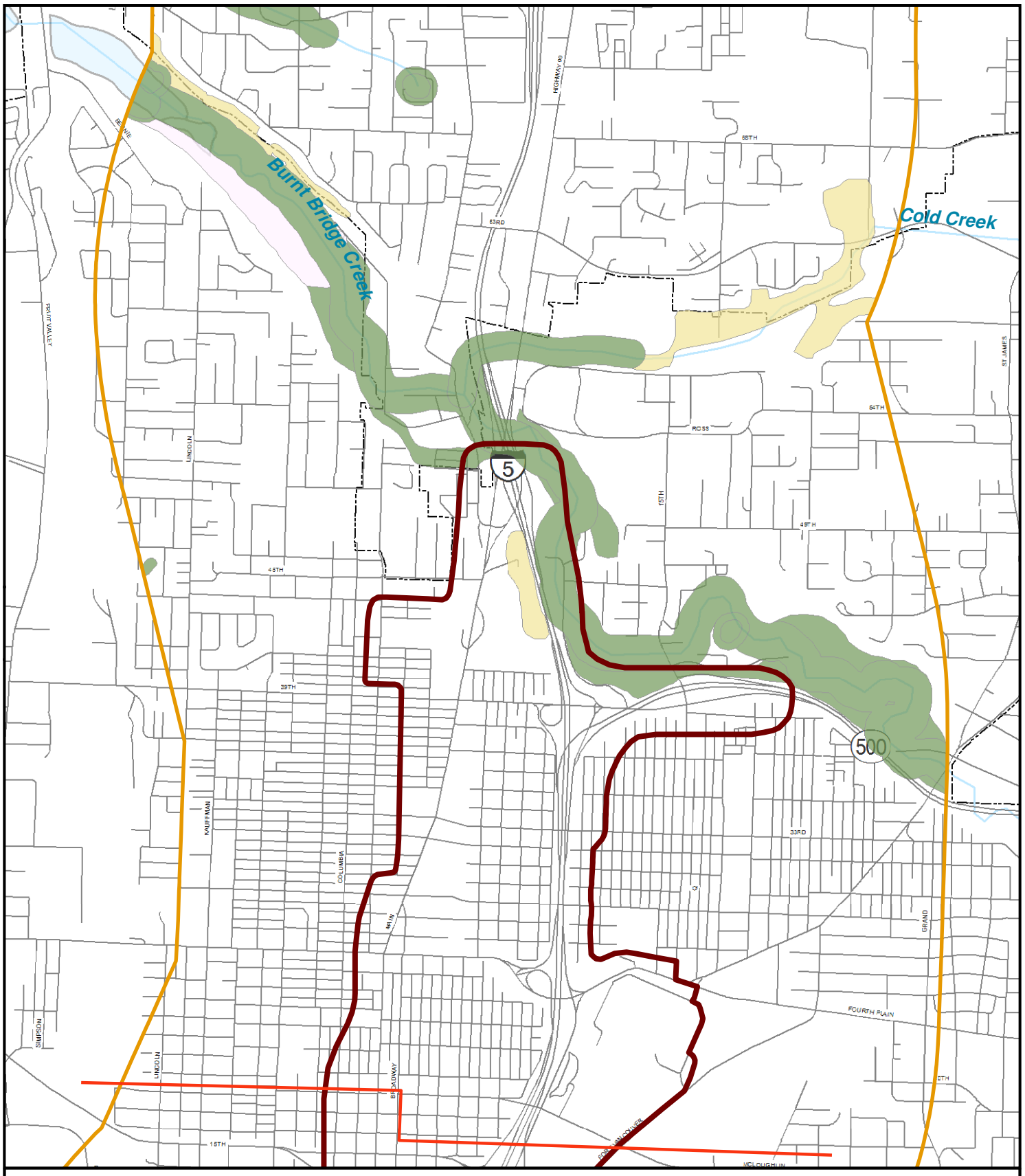
Exhibit 4-24. Regional and Local Resource Protection in Segment B

Agency	Jurisdiction	Program	Habitat Protected	Acres in Primary API	Acres in Secondary API
WDFW	Washington State	Priority Habitats	Riparian, Urban Natural Open Space, Oak Woodland	76.10	1797.70
City of Vancouver	City of Vancouver	Critical Areas Protection Ordinance	Fish and wildlife habitat conservation areas, wetlands, frequently flooded areas, critical aquifer recharge areas, and geologic hazard areas	118.49	2844.07
Clark County	Unincorporated areas of Clark County	Critical Areas Protection Ordinance	Riparian Priority Habitat, Other Priority Habitats and Species, and Locally Important Habitats and Species	See City of Vancouver acres above	See City of Vancouver acres above[a]

Based on available GIS data, Segment B contains Riparian priority habitat along Burnt Bridge Creek. There are a total of 66.1 acres of Riparian priority habitat in Segment B. Urban Natural Open Space is found in the northeastern corner of the primary API in Segment B, and there is a small area of Oak Woodland priority habitat located on either side of I-5.

4.4.4.1.1 City of Vancouver

The City of Vancouver protects priority habitat areas through its Critical Areas Protection Ordinance. Within Segment B, the City of Vancouver has designated areas as critical or sensitive or both critical and sensitive. There are 118.49 acres of critical areas within the primary API (see Exhibit 4-26).



N
W E
S

0 500 1,000
Feet

Primary API
Secondary API
Segment Boundary

Priority Habitat Classes
Non-riparian Habitat Conservation Area
Riparian Habitat Conservation Area
Species

Exhibit 4-25: Washington Department of Fish and Wildlife Priority Habitat and Species Areas
Clark County - Segment B

Columbia River CROSSING

Analysis by Analyst name; Analysis Date: Aug.-2007; Plot Date: Aug.-2007; File Name: Exhibit7_PHS_JL083.mxd

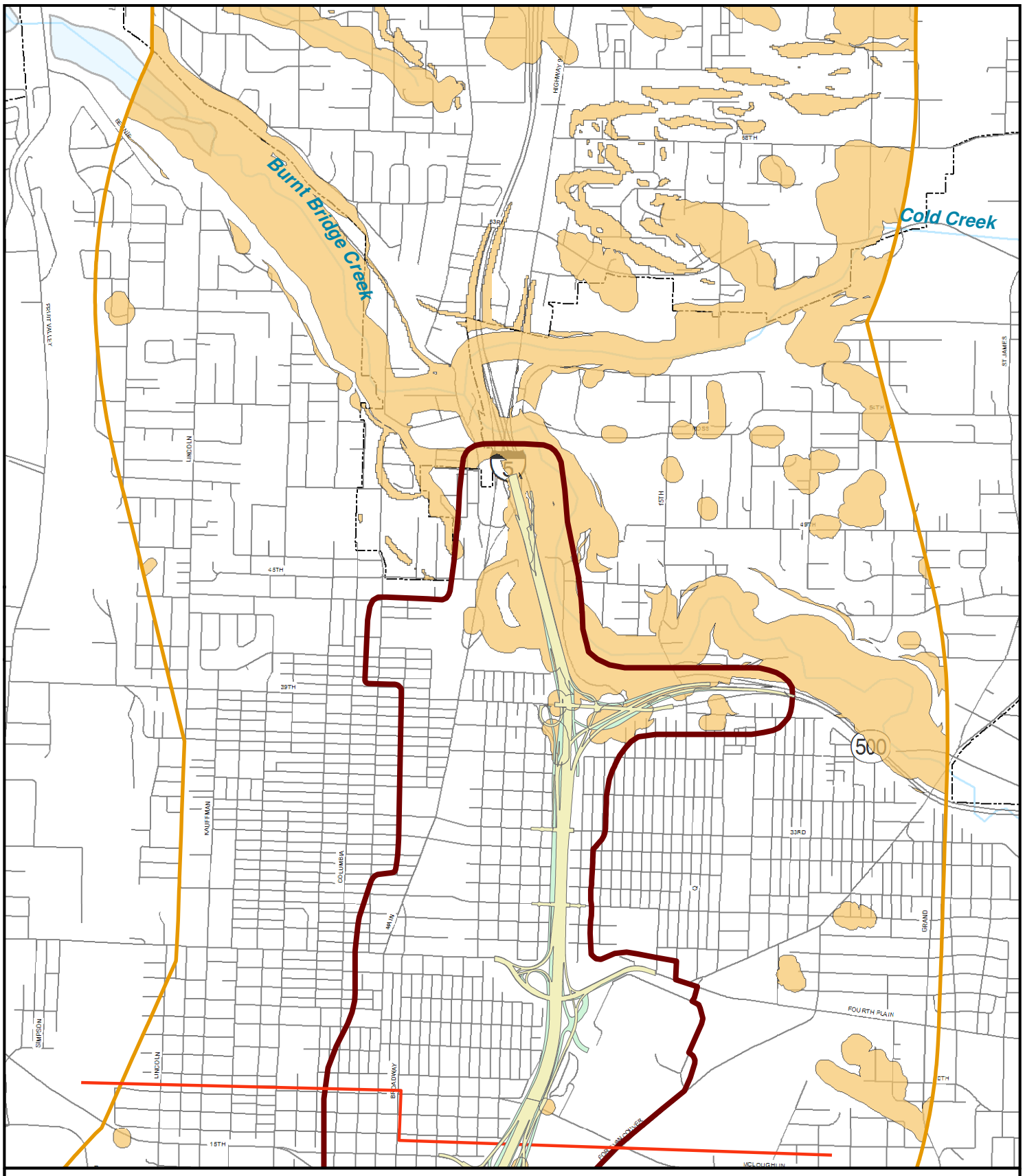


Exhibit 4-26: Critical Lands
Clark County - Segment B

Columbia River CROSSING

Analysis by Analyst name; Analysis Date: Aug.-2007; Plot Date: Aug.-2007; File Name: Exhibit7_CAO_JL083.mxd

4.4.5 Threatened, Endangered, Proposed, and Candidate Species

No listed terrestrial species are known to occur in Segment B of the primary API.

4.4.6 Species of Interest

Species of Interest, particularly bats and migratory birds, may occur in Segment B in marginal habitat near highway overpasses and bridges. Bridges within the primary API were investigated for evidence of swallow or bat activity (roosting or nesting) in April 2007. No occupied bird nests were found in the surveys, and no signs of bat use were observed. No birds protected under the MBTA were observed using any of the bridges.

The riparian habitats along Burnt Bridge Creek likely support some SOI, such as purple martin (*Progne subis*), tri-colored blackbird (*Agelaius tricolor*), pond turtles (*Actinemys marmorata)* and painted turtles (*Chrysemys picta*). Migratory birds protected under MBTA may nest throughout the API in trees, grasses, or shrubs, depending on species.

4.4.7 Wildlife Passage

Due to the highly urbanized nature of the primary API in Segment B, suitable habitat for wildlife passage is restricted. I-5 serves as a major passage barrier for species of interest and urban wildlife. Underpasses, overpasses, and streams serve as potential corridors for crossing I-5. However, due to extensive urbanization, the underpasses and overpasses are likely unsuitable and dangerous corridors for most wildlife.

On the northern edge of the primary API, the Burnt Bridge Creek corridor provides potential passage for terrestrial species. Incidence of wildlife mortality associated with roads is not closely tracked; however, WSDOT has reported roadkill of raccoons, opossum, occasional deer, and hawks in the Burnt Bridge Creek area (Britton pers. comm.).

4.4.8 Botanical Resources

4.4.8.1 Summary

No listed species, including threatened, endangered, proposed, or candidate species, are documented in Segment B within the primary or secondary API (WDNR-NHP 2005). Field visits were conducted on September 1 and September 16, 2005, to survey for potential habitat in the primary API.

4.4.8.2 Rare Plants

Listed species that could potentially occur within the region include Willamette daisy (*Erigeron decumbens* var. *decumbens*), Kincaid's lupine (*Lupinus sulphureus* ssp. *kincaidii*), Water howellia (*Howellia aquatilis*), Bradshaw's lomatium (*Lomatium bradshawii*), and Nelson's checker-mallow (*Sidalcea nelsoniana*) (USFWS 2006). Willamette daisy and Kincaid's lupine occur in wet prairie, upland prairie, and oak/savannah habitats which were once widely distributed in western Oregon and Washington. Water howellia historically occurred in small, vernal, freshwater wetlands,

or in former river oxbows. This species occurs in limited distribution in Clark County, Pierce County, and Lincoln County in eastern Washington (WNHP 2007). Bradshaw's lomatium occurs in Clark County at Lacamas Lake. Nelson's checker-mallow occurs in Oregon ash (*Fraxinus latifolia*) swales, meadows with wet depressions, or along streams. The species also grows in wetlands within remnant prairie grasslands. Bradshaw's lomatium primarily occurs in seasonally saturated or flooded prairies, adjacent to creeks and small rivers. Please refer to the Wetlands Technical Report for more detailed information on wetland plants in the project area.

The Washington Department of Natural Resources – Natural Heritage Program (WNHP) reported two current rare plant data records in Segment B within the secondary API: tall bugbane (*Cimicifuga elata)* and smallflower trillium (*Trillium parviflorum)*. Additional data records obtained from the WNHP indicate the historical presence of five rare species within the secondary API: Torrey's pea (*Lathyrus torreyi)*, spreading miners lettuce (*Montia diffusa)*, Suksdorf woodsorrel (*Oxalis suksdorfii)*, Idaho gooseberry (*Ribes oxyacanthoides* ssp. *Irriguum)*, and nose skullcap (*Scutellaria antirrhinoides)*. However, there are no current records for these species in Segment B within the secondary API.

T. parviflorum (keyed as *T. chloropetalum* in Hitchcock et al. 1969) can be found in moist, shady environments dominated by hardwoods (e.g., oak woodlands), often at the upland edge of riparian zones. The species is regionally endemic and ranges from Pierce and Thurston Counties in Washington, south to the Willamette Valley in Oregon. Potential habitat for this species can be found in the Burnt Bridge Creek riparian zone, located east of I-5 in the northeastern corner of the primary API. The habitat was surveyed for rare plants; none were identified.

C. elata can be found in or along mixed coniferous-deciduous forest margins, frequently on north- or east-facing slopes. The species occurs from Southern British Columbia to Southern Oregon, west of the Cascade Range (WNHP 2000). Potential habitat for this species was found in forest tracts on both sides of I-5 north of E 39th Street/SR 500, and south of E Fourth Plain Boulevard near its intersection with Fort Vancouver Way (Water Works Park).

4.4.8.3 Noxious Weeds

Small amounts of noxious weeds are found in Segment A within most vegetated areas that are not regularly maintained. These include vegetated areas within Washington and Oregon DOT rights-of-way that are infrequently mowed and/or controlled with herbicide applications. Fourteen noxious weeds identified by the Washington Department of Agriculture – Washington Noxious Weed Control Board (WNWCB) were found within the primary API in Washington (Exhibit 4-27). During the noxious weed survey, no Class A noxious weeds (i.e., those requiring eradication) were identified within Segment B of the primary API.

Exhibit 4-27. Noxious Weed Species Occurring Within Segment B of the Primary API

Botanical Name	Common Name	WNWCB Status
Agropyron repens	Quackgrass	N/A
Centaurea pratensis	Meadow knapweed	B
Cirsium arvense	Canada thistle	C
Cirsium vulgare	Bull thistle	C
Clematis vitalba	Old man's beard	C
Conium maculatum	Poison hemlock	C
Convolvulus arvensis	Field bindweed	C
Cytisus scoparius	Scot's broom	B
Daucus carota	Wild carrot	B
Geranium robertianum	Herb-Robert's	B
Hedera helix	English ivy	C
Hypericum perforatum	St. John's wort	C
Phalaris arundinacea	Reed canarygrass	C
Polygonum cuspidatum	Japanese knotweed	B
Rubus discolor	Himalayan blackberry	N/A
Verbascum thapsis	Common mullein	M

WNWCB Key: Class A = Non-native species with a limited distribution in the state – eradication required by state law; Class B = Established only in some regions – control required by state law in regions where the species is unrecorded or with limited distribution; Class C = Widely established in the state or of interest to agriculture – placed on the weed list so that local control is possible; M (Monitor) = Species being monitored for location, spread, and invasiveness.

N/A: Not Applicable indicates that the species does not have a listing status by either ODA or WNWCB.

4.4.9 Conclusions

4.4.9.1.1 Aquatic Resources

Due to the urban nature of the aquatic resources within the APIs, the general riparian habitat quality is poor, providing little opportunity for large wood recruitment, nutrient cycling from litter fall, and general fish cover. There are several listed fish species present within the primary API, mainly in the Columbia River and Burnt Bridge Creek. Resident native fish occur in small tributaries to the Columbia River and its associated sloughs and lakes. Water quality is compromised by urban and roadway contaminants.

4.4.9.1.2 Terrestrial Resources

Bald eagles, peregrine falcons, migratory songbirds, small mammals, and some reptiles may occur in Segment B in both the primary and secondary API in transit between areas of more suitable habitat. Existing overpasses and bridges provide potential habitat for bats and swallows.

The three Johnson and O'Neil habitat types identified within the primary API are found in Segment B: of these, Westside Riparian Wetlands is considered a Johnson and O'Neil priority habitat. WDFW Priority Habitat and City of Vancouver Critical Areas also occur in Segment B. These habitat types also support other species of interest.

4.4.9.1.3 Botanical Resources

Potential habitat for species of interest occurs within the primary and secondary APIs, but is of low quality. However, rare plants were not found during surveys. Noxious weeds are present throughout the primary API, although no Class A noxious weeds were detected.

4.5 Secondary API

The secondary API includes aquatic habitat in Washington (Burnt Bridge Creek, Cold Creek, Cougar Canyon, Salmon Creek, and Whipple Creek) and Oregon (Columbia Slough and Smith and Bybee Lakes), as well as portions of the Columbia River. Terrestrial habitat in the secondary API includes riparian corridors, wetlands, and urban trees. Fish and wildlife species that occur in the secondary API are consistent with those discussed above in Segments A and B of the primary API.

4.5.1 Aquatic Resources

The Columbia River flows within the secondary API in Washington and Oregon. Its condition within the secondary API is similar to its condition within the primary API.

4.5.1.1 Oregon Aquatic Resources

The Columbia Slough runs parallel to the Columbia River for approximately 18 miles before joining the Willamette River near RM 0.5 near its confluence with the Columbia River. The Columbia Slough historically was a continuous waterbody, but now has been broken into the upper, middle, and lower sections. The lower Columbia Slough is tidally influenced by the Pacific Ocean, but within the secondary API, it flows generally from east to west. Historically, the upper slough was connected to the Columbia River. Since the 1910s, the Columbia Slough has been diked and filled, converting its natural floodplain into a managed flood control system complete with floodgates. The slough flows into the secondary API at approximately RM 10, and out of the secondary API at approximate RM 4. The I-5 bridge is located in the vicinity of RM 6.5 of the slough.

The stream passes through a broad valley constrained by terraces in a broad channel constrained by surrounding land uses and levees. Stream slope approaches 0 percent. The channel stability is indeterminate as there is no generalized pattern of degrading or aggrading conditions. No evidence of recent flooding was present. The dominant substrate identified during field surveys was fines/silt/organics, with a subdominant substrate of sand. Glide habitat was the only habitat unit observed within the secondary API. The APIs are heavily urbanized as the city of Portland surrounds this reach of the stream. Levees are the dominant floodplain constrictions. Low flow conditions existed at the time of survey.

The riparian vegetation along the slough provides the potential for future large wood recruitment. Fish cover elements are generally sparse. Within the secondary API, the stream is known to provide rearing and migration habitat for coho and Chinook salmon and steelhead, that spawn in and migrate through the Willamette River System. Due to

the proximity of the mouth of the slough to the Columbia River, some straying of Columbia River system species may occur.

The Columbia Slough is 303(d) listed for temperature, iron, and manganese (DEQ 2007). As discussed in the Water Quality Technical Report, DEQ set TMDLs (and therefore delisted) the following constituents in the Columbia Slough in 1998: chlorophyll a, pH, phosphorous, fecal coliform, dissolved oxygen, lead, DDE/DDT, PCBs, and dioxin (2,3,7,8-TCDD) (DEQ 1998). DEQ also issued a draft TMDL for temperature for the Slough in 2003. Refer to the Water Quality Technical Report for details on the Columbia Slough floodplain, hydrology, and stormwater outfalls.

The Smith and Bybee Wetlands Natural Area is a large (approximately 2000 acres) network of wetlands, sloughs, lakes, and forest within the Oregon portion of the secondary API. The natural area is managed by Metro and is a popular urban recreation and wildlife viewing site. Native wildlife that occurs in and around the natural area includes beavers, river otters, deer, osprey, eagles, and painted turtles (Metro 2007).

4.5.1.2 Washington Aquatic Resources

Listed fish known to occur in Burnt Bridge Creek include coho and Chinook salmon and winter steelhead (see Section 4.4.1.2). No anadromous fish are reported to occur in Cold Creek, Cougar Canyon, or Whipple Creek; however, coho salmon and steelhead are recorded as occurring in Salmon Creek (StreamNet 2008). Field surveys were not conducted for aquatic resources within the secondary API.

4.5.2 Terrestrial Resources

Within the secondary API, terrestrial wildlife habitat occurs in city parks, greenways, riparian areas, and undeveloped pockets of forested habitat. Exhibit 4-28 lists the acreage for habitat types in the secondary API. See Section 4.3.2 for a description of each habitat type.

Suitable wildlife corridors may be found in vegetated areas associated with the Columbia Slough, Smith and Bybee Lakes, Cold Canyon, Cougar Canyon, Salmon Creek, and Whipple Creek. The Columbia Slough, in particular, serves as the major connector of habitats between the east and west sides of I-5. Wildlife habitat on the Oregon side of the river exists throughout the Peninsula 1 Drainage District, west of I-5, where Vanport once existed, and which now contains Portland International Raceway, Heron Lakes Golf Course, and Vanport Wetlands. To the east of I-5 in the Peninsula 2 Drainage District, some habitat is present in slough channels at Delta Park, Bridgeton Slough, and small wetland and upland areas in the vicinity. Wildlife may use the corridor under I-5 and the Denver Avenue viaduct along Schmeer Road and Schmeer Slough on the south end near the Columbia Slough. Many species moving longer distances likely use the south side of the slough (Thompson pers. comm.).

A wildlife passage gap with restoration potential has been identified between Vanport Wetlands and Heron Lakes Golf Course west of I-5.[7] Good quality habitat and wildlife passage are present at Smith and Bybee Wetlands Natural Area to the west of the secondary API.

Exhibit 4-28. Number of Acres in Each Habitat Classification in the Secondary API

Habitat Classification	Segment A	Segment B	Total in Secondary API
Johnson and O'Neil classifications:			
Westside Lowland Conifer-Hardwood Forest	59.27	204.87	264.14
Lakes, Rivers, Ponds, and Reservoirs	1,062.58	63.88	1,126.45
Herbaceous Wetlands	53.35	38.70	92.05
Westside Riparian – Wetlands	125.79	662.88	788.67
Urban and Mixed Environs	8,109.85	8,237.35	16,347.20
Washington Priority Habitats	443.72	1,797.70	2,241.42
Vancouver Critical Areas	540.40	2,844.07	3,384.47
Metro Goal 5	2,315.25	N/A	2,315.25
City of Portland E-Zones	1,294.82	N/A	1,294.82
Total	**14,005.05**	**13,849.44**	**27,854.49**

4.5.3 Botanical Resources

Wapato and cattail occur near Burnt Bridge Creek, east of I-5. Both of these species are common in Vanport Wetlands.

The WDNR-NHP identified two rare plant species within the secondary API in Washington: tall bugbane *(Cimicifuga elata*) and small-flowered trillium *(Trillium parviflorum*) (see Exhibit 4-29). Historical records exist for five rare species within the secondary API: Torrey's peavine (*Lathyrus torreyi*), diffuse montia (*Montia diffusa*), western yellow oxalis (*Oxalis suksdorfii*), Idaho gooseberry (*Ribes oxyacanthoides* ssp. *irriguum*), and snapdragon skullcap (*Scutellaria antirrhinoides*); however, there are no current records for these species within the secondary API.

ORNHIC reported two rare plant data records in Segment A within the secondary API: Bristly sedge (*Carex comosa*) and Columbian watermeal (*Wolffia columbiana*). Both plant species are classified by ORNHIC as threatened, endangered, or extirpated from Oregon, but secure or abundant elsewhere.

C. comosa can be found in marshes, lake shores, and wet meadows, and occurs in disjunct populations in the western states (Hitchcock et al. 1969). Potential habitat for *C. comosa* is found in Vanport Wetlands, a closed slough along N Whitaker Road, a closed aquatic feature in East Delta Park, and the riparian area of the Columbia River/North

[7] A parcel in this area that could provide some connectivity is owned by the Port of Portland and is being considered for a future mitigation site by the Port; this mitigation is not related to the CRC project (Thompson pers. comm.).

Portland Harbor. This species which was last observed in the 1880's in the secondary API.

W. columbiana can be found just below or touching the surface of low-elevation freshwater lakes, ponds, and slow-moving streams. It is widely distributed throughout North and South America; however, there are few documented occurrences of the species in Oregon and Washington (Hitchcock et al. 1969). Potential habitat for *W. columbiana* is found in slow-moving portions of the Columbia River/North Portland Harbor, the Columbia Slough, a closed slough along North Whitaker Road, a closed aquatic feature in East Delta Park, and the Vanport Wetlands. This species was last observed in the secondary API in 1991.

Exhibit 4-29. Special-Status Plant Species Reported to Occur Within the Secondary API

Species	Federal Status	WA Status	OR Status	Habitat Type	Potential Habitat Type	Habitat Condition
Tall bugbane *Cimicifuga elata*	SC	Sensitive	Candidate	Mixed coniferous-deciduous forest margins	Hardwood forest	Disturbed
Small-flowered trillium *Trillium parviflorum*	N/A	Sensitive	N/A	Moist, shady environments dominated by hardwoods	Slow-moving water	Disturbed

Source: ORNHIC; WDNR-NHP.

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5. Long-Term Effects

5.1 How is this section organized?

This section describes the long-term impacts that would be expected from the I-5 CRC alternatives and options. It first describes impacts from the four full alternatives and No-Build. These are the five comprehensive alternatives that include specific highway, transit, bicycle, pedestrian and other elements. This discussion focuses on how these alternatives would affect corridor and regional impacts and performance. The discussion then focuses on impacts that would occur with various design options at the segment level, for example, comparing the impacts of transit alignment options in downtown Vancouver. Finally, it provides a more comparative and synthesized summary of the impacts associated with the system-level choices. This three part approach provides a comprehensive description and comparison of (1) the combination of system-level and segment-level choices expressed as five specific, multi-modal alternatives (2) discrete system-level choices, and (3) discrete segment-level choices.

Section 5.2-5.4 addresses direct long-term impacts. Section 5.5 addresses indirect impacts.

5.2 Impacts from Full Alternatives

Full alternatives represent the range of multimodal choices that most affect overall performance, impacts and costs. They are most useful for understanding the regional impacts, performance and total costs associated with the CRC project.

5.2.1 No-Build Alternative

5.2.1.1 Summary

Under the No-Build Alternative, impacts to ecosystem resources would remain consistent with current conditions. Examples of current impacts include presence of bridge piers in the Columbia River that influence hydrology and habitat conditions, reductions in water quality due to untreated stormwater runoff, and traffic congestion that contributes to water and air quality degradation. Under the No-Build Alternative, impacts to water and air quality would likely be exacerbated in the long term due to increasing traffic congestion.

5.2.1.2 Aquatic Resources

The No-Build Alternative would not result in appreciable changes in current impacts to aquatic resources; rather, existing conditions would persist and current impacts would be exacerbated in the long-term. For example, long-term effects of no changes to the existing crossing include increased traffic congestion, with consequent increases in air and water pollution from vehicle emissions and roadway pollutants. Stormwater runoff

from the existing I-5 bridge would likely continue to flow into the river untreated. In the event of a major seismic event, the I-5 bridge structures could be extensively damaged or collapse, necessitating emergency actions to stabilize or remove the structure. Impacts from potential future upgrades to the bridge, for example seismic upgrades or stormwater treatment, would need to be considered at that time.

5.2.1.2.1 Aquatic Habitats

Impacts to the Columbia River, North Portland Harbor, and Burnt Bridge Creek under the No-Build Alternative would be consistent with current conditions. Under current conditions, stream flow in the Columbia River and North Portland Harbor is affected by the presence of bridge piers in the water, which has led to scouring of the river bed and local disruptions of currents (DEA 2006). Potential sources of contaminants, associated with the highway and bridge that may affect water quality include oil and other vehicle fluids; copper (e.g., dissolved copper from brake pad wear); flaking bridge paint containing lead and other heavy metals; and chemicals and toxins associated with washing, painting, and maintaining the existing structures.

Delays in traffic associated with the use of the lift-span and the current sizing have been linked to a high level of vehicle collisions. Each collision on a bridge deck that is directly connected to the river presents the possibility of hazardous materials entering the Columbia River.

Under this alternative, no alterations would be made to the highway and road system. Consequently, no increases in impervious surface area and its related water quality impacts (increased storm peaks, reduced low flows, etc.) would occur. However, with time and increasing traffic, congestion and associated start-and-stop traffic will increase. This increasingly congested traffic pattern will increase brake pad wear and vehicle idling/exhaust; consequently, loading of copper and other contaminants to receiving waterways also would increase. Stormwater runoff would remain untreated on portions of the existing bridge. Stormwater treatment would not be upgraded or modernized and no net gain to water quality would be realized.

5.2.1.2.2 Aquatic Species

Impacts to aquatic species under the No-Build Alternative would be consistent with current conditions. Existing piers in the river may provide refugia (via hydrologic shadow and bridge deck shading) for native and non-native piscivorous fish. These man-made structures in the river may influence fish use of the water column and the river within the primary API, providing opportunities for predators that may not otherwise exist. Juvenile salmon and other native fish may be subject to elevated predation pressure at these bridge piers. Water quality for aquatic species is currently compromised by untreated stormwater that flows into the Columbia River from the existing bridge. Dissolved copper would continue to degrade conditions for listed fish species.

5.2.1.2.3 Fish Passage

No changes to fish passage would result from the No-Build Alternative. No physical passage barriers would be present in the Columbia River within the API, and passage in

the North Portland Harbor would continue to be limited compared to historical conditions. No additional passage barriers would be present in Burnt Bridge Creek.

5.2.1.3 Terrestrial Resources

The No-Build Alternative would not result in appreciable changes in current impacts to terrestrial resources; rather, existing conditions would persist and current impacts would be exacerbated in the long-term. For example, long term effects include increased traffic congestion, with consequent increases in air pollution from vehicle emissions and roadway pollutants. Migratory birds would continue to use the area for nesting, roosting, foraging, and dispersal. Bats may use some bridge structures for night roosting. Urban wildlife such as raccoons, mice, squirrels, and foxes would continue to use the small patches of habitat for feeding, reproduction, and dispersal.

5.2.1.3.1 Threatened, Endangered, Proposed, and Candidate Species

Impacts to bald eagles would be consistent with existing conditions. Foraging and migration habitat would continue to be present within the primary API. No changes to nesting and roosting habitat (which currently are not present within or adjacent to the primary API) would be anticipated. Nesting territories that currently exist within one mile of the secondary API would not be affected.

5.2.1.3.2 Species of Interest

Effects to species of interest (e.g., migratory birds, bats, pond turtles, painted turtles) would be consistent with existing conditions. These species' use of the potential roosting, feeding, and/or breeding habitat associated with the bridge and the habitat within the APIs would not be appreciably changed under the No-Build Alternative.

Impacts to peregrine falcons would be consistent with existing conditions. Year-round habitat would continue to be present within the primary API. No changes to peregrine use of habitat features in the primary API would be anticipated. In the event of a major seismic event, the structure could be extensively damaged or collapse, thereby hindering continued use of the bridge structure by peregrine falcons.

5.2.1.3.3 Terrestrial Habitat

Effects to the existing habitat types present in the primary API (Open Water – Lakes, Rivers, Streams; Urban and Mixed Environs; Westside Lowlands Conifer-Hardwood Forest; Herbaceous Wetlands; Westside Riparian – Wetlands) would be consistent with existing conditions. Effects to Priority Habitats (Washington State), Critical Areas (City of Vancouver and Clark County), Environmental Zones (City of Portland), and Goal 5 resources (Metro) would be consistent with existing conditions. Under the No-Build Alternative, some existing conditions that impact terrestrial habitats would be exacerbated. For example, traffic congestion would worsen, adding to air and water quality pollutant loads from vehicle emissions, roadway contaminants, untreated stormwater, and other pollutant sources.

5.2.1.3.4 Wildlife Passage

Wildlife passage would continue to be restricted by I-5, the existing overpass and underpass structures, and the surrounding urban environment.

5.2.1.4 Botanical Resources

The No-Build Alternative would not result in appreciable changes in current impacts to plants. Native plant habitat, particularly for rare plants, would remain fragmented and degraded due to the urbanized character of the area. Potential habitat for rare species would likely continue to persist at Vanport Wetlands, the closed aquatic feature in East Delta Park, along the riparian areas of the Columbia River and North Portland Harbor in Oregon, in the riparian zone at Burnt Bridge Creek, and in limited forest tracts near SR 500 in Washington.

5.2.2 Impacts Common to all Build Alternatives

Certain impacts to ecosystem resources would be common to all of the build alternatives. These potential impacts are grouped together in this section and apply to all options for the Replacement and the Supplemental crossing alternatives.

Potential impacts that are unique to specific build alternatives and design options are discussed in Sections 5.2.3 (Replacement crossing alternative) and 5.2.4 (Supplemental crossing alternative).

5.2.2.1 Aquatic Resources

Impacts to the Columbia River and North Portland Harbor are a concern for aquatic resources because these waterways serve as habitat for threatened, endangered, and rare fish species with federal and state regulatory protection. Bridge piers in the Columbia River and North Portland Harbor are likely to affect habitat for fish species under all build alternatives. Overall pollutant loads in the Columbia River are likely to be reduced because all build alternatives contain modernized stormwater collection and treatment systems; however, net pollutant loads in Burnt Bridge Creek and the Columbia Slough are likely to increase due to increased impervious surfaces draining to those basins. These impacts are discussed in more detail in the sections below.

5.2.2.1.1 Aquatic Habitats

Shallow water habitat. In the long-term, the proposed build alternatives would affect the Columbia River and the North Portland Harbor by affecting river currents at the piers, altering behavior patterns of piscivorous fish, and potentially facilitating negative impacts to water quality. All build alternatives would require piers in the river, which can negatively impact near-shore and shallow areas by altering channel dynamics as a result of sediment deposition and scour. Shallow areas, particularly those 20 feet deep or less, are important feeding, migration, and holding habitat for listed salmonids and other native fish. Depending on the final bridge design, aquatic habitat quality could conceivably be improved from current conditions if the new bridge design includes fewer piers in the mainstem river and therefore fewer modifications to riverine habitat.

Preliminary bridge pier designs suggest that the Replacement bridge would have two piers with less than a 20-foot clearance from the bottom of the pile cap to the river bottom; the Supplemental crossing would have three (Exhibit 5-1). In the Replacement alternative, none of the piers for the transit bridge would be in less than 20 feet of water. The average depth of the North Portland Harbor is relatively shallow (approximately 14 feet [DEA 2006]); therefore, bridge piers are expected to be in shallow water in the slough for all the alternatives.

Stormwater. The continued presence of a major highway over the Columbia River would maintain the potential for highway-related pollutants to be present in the project area and to eventually make their way into the river. Because metals and other pollutants bind to fine particles, accumulations of road-derived sediments may have elevated levels of contaminants. However, improvements to stormwater treatment on the bridge may result in improved water quality for aquatic habitats and species in the Columbia River. Some level of benefit to water quality will be realized through the build alternatives because runoff generated by the existing highway corridor is not treated in accordance with standards for new construction. All new impervious surfaces, as well as existing surfaces that would be altered, would be treated in accordance with current stormwater treatment standards before being discharged to project area receiving streams.

Depending on the alternative, the build alternatives include an increase of approximately 27.7 to 42.7 acres of additional impervious surface, which could reduce natural infiltration rates and increase stormwater pollutants loads of suspended sediments, nutrients, PAHs, oils and grease, antifreeze from leaks, cadmium and zinc from tire wear, and copper from wear and tear from brake pads, bearings, metal plating, and engine parts. Sediment from highway runoff may contribute to turbidity, but is not expected to contribute to clogging spawning gravels or to morphologic changes in waterways. Stormwater is planned to be treated through swales. Stormwater draining to Burnt Bridge Creek is planned to be treated through wet ponds. A small amount of stormwater is planned to be sent directly to municipal systems.

Pollutant loads are affected by traffic volumes, adjacent land uses, air quality, and the frequency and duration of storms, among other factors. Most of the stormwater runoff is currently conveyed to the Columbia River and much of it flows untreated directly into the river; however, under the build alternatives, the majority of highway runoff would be conveyed to the Columbia Slough. This would result in improved water quality conditions in the Columbia River, but not in the Columbia Slough. Conditions in the Columbia Slough, such as slow moving water and existing water quality problems, make this waterbody more sensitive to total suspended solids and other contaminants than other waterbodies within the project area. Loading of dissolved copper and dissolved zinc are projected to increase in the Columbia Slough compared to the No-Build Alternative.

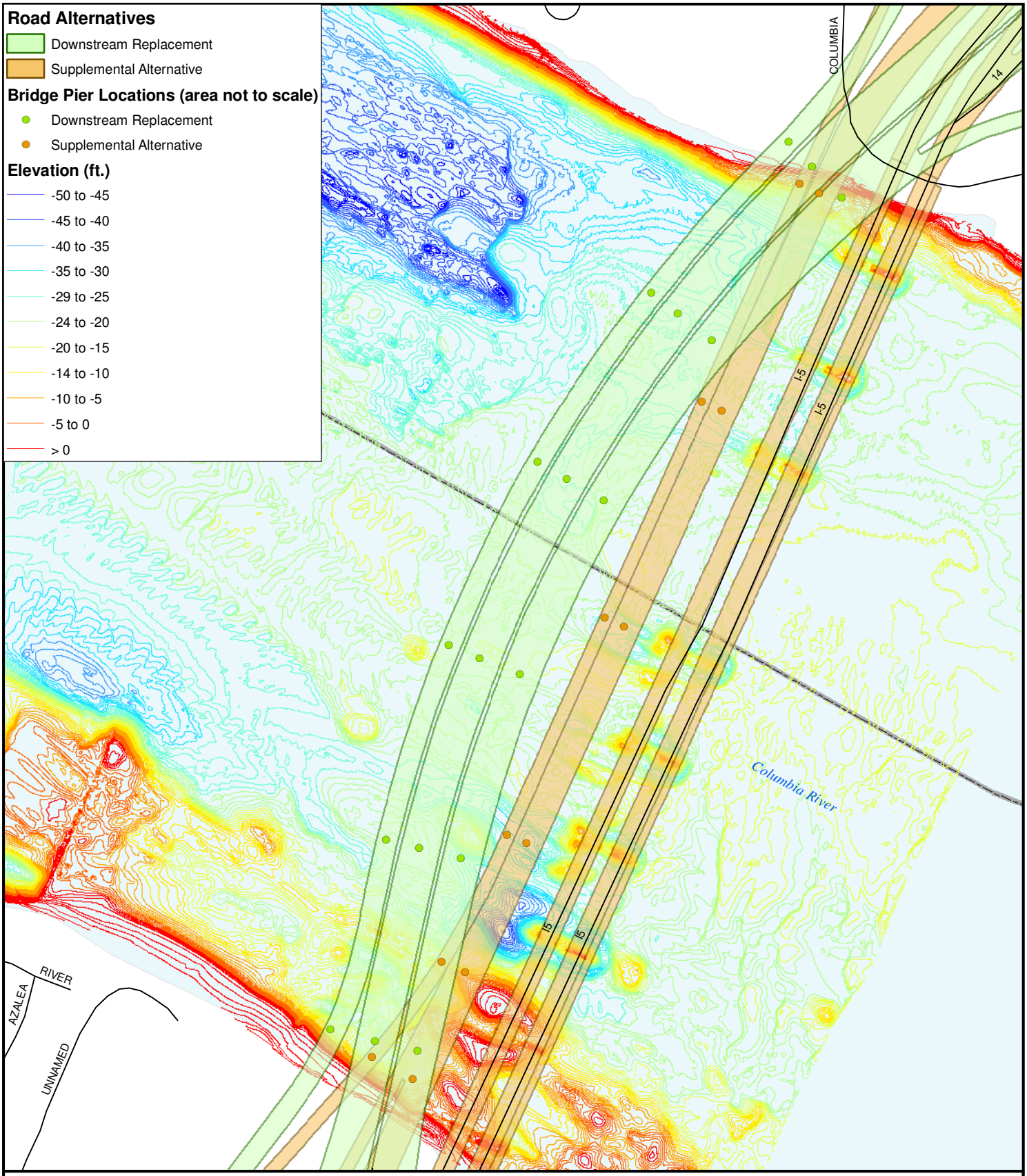


Exhibit 5-1: Bridge Pier Locations in the Columbia River

Columbia River CROSSING

Analysis by J. Koloszar; Analysis Date: 11/15/2007; Plot Date: 11/15/2007; File Name: bathymetry.mxd

Decreasing traffic congestion on the I-5 bridge and the roadways in the project area may reduce the amount of copper carried by project runoff compared to what would be proportionately carried by the No-Build Alternative. Consequently, idling and brake pad wear are expected to decrease, as will the amount of total copper generated and eventually transported to the project's receiving waters. Traffic models projected to the year 2030 indicate that the build alternatives will substantially improve traffic congestion within the project corridor. A Replacement crossing would provide more congestion relief than the Supplemental crossing or No-Build Alternative.

5.2.2.1.2 Aquatic Species

Under all build alternatives, aquatic species, including listed ESUs of Chinook, sockeye, coho, and chum salmon, steelhead, coastal cutthroat, and bull trout, as well as Species of Concern (Pacific and river lamprey, green sturgeon) would be affected by water quality and by physical changes to habitat elements (i.e., bridge piers in the river). Aquatic species in the Columbia River would likely experience improved water quality in the long-term due to improvements in stormwater and traffic management. Aquatic species in Burnt Bridge Creek and the Columbia Slough would likely be exposed to increases in pollutant loading due to stormwater conveyance to these basins. Fish in basins with increases in dissolved copper would be more susceptible to olfactory and behavioral impairment that could reduce predator avoidance and feeding success.

New bridge piers would have similar effects to aquatic species as the existing piers. Piers can locally alter currents by creating hydrologic shadows that could provide refugia for piscivorous fish. Native and non-native piscivorous fish are known to use piers and other in-water structures for refugia from the current, a vantage point from which they may opportunistically feed on passing fish, including juvenile salmonids. Shading from the bridge deck could also provide cover for piscivorous fish species and encourage their use of the mainstem river.

Adverse long-term effects to non-listed species, including forage species such as small fish and invertebrates, would be consistent with those described above. Fish could be exposed to predation at bridge piers and be disturbed by altered stream flow patterns caused by in-water structures such as bridge piers. All aquatic species are susceptible to reduced water quality that may result from any increases in pollutant loads. Degraded water quality may adversely impact breeding, spawning, dispersal, migration, feeding, and other life stages.

5.2.2.1.3 Fish Passage

There are no known physical barriers to fish passage within the primary or secondary APIs, and none would be installed under the build alternatives. There would be no effect on fish passage.

5.2.2.2 Terrestrial Resources

All build alternatives will impact terrestrial habitats. Exhibit 5-2 compares project impacts to the various terrestrial habitat types from each alternative. Comparison is made

of acres of habitat within right-of-way to represent the most consistent project footprint possible between Build and No-Build Alternatives. For purposes of this analysis, impacts include construction cut/fill activities, paved surface, area that may be accessed in the right-of-way for maintenance, and other ground-disturbing and potentially habitat-disturbing activities. Figures in parentheses indicate total increase in habitat impact relative to existing conditions (i.e., the No-Build Alternative). All build alternatives would result in increased impacts to terrestrial habitats. The Replacement crossing would impact approximately 18 more acres than the Supplemental crossing.

Exhibit 5-2. Terrestrial Habitat Impacts by Alternative

	No-Build	Replacement	Supplemental
Washington Priority Habitats	35.4	45.8	41.0
Vancouver Critical Areas	79.8	90.2	85.4
Metro Goal 5	72.1	112.2	105.3
City of Portland E-Zones	30.4	43.5	42.0
Totals	**217.7**	**291.7**	**273.7**

For impacts to terrestrial species, refer to Sections 5.2.3, Replacement crossing, and 5.2.4, Supplemental crossing.

5.2.2.3 Botanical Resources

The Build Alternatives are not anticipated to have long-term impacts to botanical resources.

5.2.3 Replacement Crossing Alternative

Tolling and bus/light rail options being considered with the Replacement crossing are not anticipated to create substantial ecosystem impacts unique to each option. Potential impacts of the Replacement Crossing Alternative discussed in this section apply to:

- Replacement Crossing with LRT and I-5 Standard Toll
- Replacement Crossing with LRT and No Toll
- Replacement Crossing with BRT and I-5 Standard Toll

5.2.3.1 Summary

In general, the Replacement crossing would have fewer impacts to ecosystem resources than the Supplemental crossing.

Relative to aquatic resources, the Replacement crossing would have fewer piers in the mainstem Columbia River, although the pier placement on the north (Vancouver) bank would be closer to shore than in the Supplemental crossing. The bridge deck in the Replacement crossing would be elevated higher above the water surface than in the Supplemental crossing. A higher deck may lessen the intensity of the shading effect that is a potential concern for fish; however, the actual shaded area may increase. Stormwater treatment for the Replacement crossing would be more effective and efficient because the

entire structure would be designed to meet current standards. Roadway pollutants would be more effectively conveyed and treated, reducing risks to water quality.

The Replacement crossing would have more impacts to terrestrial species because existing structures that serve as nesting and roosting habitat for migratory birds would be removed. Although habitat structures (e.g., nest boxes) would be incorporated into the Replacement bridge design, long-term effects to listed terrestrial species could occur (for example, if nest boxes were not successful in attracting listed birds).

5.2.3.2 Aquatic Resources

5.2.3.2.1 Aquatic Habitats

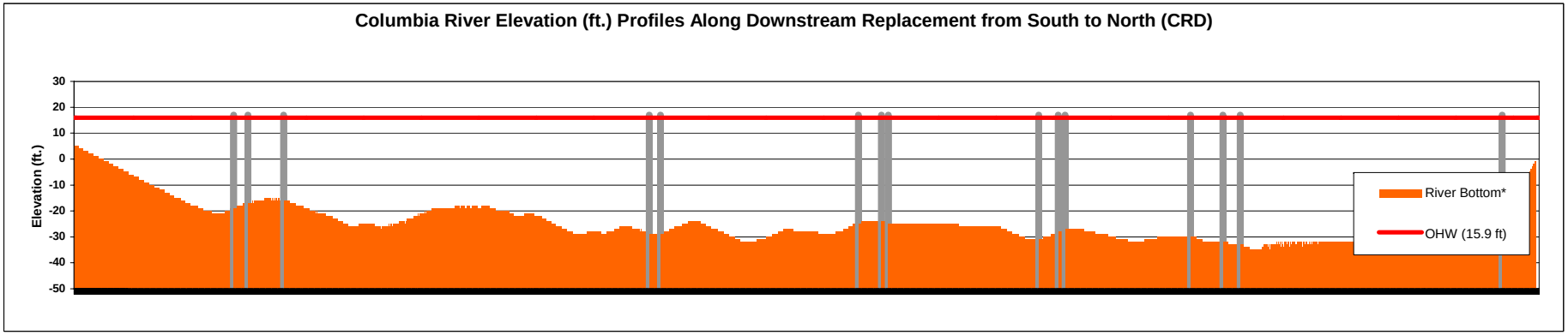
Shallow water habitat. Shallow waters are important feeding and holding areas for salmonids. Refer to Section 5.2.2.1.1, Impacts Common to All Build Alternatives for a discussion of impacts to shallow water habitats. The Replacement crossing would have fewer piers (six pier sets) in the Columbia River than the Supplemental crossing (10 pier sets); however, they would be closer to shore, particularly on the north (Vancouver) bank (Exhibit 5-3). Bridge piers in near-shore and shallow areas can have long-term impacts to aquatic habitat and channel dynamics as a result of sediment deposition, bank and bed scour, erosion, and alteration of flow patterns. Piers close to or on the shore can also serve as movement barriers and attract predators.

Preliminary Replacement crossing designs indicate that two piers will be in water that is 20 feet or shallower. For both the north- and southbound Replacement bridges, piers 1-5 will have at least a 20-foot clearance from the bottom of the pile cap to the river bottom, pier 6 (near the Vancouver shore) will have less than a 20-foot clearance, and pier 7 will be on land. None of the piers for the transit bridge would be in less than 20 feet of water.

The Replacement crossing over North Portland Harbor would likely have four piers in the water, while the existing bridge has six piers in the water. The average depth of the North Portland Harbor is relatively shallow (approximately 14 feet [DEA 2006]); therefore, bridge piers are expected to be in shallow water in the slough for all the alternatives.

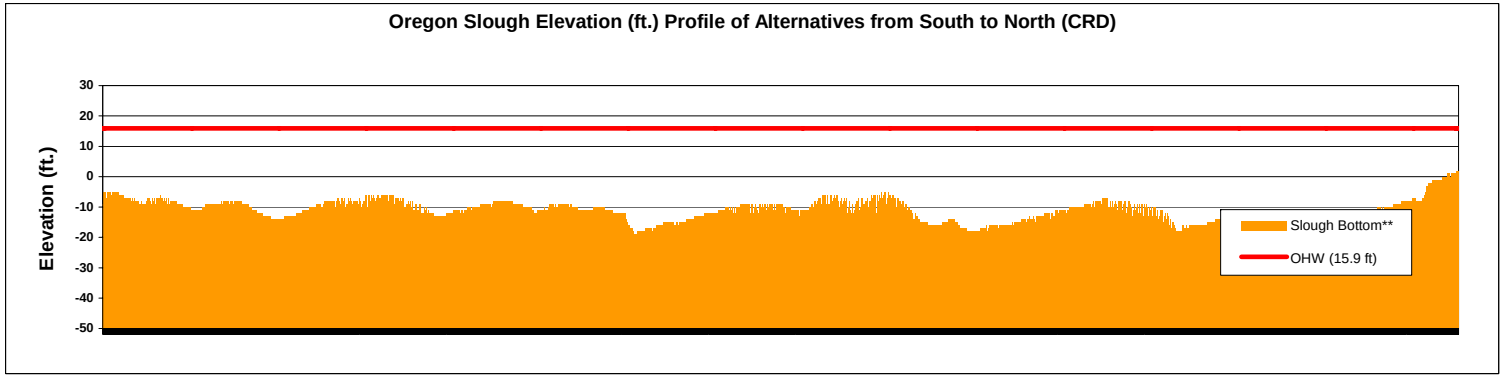
The piers in the Replacement crossing would have a lower total volume of concrete in the Columbia River than the Supplemental crossing, causing relatively less disruption to aquatic habitat. The Replacement crossing piers would have a footprint of 114,000 square feet (2.62 acres), displacing 66,667 cubic yards of water. The Supplemental crossing (the existing structure and the new southbound structure combined) would have a footprint of 127,000 square feet (2.93 acres), displacing 101,362 cubic yards of water.

Exhibit 5-3. Cross-channel Profile of the Mainstem Columbia River for the Replacement Crossing



Note: Graph is oriented looking downstream, with the Oregon bank on the left and the Washington bank on the right. The gray columns represent proposed pier locations.

Exhibit 5-4. Cross-channel Profile of the Oregon Slough (North Portland Harbor)



Note: Graph is oriented looking downstream, with the south bank on the left and the north bank on the right. Due to multiple crossings and ramps over the slough under each alternative, elevations used here represent general depths down the center of the conglomeration of alternatives.

Stormwater. Stormwater treatment with the Replacement crossing would be more cost-effective and more efficient compared to the other alternatives because the entire span could be fitted to convey stormwater to current standards. However, the Replacement crossing would create more impervious surface area compared to the Supplemental crossing. A Replacement crossing could add approximately 43.7 additional acres of impervious surface (Exhibit 5-5). Stormwater would be treated and conveyed to the Columbia Slough. Approximately 7.9 acres of impervious surface could be added in the Burnt Bridge Creek basin under the Replacement alternative. Water quality, and consequently aquatic habitat, is likely to be negatively impacted by an increase in impervious surface. Although the increase in impervious surface represents a small portion of the associated watersheds, an incremental increase in impervious surface could still adversely affect stream quality.

Exhibit 5-5. Comparison of Total Impervious Area (Acres) Among the Alternatives

`	No Build	Replacement with BRT	Supplemental with BRT
Columbia Slough Basin	38.8	72.1	59.7
Columbia River Basin[a]	32.7	19.6	28.2
Columbia Slope Basin	94.6	110.2	99.7
Burnt Bridge Creek	39.4	47.3	46.6
Total	205.5	249.2	234.2
Increase from Existing	--	42.7	27.7

[a] Number of acres of impervious surface in the Columbia River Basin for the build alternatives appears here as reduced from the No-Build Alternative because for stormwater analysis purposes, runoff from the Columbia River basin will be conveyed to the Columbia Slough; therefore, these acres of impervious surface are accounted for in the Columbia Slough figures in the preceding row. See the Water Quality Technical Report for additional details.

The estimated concentrations of dissolved copper under the different alternatives are listed in Exhibit 5-6 below. Estimates are based on the annual load for dissolved copper, impervious drainage area, annual mean rainfall, and outfall locations. Actual concentrations within streams will vary depending on rainfall patterns, traffic patterns, stream flow, and other factors. The Replacement crossing represents a likely decrease in overall dissolved copper compared to the No-Build Alternative in the Columbia River and the Columbia Slope. A net increase in dissolved copper is likely in the Columbia Slough because this waterway will receive an increase in conveyed stormwater from the new bridge surface and from other increases in impervious surface. For this alternative, runoff from additional impervious surface area could increase dissolved copper loads in the Columbia Slough by 20% compared to the No-Build Alternative. Loads for other pollutants are expected to decrease since stormwater treatment would be provided where treatment would otherwise not exist.

An increase in dissolved copper is likely in Burnt Bridge Creek because of the increase in impervious surface in that basin. Pollutant loads could increase by approximately 20% in comparison to the No-Build Alternative. For additional information on pollutant loads, including zinc, phosphorus, and total suspended solids, refer to the Water Quality Technical Report.

Exhibit 5-6. Estimated Dissolved Copper Loads by Alternative (pounds/year)

	No Build	Replacement	Supplemental
Columbia Slough Basin	1.9	2.4	2.1
Columbia River Basin	1.6	0.6	0.8
Columbia Slope Basin	4.7	3.8	3.4
Burnt Bridge Creek	1.2	1.4	1.4
Total	**9.4**	**8.2**	**7.7**

5.2.3.2.2 Aquatic Species

Shading from bridge deck surfaces is a potential concern for aquatic species because piscivorous fish may use shade as cover and refugia during feeding. Large amounts of shade from the bridge deck may put native fish, including juvenile salmonids, at elevated risk of predation. The Replacement crossing would have more bridge deck surface (250 feet wide) than the Supplemental deck surface (202 feet wide). However, the Replacement bridge deck would be elevated higher than the Supplemental bridge deck, which could reduce the intensity of the shading on the surface of the Columbia River (the actual area subject to shading could also increase as the shadow would be cast farther). See Section 5.2.2.1.2, Impacts Common to All Build Alternatives, for a discussion of additional impacts to aquatic species.

5.2.3.3 Terrestrial Resources

5.2.3.3.1 Terrestrial Habitats

A total of approximately 292 acres of locally and regionally designated habitats are anticipated to be impacted by the Replacement crossing, an increase of approximately 74.0 acres over existing conditions (i.e., the No-Build Alternative) (Exhibit 5-7). See also Section 5.2.2.2, Impacts Common to All Build Alternatives.

Exhibit 5-7. Habitat Impacts for the Replacement Alternative

Habitat Classification	Replacement
Washington Priority Habitats	45.8
Vancouver Critical Areas	90.2
Metro Goal 5	112.2
City of Portland E-Zones	43.5
Totals	**291.7**

5.2.3.3.2 Threatened, Endangered, Proposed, and Candidate Species

No terrestrial threatened, endangered, proposed, or candidate species would be affected under this alternative.

5.2.3.3.3 Species of Interest

The proposed Replacement Bridge Alternative would affect terrestrial resources by removing structures used by migratory birds and potentially by bats. Removal of these structures is a concern because life stages such as feeding and breeding may be affected. New habitat elements such as nest boxes could be included in the new structure to offset removal of habitat elements associated with the existing bridge. However, this alternative is not anticipated to have adverse long-term impacts to most terrestrial resources

Peregrine falcons would be affected under this alternative as the existing bridge, which the falcons have been documented using since 2001, would be removed. Removal of the habitat structure on the existing bridge would appreciably disrupt peregrine breeding, foraging, and roosting activity. Peregrines using the existing bridge would be forced to find alternative structures in the area, or would vacate the area in the long term. Nesting boxes, platforms, and other artificial structures would be installed with the new replacement structure to offset removal of the existing bridge.

Long-term effects to migratory birds could include altered habitat for nesting and roosting if the Replacement bridge design provided less structure suitable for these species (e.g., the Replacement structure would not include steel girders that birds currently use).

5.2.3.3.4 Wildlife Passage

Wildlife passage may be hindered compared to existing conditions. The existing shoreline provides minimal passage habitat in the form of open riprap and concrete. Piers for the Replacement bridges would likely impact one or both shores of the Columbia River, creating an obstruction to movement along the shoreline. Options for improving wildlife passage are limited.

5.2.4 Supplemental Crossing Alternative

Tolling and bus/light rail options being considered with the Supplemental Crossing are not anticipated to create ecosystem impacts unique to each option. Potential impacts of the Supplemental Crossing Alternative discussed in this section apply to:

- Supplemental Crossing with LRT and I-5 Higher Toll
- Supplemental Crossing with BRT and I-5 Higher Toll

5.2.4.1 Summary

Compared to the other alternatives, this alternative would have more in-water structure impacts because the existing bridge would require substantial seismic retrofitting, in addition to new bridge in-water structures. The bridges in this alternative would have more piers in the river channel. Stormwater treatment in this alternative would be more difficult, increasing the potential for roadway pollutants to degrade water quality and aquatic habitat in the Columbia River and the North Portland Harbor. This alternative would have fewer impacts to listed terrestrial species because existing structures would not be removed.

5.2.4.2 Aquatic Resources

5.2.4.2.1 Aquatic Habitats

Shallow water habitat. Shallow waters are important feeding and holding areas for salmonids. Refer to Section 5.2.2.1.1 (Impacts Common to All Build Alternatives) for a discussion of impacts to shallow water habitats. The Supplemental crossing would have more pier sets in the Columbia River (10 pier sets) than the Replacement crossing (6 pier sets)

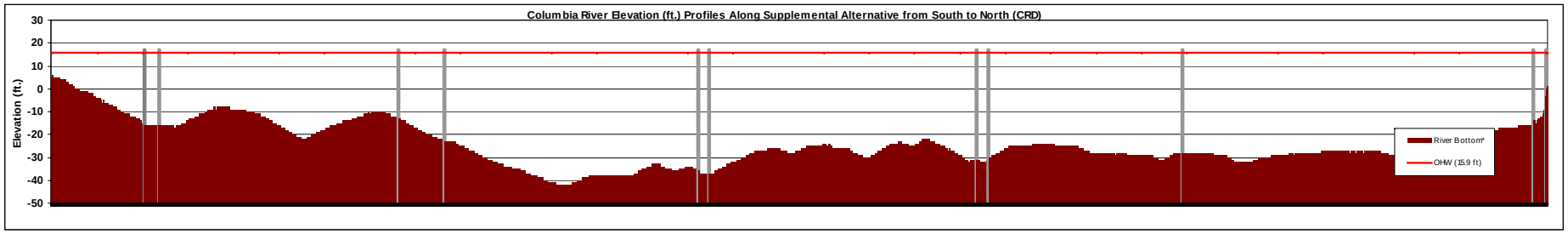
Preliminary Supplemental crossing designs indicate that approximately three to four piers will be in water that is 20 feet or shallower (Exhibit 5-8). For the northbound Supplemental bridge, piers 3-5 will have at least a 20-foot clearance from the bottom of the pile cap to the river bottom, piers 1, 2, and 6 will have less than a 20-foot clearance, and pier 7 will be on land.

The Supplemental crossing over the North Portland Harbor would likely have four pier sets in the water, while the existing bridge has six pier sets in the water. The average depth of the North Portland Harbor is relatively shallow (approximately 14 feet [DEA 2006]); therefore, bridge piers are expected to be in shallow water in the slough for all the alternatives.

The pier sets in the Supplemental crossing would have a higher total volume of concrete in the Columbia River than the Replacement crossing, causing relatively more disruption to aquatic habitat. The Supplemental crossing (the existing structure and the new southbound structure combined) would have a footprint of 127,000 square feet (2.93 acres), displacing 101,362 cubic yards of water. The Replacement crossing piers would have a footprint of 114,000 square feet (2.62 acres), displacing 66,667 cubic yards of water.

Stormwater. Stormwater treatment in this alternative would be more difficult due to the technical complexities and expense involved in retrofitting the existing bridge. However, the increase in impervious surface area is expected to be lower for the Supplemental alternative than the Replacement alternative. The Supplemental alternative could add approximately 28.7 additional acres of impervious surface (Exhibit 5-9). In Burnt Bridge Creek, approximately 7.2 acres of impervious surface could be added under the Supplemental alternative. Stormwater would be treated and conveyed to the Columbia Slough. Water quality, and consequently aquatic habitat, is likely to be negatively impacted by an increase in impervious surface. Although the increase in impervious surface represents a small portion of the associated watersheds, an incremental increase in impervious surface could still adversely affect stream quality.

Exhibit 5-8. Cross-channel Profile of the Mainstem Columbia River for the Supplemental Crossing



Note: Graph is oriented looking downstream, with the Oregon bank on the left and the Washington bank on the right. The gray columns represent proposed pier locations.

Exhibit 5-9. Comparison of Total Impervious Area (Acres) Among the Alternatives

	No Build	Replacement	Supplemental
Columbia Slough Basin	38.8	72.1	59.7
Columbia River Basina	32.7	19.6	28.2
Columbia Slope Basin	94.6	110.2	99.7
Burnt Bridge Creek	39.4	47.3	46.6
Total	205.5	249.2	234.2
Increase from Existing	--	42.7	27.7

[a] Number of acres of impervious surface in the Columbia River Basin for the build alternatives appears here as reduced from the No-Build Alternative because for stormwater analysis purposes, runoff from the Columbia River basin will be conveyed to the Columbia Slough; therefore, these acres of impervious surface are accounted for in the Columbia Slough figures in the preceding row. See the Water Quality Technical Report for additional details.

Pollutant loads under the Supplemental crossing are similar to those discussed in Section 5.2.3.2 for the Replacement crossing. The Supplemental crossing represents a likely net decrease in dissolved copper compared to the No-Build Alternative in the Columbia River and the Columbia Slope. A net increase in dissolved copper is likely in the Columbia Slough because this waterway will receive an increase in conveyed stormwater from the new bridge surface and from other increases in impervious surface. The increase in dissolved copper is less under the Supplemental crossing (5%) than the Replacement crossing (20%). A net increase in dissolved copper is likely in Burnt Bridge Creek because of the increase in impervious surface in that basin. Runoff from additional impervious surface area could increase dissolved copper loads in Burnt Bridge Creek by 15% compared to the No-Build Alternative. Refer to the Water Quality Technical Report for more details.

Exhibit 5-10. Estimated Dissolved Copper Loads by Alternative (pounds/year)

	No Build	Replacement	Supplemental
Columbia Slough Basin	1.9	2.4	2.1
Columbia River Basin	1.6	0.6	0.8
Columbia Slope Basin	4.7	3.8	3.4
Burnt Bridge Creek	1.2	1.4	1.4
Total	**9.4**	**8.2**	**7.7**

5.2.4.2.2 Aquatic Species

Shading from bridge deck surfaces is a potential concern for aquatic species because piscivorous fish may use shade as cover and refugia during feeding. Large amounts of shade from the bridge deck may put native fish, including juvenile salmonids, at elevated risk of predation. The Supplemental crossing would have less bridge deck surface (202 feet wide) than the Replacement deck surface (250 feet wide). The shading effect from the bridge deck may be more pronounced in this alternative because the deck would be

lower than in the Replacement Alternative. See Section 5.2.2.1.2, Impacts Common to All Build Alternatives, for a discussion of additional impacts to aquatic species.

5.2.4.3 Terrestrial Resources

5.2.4.3.1 Terrestrial Habitat

A total of approximately 274 acres of locally and regionally designated habitats are anticipated to be impacted by the Supplemental crossing, an increase of approximately 56 acres over existing conditions (i.e., the No-Build Alternative) (Exhibit 5-11). See also Section 5.2.2.2, Impacts Common to All Build Alternatives.

Exhibit 5-11. Habitat Impacts for the Supplemental Alternative

	Supplemental
Washington Priority Habitats	41.0
Vancouver Critical Areas	85.4
Metro Goal 5	105.3
City of Portland E-Zones	42.0
Totals	**273.7**

5.2.4.3.2 Threatened, Endangered, Proposed, and Candidate Species

No terrestrial threatened, endangered, proposed, or candidate species would be affected under this alternative.

5.2.4.3.3 Species of Interest

In the long term, peregrine falcons would likely not be appreciably affected under this alternative because the structures of the bridge that they are known to use would remain in place.

In the long-term, migratory birds would not be appreciably affected under this alternative. Nesting and roosting habitat (i.e., the bridge structures themselves) would be present. No adverse long-term effects to non-listed species, including forage species, are anticipated under this alternative.

5.2.4.3.4 Wildlife Passage

Wildlife passage may be hindered compared to existing conditions. The existing shoreline provides minimal passage habitat in the form of open riprap and concrete. Piers for the additional bridges would likely impact one or both shores of the Columbia River, creating an obstruction to movement along the shoreline. Options for improving wildlife passage are limited.

5.3 Impacts from Segment-level Options

This section describes and compares the impacts in the primary API associated with specific highway alignment and interchange options and specific transit alignments and options. They are organized by Segment, including:

- Segment A: Delta Park to Mill Plain District
- Segment B: Mill Plain District to North Vancouver

For transit options, Segment A is divided into two sub-segments, each with a discrete set of transit choices:

- Sub-segment A1: Delta Park to South Vancouver
- Sub-segment A2: South Vancouver to Mill Plain District

Impacts from highway options are described separately from impacts from transit options. The purpose of this organization is to present the information according to the choices to be made. Where the traffic and transit choices would have a substantial effect on each other, this is considered.

5.3.1 Segment A: Delta Park to Mill Plain District – Highway Alternatives

5.3.1.1 No-Build

Impacts to ecosystem resources would be consistent with those discussed in 5.2.1, Impacts from the No-Build Alternative.

5.3.1.2 Replacement Crossing

Realigning Marine Drive south of the Expo Center would impact the Vanport wetland, which is a mitigation site owned and maintained by the Port of Portland. Construction would impact approximately 0.48 acre of wetland and 1.58 acres of E-zone. Two piers would be placed in the wetland, both approximately 10 feet in diameter, causing a direct impact of 0.003 acre. Long-term effects on vegetation (mature cottonwood trees) below the alignment in the Vanport and Expo Center wetlands cannot be quantified due to the preliminary design of this option. The diagonal realignment of Marine Drive would not impact the Vanport wetland or its associated E-zone, and would impact approximately the same area of the Expo Center wetland and its E-zone as the standard Marine Drive alignment.

Other impacts to ecosystem resources under the Replacement crossing option would be consistent with those discussed in Section 5.2.3 (Impacts from the Replacement Crossing).

5.3.1.3 Supplemental Crossing

The discussion in 5.3.1.2 above regarding the realignment of Marine Drive and the associated impacts to ecosystem resources also applies to the Supplemental crossing.

Other impacts to ecosystem resources would be consistent with those discussed in 5.2.4 (Impacts from the Supplemental crossing).

5.3.2 Segment B: Mill Plain District to North Vancouver - Highway Alternatives

5.3.2.1 No-Build Alternative

Impacts to ecosystem resources in this segment under the No-Build Alternative are consistent with those discussed in 5.2.1, Impacts from the No-Build Alternative.

5.3.2.2 Build Alternatives

Approximately two acres of riparian buffer at Burnt Bridge Creek are likely to be impacted under the Build Alternatives (see Exhibit 5-12). For the transit alignments, the I-5 terminus would have the largest footprint within the riparian buffer of all the alternatives. Stormwater will be treated but will drain to Burnt Bridge Creek under all the alternatives. Stormwater will be treated in wet ponds in Burnt Bridge Creek watershed, similar to what is available presently. Refer to Section 5.2, Impacts from Full Alternatives, for a discussion of stormwater impacts.

5.3.3 Segment A1: Delta Park to South Vancouver - Transit Alternatives

See Section 5 for a description of project impacts to ecosystem resources in Segment A. Differences in transit alternatives are not expected to have appreciable impacts to ecosystem resources.

5.3.4 Segment A2: South Vancouver to Mill Plain District - Transit Alternatives

See Section 5 for a description of project impacts to ecosystem resources in Segment A. No appreciable differences in impacts to ecosystem resources are anticipated under the various Segment A2 transit options.

5.3.5 Segment B: Mill Plain District to North Vancouver - Transit Alternatives

The I-5 transit alignment will impact the riparian buffer of Burnt Bridge Creek. No other appreciable differences in impacts to ecosystem resources are anticipated under the various Segment B transit alternatives.

5.3.6 Minimum Operable Segment

The Mill Plain and Clark College MOSs would avoid encroachment on the Burnt Bridge Creek riparian buffer, an impact associated with the I-5 transit alignment that terminates at Kiggins Bowl. No appreciable impacts to ecosystem resources are anticipated under the MOS.

5.3.7 Transit Maintenance Base Options

Bus rapid transit would require adding approximately one acre more of new paved surface at the Expo Center transit station. This could have an adverse effect on habitat and water quality in this area, compared to light rail.

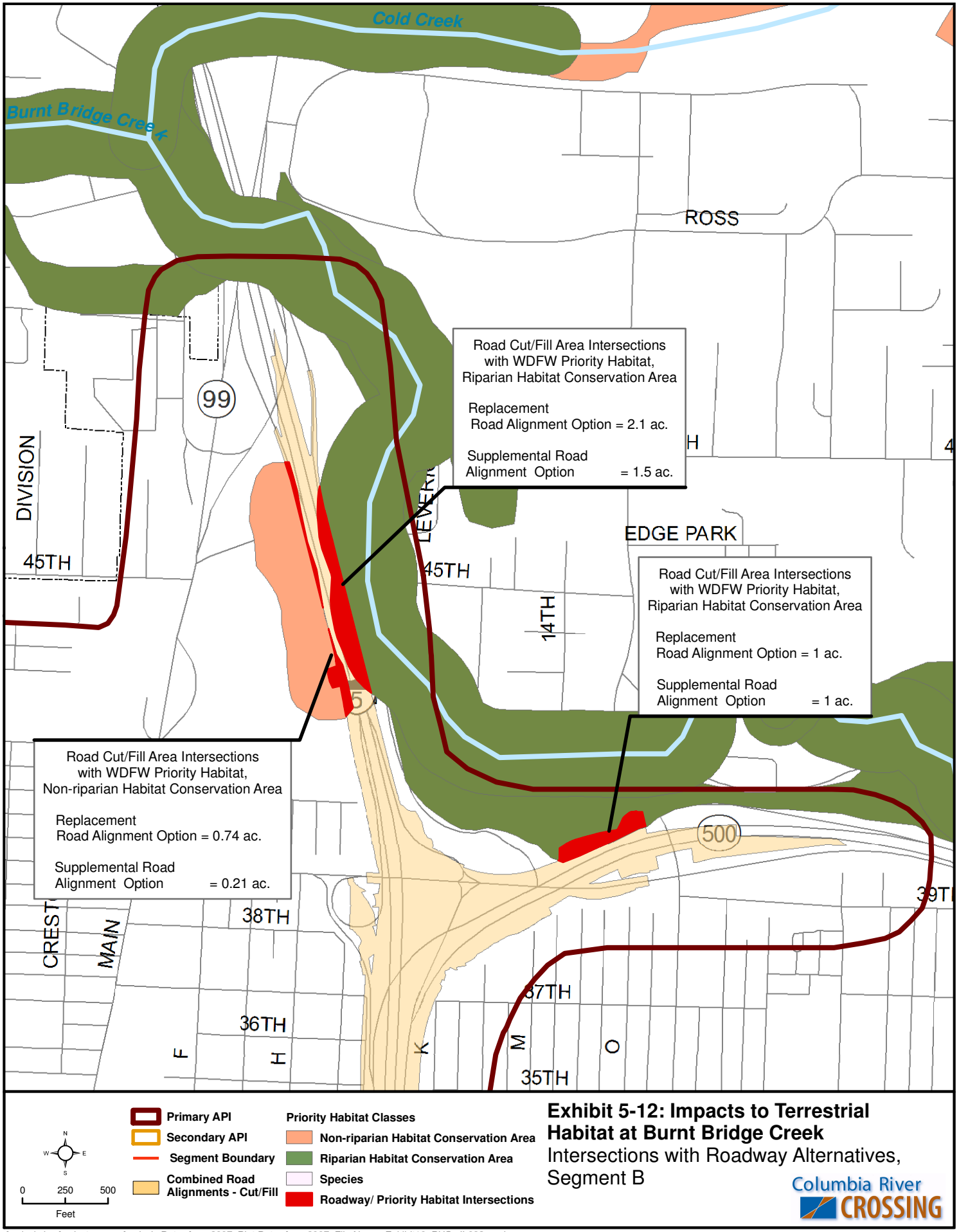


Exhibit 5-12: Impacts to Terrestrial Habitat at Burnt Bridge Creek
Intersections with Roadway Alternatives, Segment B

Columbia River CROSSING

Analysis by Analyst name; Analysis Date: Aug.-2007; Plot Date: Aug.-2007; File Name: Exhibit10_PHS_JL083.mxd

Bus rapid transit could potentially require expanding the C-TRAN bus maintenance facility in east Vancouver at 65th Avenue. Vegetative cover at this facility consists of residential/commercial lawn and trees, and agriculture. No threatened, endangered, or sensitive species or species of interest are known to occur in the area. Expansion of the facility would result in the removal of lawn, approximately 50 immature broadleaf trees, and approximately ten mature broadleaf trees. In addition, expansion would convert pervious surfaces to impervious, requiring integration of stormwater controls.

Likewise, light rail would require expansion of the existing Ruby Junction maintenance facility on NW Eleven Mile Avenue in Gresham. Vegetative cover at the Ruby Junction maintenance facility consists of developed land (no vegetation), with small portions of residential lawn and mature trees. No threatened, endangered, or sensitive species or species of interest likely occur in the area. Expansion of the facility would result in the removal of lawn and approximately two dozen conifers and broadleaf trees. In addition, the expansion would convert pervious surfaces to impervious, requiring integration of stormwater controls.

5.4 Impacts from System-Level Choices

5.4.1 River Crossing Type and Capacity: How does the Supplemental 8-lane crossing compare to the Replacement 10-lane crossing?

Both the Supplemental and Replacement crossings would impact aquatic habitats, listed fish, migratory birds, and riparian habitat. Exhibit 5-13 summarizes differences in impacts between these alternatives.

Exhibit 5-13. Summary Comparison of the Replacement and Supplemental Alternatives

	Replacement Crossing	Supplemental Crossing
Aquatic Resources		
Approximate total construction duration	4 years	5-6 years
Approximate in-water work duration	42 months	42 months
Aquatic Habitat		
Stormwater	Conveyance and treatment improved over existing conditions. Stormwater would be conveyed for the full surface of the new bridge deck.	Stormwater would be conveyed and treated on the new southbound bridge only. Existing bridge would continue to pass stormwater directly into the Columbia River untreated.
Additional impervious surface	43.7 acres	28.7 acres
Pollutant loading		
Columbia River	Pollutant loads would decrease in the Columbia River.	Pollutant loads would decrease in the Columbia River.

	Replacement Crossing	Supplemental Crossing
Columbia Slough	20% (0.5 lbs/yr) increase in dissolved copper. 16% (2.0 lbs/yr) increase in dissolved zinc. All other pollutants would decrease because of improved treatment.	5% (0.2 lbs/yr) increase in dissolved copper. 1% (0.1 lbs/yr) decrease in dissolved zinc. All other pollutants would decrease because of improved treatment.
Burnt Bridge Creek	15% (0.4 lbs/yr) increase in dissolved copper. 20% (1.9 lbs/yr) increase in zinc because of an increase in impervious surface draining to the basin.	15% (0.4 lbs/yr) increase in dissolved copper. 20% (1.8 lbs/yr) increase in zinc because of an increase in impervious surface draining to the basin.
Number of piers below OHW in the Columbia River	6	6 (plus 10 existing)
Number of piers below OHW in the North Portland Harbor	4	4
Number of piers in near-shore/shallow water habitat (<20 feet in depth)	2	3-4
Volume of concrete for new piers	114,000 square feet (2.62 acres) Displace 66,667 cubic yards of water	Existing and new combined: 127,000 square feet (2.93 acres) Displace 101,362 cubic yards of water
Width of total deck surface	250 feet	202 feet
Aquatic species	Listed fish and other native species subject to impacts to water quality, predation risk at bridge piers, and impacts to shallow water habitat important for migration, holding, and feeding.	Listed fish and other native species subject to impacts to water quality, predation risk at bridge piers, and impacts to shallow water habitat important for migration, holding, and feeding.
Fish passage	No passage barriers.	No passage barriers.
Terrestrial Resources		
Terrestrial habitat impacted	291.7 acres (an increase of 74.0 acres over existing)	273.7 acres (an increase of 56.1 acres over existing)
Terrestrial species	Habitat for migratory birds, including peregrine falcons, removed during demolition of existing structures. Nest boxes and other artificial habitat structures would be included in the new bridge design.	Existing habitat for migratory bird nesting and roosting would remain in place.
Wildlife passage	Passage would remain consistent with existing conditions—opportunities for wildlife passage limited by the urban setting.	Passage would remain consistent with existing conditions—opportunities for wildlife passage limited by the urban setting.
Botanical Resources		
Rare plants	No long-term impacts expected.	No long-term impacts expected.

5.4.2 Transit Mode: How does BRT compare to LRT?

Alternatives containing BRT transit options may have slightly more impacts to ecosystem resources because BRT transit options contain more impervious surface area than those containing LRT options. The BRT option may also affect dissolved copper loads in stormwater runoff. The pollutant loading to receiving waters from BRT is comparable to other road vehicles; however, LRT does not use a braking system that contains copper. Consequently, the reduction in use of personal vehicles and buses realized as a result of the LRT system may reduce copper loading. See Section 5.2.2.1 (Impacts Common to all

Build Alternatives) for a discussion of impervious surface and stormwater impacts. Refer to the Water Quality Technical Report for more information on BRT/LRT effects to impervious surface and stormwater.

5.4.3 Balance of Transit vs. Highway Investment: Increased Transit System Operations with Aggressive TDM/TSM Measures, and Efficient Transit System Operations with Standard TDM/TSM Measures

No appreciable differences in impacts to ecosystem resources are anticipated.

5.4.4 Major Transit Alignment: How does the Vancouver alignment compare to the I-5 alignment?

The I-5 alignment would have impacts to terrestrial resources at Burnt Bridge Creek, which is classified as a "sensitive" habitat under the Clark County Critical Areas Ordinance and as a Fish and Wildlife Habitat Conservation Area flanked by Priority Habitats and Species areas under the City of Vancouver's Critical Areas Protection Ordinance. The I-5 alignment would impact approximately two acres of the riparian buffer. The I-5 transit alignment would also involve a greater amount of impervious surface within the Burnt Bridge Creek watershed. The Vancouver alignment is not anticipated to impact ecosystems resources.

5.4.5 Tolling: How do the tolling options compare (no toll, standard or higher toll on I-5, toll on both I-5 and I-205)?

No appreciable differences in impacts to ecosystem resources are anticipated between the different tolling options.

5.4.6 Transit Project Length: How do the full-length alternatives compare to the shorter length option?

No appreciable differences in impacts to ecosystem resources are anticipated between the different transit project length options. See Section 5.4.4 above for reference to impacts to Burnt Bridge Creek under the transit alignments.

5.5 Indirect Effects

5.5.1 Traffic

A major goal of the CRC project is to address growing travel demand and traffic congestion along I-5 over the Columbia River and several miles of I-5 north and south of the crossing in the cities of Portland and Vancouver. Existing travel demand exceeds capacity on the I-5 bridge and the associated highway and local road interchanges (e.g., Martin Luther King Boulevard and Interstate Avenue in Portland, and Main Street and Columbia Street in Vancouver). Daily traffic demand over the I-5 bridge is projected to increase by 40% during the next 20 years. The addition of traffic lanes in the new configuration of the I-5 bridge may reduce congestion by increasing capacity, but may also attract additional vehicle trips to the highway, thus offsetting the congestion decrease.

5.5.2 Induced Growth

Indirect effects of specific transportation infrastructure improvements on urban growth patterns can be difficult to analyze independently of socioeconomic, policy, and land use issues that also influence urban growth (Litman 2005, Moore and Sanchez 2001). While transportation improvements in relatively rural areas may encourage growth, improvements to existing infrastructure in already developed urban areas are less likely to have a pronounced effect. Local comprehensive plans and overall economic conditions may have a more significant impact on land use and growth than capacity changes resulting from highway widening projects (Parsons Brinkerhoff 2001). Local planning policies, relative level of community affluence, public investment in utilities (water, sewer, electric service), and zoning also tend to strongly influence growth patterns (Moore and Sanchez 2001).

Urban growth in the CRC API, and growth in related sectors such as local transportation, utilities, and other infrastructure, is expected to be consistent with growth already planned for the Portland and Vancouver areas through urban growth boundaries (UGB), regional transportation plans (RTP), and other local and regional planning venues. The CRC project is not expected to encourage urban growth above and beyond already existing growth models for the region. Effects to ecosystem resources are therefore consistent with effects expected from planned urban growth in the Vancouver and Portland metropolitan areas.

Land use conversion as a result of current and planned future growth is considered the primary impact to fish and wildlife species (Clark County 2006). Growth patterns that convert land use from rural, forest, and agricultural uses to urban uses (e.g., growth patterns that allow expanded urban growth boundaries) are likely to result in the loss and fragmentation of fish and wildlife habitat. Wildlife passage corridors could be limited or eliminated by development. Human/wildlife conflicts could increase as displaced wildlife are attracted to anthropogenic sources of food such as domestic pets and pet food, bird feeders, and ornamental garden plantings. Wildlife requiring relatively large home ranges, such as medium to large mammals (deer, coyotes) would be displaced as food and shelter sources decline in the process of land use conversion. Migration patterns for small wildlife (e.g., amphibians and reptiles such as turtles and snakes) could be disrupted as habitat is converted. Land use conversion may also contribute to loss of habitat for birds migrating along the Pacific Flyway, reducing available habitat for resting and feeding during migrations. Impacts to wetlands resulting from planned urban growth include filling and draining to make land available for urban uses, which reduces functional and ecosystem value.

Growth patterns that encourage more compact development (e.g., are confined to existing urban growth boundaries) are less likely to lead to land use conversion; however, more stress is likely to be placed on habitat within urban areas as the intensity of development increases. Existing marginal wildlife habitat, such as wildlife passage along urban riparian corridors, would be further impacted by higher density redevelopment. Impacts from higher density development could also include additional impervious surface and more intensified human interference from noise and light (Clark County 2006).

Vancouver Area. Growth planning in the Vancouver area is described in the Final Environmental Impact Statement (FEIS) for the 20-year Comprehensive Growth Management Plan of Clark County, Battle Ground, Camas, La Center, Ridgefield, Vancouver, Washougal, and Yacolt (Clark County 2007). Assessing impacts to ecosystem resources as a result of planned urban growth can be addressed by identifying and assessing impacts to priority habitats within the Urban Growth Area (UGA). Approximately 102,372 acres are currently identified as priority habitat in Clark County. Under the Preferred Alternative outlined in the FEIS, the UGAs would be expanded by approximately 12,063 acres total; 2,362 acres of priority habitat would be added to the UGA for future urbanization, the majority of which is classified as riparian habitat (see Exhibit 5-14 below).

Exhibit 5-14. Acres of Priority Habitat Added to the Existing Urban Growth Areas (UGA) under the Preferred Alternative for the Comprehensive Growth Management Plan

	Existing UGA	Total Acreage Added by Habitat Type	Battle Ground UGA	Camas UGA	La Center UGA[a]	Ridgefield UGA	Vancouver UGA	Washougal UGA
Priority Habitat for Species	7,384	329	0	97	152	59	0	21
Non-riparian Habitat Conservation Area	2,256	230	2	143	5	9	70	1
Riparian Habitat Conservation Area	7,314	1,803	125	381	368	528	307	94
Total	**16,954**	**2,362**	**127**	**621**	**525**	**596**	**377**	**116**

Source: Clark County 2007

[a] Approximately 25% of the La Center UGA would be designated Parks/Open Space along the East Fork Lewis River.

Policies, programs, and regulations that currently provide protection for priority habitats and species (e.g., Clark County's Habitat Conservation Ordinance; Battle Ground, Camas, and Ridgefield's comprehensive plans; La Center's Environmental Goal #10 and critical area ordinance; Vancouver's comprehensive plan and critical area ordinance; and Washougal's Goal 5 Critical Areas) would remain in place under the proposed 20-year growth plan.

Listed species that are likely to be impacted by urban growth in the new UGAs include bald eagles (in the Salmon River/Lewis River area), purple martins (in part of Camas's expanded UGA), and reticulate sculpins (*Cottus perplexus*) (a state monitor species that has been identified in Lacamas Creek). Streams that are known to support listed fish (e.g., coho and Chinook salmon and steelhead) and that would be included in new UGAs include Gee Creek, Salmon Creek, Weaver Creek, East Fork Lewis River, and Whipple Creek.

Migration routes for terrestrial wildlife and migratory birds would likely be impacted by planned urban growth as natural habitat is converted to urban uses. Movement corridors for terrestrial wildlife would be restricted and/or eliminated. Urban development in the cities of Clark County would reduce the local quality for migratory birds; for example Camas's UGA would extend around Lacamas Lake, and Vancouver's UGA would extend close to Green Lake and near Shillapoo wildlife area, reducing habitat quality for migrating waterfowl. Mitigation for impacts to fish and wildlife habitat anticipated from planned growth will be addressed through critical area ordinances, stormwater management programs and regulations, erosion control regulations, tree protection ordinances, and a Clark County salmon recovery program approved by NMFS. Refer to the Land Use Technical Report for further detailed analysis of patterns in urban growth associated with the CRC project.

Portland Area. Metro, the regional government body that manages urban growth in the counties and cities that make up the greater Portland metropolitan area, has developed a 2040 Growth Concept to guide growth and development for the next 50 years. Growth management policies in the long-range plan include protection of forests, rivers, streams, and natural areas. The Nature in Neighborhoods program is the main planning tool for protecting ecosystem resources that are in or adjacent to future and planned urban areas through protecting habitat and water quality, and acquiring natural areas for parks and open space. Under Oregon's Statewide Planning Goals and Guidelines, Goal 5 requires local governments to adopt programs to protect natural resources, scenic and historic areas, and open spaces. Goal 5 includes planning and implementation guidelines that require development to be planned and directed to conserve open space and protect fish and wildlife habitat.

6. Temporary Effects

6.1 Introduction

Under both the Replacement and Supplemental alternatives, unavoidable impacts to ecosystem resources, particularly the Columbia River and North Portland Harbor, are likely to occur. Disturbance to migratory birds, potentially during nesting season, and modifications to nesting habitat are also likely to occur under all build alternatives.

Temporary effects to aquatic habitat and aquatic species are anticipated from in-water work. Depending on the alternative chosen, in-water work may include removing existing bridge piers, constructing new piers, and conducting seismic retrofitting. In-water work is likely to include coffer dams, barges, drilling equipment, and other construction vehicles in and near the water. In-water work will likely cause localized increases in turbidity and underwater noise impacts. Construction activities may cause injury or death to aquatic species.

Temporary effects to terrestrial species are anticipated from construction noise and impacts to vegetation. Construction activity causing noise disturbance could result in reduced nesting success for migratory birds. Trees, shrubs, and other vegetation serving as cover, nesting, roosting, and perching habitat may be removed during construction. Such vegetation removal could also impact terrestrial wildlife using such habitat structure for cover, feeding, breeding, and dispersal.

6.2 Regional and System-wide Impacts

The Columbia River is a major migratory route for twelve listed salmonid stocks, as well as for lamprey and sturgeon. Salmonids are present in the project area during adult migration upriver to spawn, and juvenile outmigration, holding, feeding, and rearing. Other native aquatic species, including minnows, dace, shiners, crustaceans, bivalves, and invertebrates also occur in the project area during various portions of their life cycles. Impacts to these species at all life stages could have substantial implications for survival and reproduction. Federally designated critical habitat is present within the primary API for seven salmonid species, and Essential Fish Habitat (EFH) is present for five salmonid species (see Section 4.3.1.2).

All build alternatives would temporarily affect aquatic habitat in the Columbia River for these species by placing physical obstacles in the water column (e.g., coffer dams and work barges) and locally disrupting currents, creating the potential for contaminants to enter the water from construction materials and vehicles, causing underwater noise via pile driving, and increasing turbidity levels. Habitat disturbance during critical life stages for salmonids and other native fish could cause reduced feeding success, delayed migration, avoidance of the work area, and direct injury or mortality.

The project area is located within the Pacific flyway, the major north-south route for migratory birds that extends from Patagonia to Alaska. Migratory birds are present in the project area year-round and use natural habitat as well as components of the built environment for resting, feeding, and breeding. Temporary effects to migratory birds could include disturbance during nesting and migration seasons. Construction noise and other activities could prevent birds from nesting in the project area. If disturbance occurred during active nesting season, birds could abandon nests or young. Construction activities should be timed to avoid disturbance to nesting birds (see Section 9, Mitigation for Temporary Impacts). Removal of vegetation during project work (e.g., clearing in the right-of-way for access) could also affect migratory birds by temporarily removing nesting, feeding, roosting, and/or perching habitat.

The Replacement crossing is estimated to take approximately four years to complete, while the Supplemental crossing is estimated to take approximately five to six years. In-water work would be approximately 42 months for each crossing, although spacing of the in-water work would differ between alternatives: the Replacement crossing would have approximately 3.5 years of consecutive in-water work, while the Supplemental crossing would have approximately an 18-month gap between in-water construction work periods. In-water work duration would therefore be similar between the alternatives, although the in-water work impacts would be consistent over the work period in the Replacement crossing, and more spread out over the work period in the Supplemental crossing.

6.3 Segment A: Delta Park to Mill Plain District

The bulk of temporary impacts to ecosystem resources are anticipated to occur in Segment A because a large portion of this segment is characterized by important natural habitat types (e.g., the Columbia River and the North Portland Harbor).

6.3.1 Impacts Common to All Alternatives

Impacts discussed below apply to both the Replacement and Supplemental alternatives. Differences in temporary impacts to aquatic and terrestrial resources among the build alternatives are minimal. Additional analysis on project impact to listed species will be conducted in a Section 7 ESA consultation with NMFS and USFWS when project details are more fully developed.

6.3.1.1 Aquatic Resources

In-water and surface activities to construct, deconstruct, and/or retrofit bridge structures is likely to result in impacts to water quality (e.g., contaminants and elevated turbidity), aquatic habitat, and fish species through noise impacts, physical alteration of habitat elements, and potential contaminant spills.

Surface activities for new construction may include tower crane installation, column construction, pier table construction, and superstructure erection. Surface activities for demolition may include lift tower and machinery removal, deck removal, truss falsework installation, and truss lowering.

The approved in-water work window for the Columbia River in the project area is November 1-February 28. In-water activities for new construction may include pile template float-in, pile driving, pilecap float-in, pilecap concrete placement, and cofferdam installation and removal. In-water activities for demolition may include cofferdam installation and removal, and pier removal. Construction activities will require use of barges and/or tugboats to maneuver and install equipment.

Aquatic species, including listed ESUs of Chinook, sockeye, coho, and chum, salmon, steelhead, coastal cutthroat, and bull trout, as well as Species of Concern (Pacific and river lamprey, green sturgeon) would be affected by construction activity in and over the Columbia River and the North Portland Harbor. Life stages that would be affected include migrating adult, outmigrating juvenile, and rearing salmonids and lamprey, and potentially juvenile green sturgeon. Disturbance from in-water work could cause delayed migration and limit reproductive success. Impacts to the prey base for native fish would likely be temporary and limited in scope. All build alternatives will have in-water noise impacts to fish from pile driving and pier construction. Migrating adult salmonids, as well as outmigrating and rearing juveniles, would pass through the primary API during in-water work and be subject to impacts discussed below.

Aquatic habitat. Shallow water aquatic habitat is likely to be impacted by construction work near the Oregon and Washington banks. Impacts to shallow water habitat would result from in-water construction activities described above (e.g., coffer dams, pilecap placement). Construction work to install and/or remove piers would cause localized disruption in river currents, physical barriers to movement, elevated sediment levels, change in distribution of invertebrates and other prey species, and general disturbance sufficient to deter aquatic species from utilizing the immediate work areas. Disturbance would occur in both shallow and deeper water habitats. Effects to aquatic habitat would be more pronounced in shallow areas with high habitat value; however, disturbance such as suspended sediment levels in deeper water could also affect shallow areas as currents carry suspended materials.

In-water disturbance resulting in fish avoidance of preferred feeding, holding, and migration areas could result in delayed outmigration of juvenile salmonids, causing juveniles to reach marine estuarine habitat later than normal and disrupting juvenile development. Adults migrating upriver could be harassed, potentially causing delayed migration timing and delayed spawning. Effects to salmonids during rearing could also include harassment and avoidance of the work area, potentially lethal injury, and direct mortality from noise impacts, turbidity, and reduced water quality. Installing and maintaining coffer dams will likely require fish salvage, causing stress, injury, and/or mortality of listed and non-listed fish.

Water quality. Water quality may be temporarily impacted within the API and possibly downstream by contaminant spills (oil, gasoline, work materials, and other pollutants) due to the presence of trucks, barges, and other construction vehicles in the project area. Accidental barge grounding could also occur, causing damage to riparian habitat, river substrate, and potential contaminant leaks. Elevated levels of contaminants in the Columbia River and the North Portland Harbor could impact salmonids and other native aquatic species, potentially causing lethal injury or developmental problems that could

compromise survival. Erosion and sediment could also occur from construction activities on the river banks.

Turbidity. In-water work will disturb the river bed and cause sand and fine sediments to be suspended in the water column, and may temporarily displace invertebrates in the water column. Turbidity may reduce sight distance and therefore the susceptibility to predation for young salmonids and other native fish; conversely, turbidity may also reduce foraging success. Elevated sediments may also cause physical abrasion of tissue (e.g., gills). The river bed within the project area consists primarily of sand, which would be expected to settle quickly once disturbed. Invertebrates could be displaced during in-water construction work, but would be expected to recolonize disturbed shallow water areas rapidly (NMFS 2002). Effects to salmonids and other native fish could therefore include physical injury to gill tissues and a short-term disruption in feeding opportunities within the project area.

Project scheduling details are not yet available to determine seasonal timing and levels of expected turbidity. Duration of construction, and timing and staging of activities, will influence the concentrations and the physical and temporal extents of turbidity levels. Overall timing and extent of impacts to the river bed are likely to be similar among the build alternatives. Project work must meet DEQ and Ecology standards to obtain water quality certifications.

Noise impacts. Direct injury and/or lethal effects to fish species could result from noise and vibration associated with pile driving and other in-water construction techniques. Impacts associated with pile driving may include physical injury (particularly to swim bladders), auditory tissue damage, hearing loss, behavioral effects, and immediate and delayed mortality. Severity of impacts associated with pile driving depends on several factors, including the amount of energy and the resulting sound pressure, size and type of pile, type of hammer, energy of the hammer, fish species, depth of the water column, and environmental setting (Popper et al. 2006). Use of bubble curtains around pile driving sites may reduce risk of noise impacts to fish. Design and implementation of this mitigation technique is under discussion with state and federal regulatory agencies.

6.3.1.2 Terrestrial Resources

Terrestrial habitat. Terrestrial habitat is likely to be temporarily impacted for construction access along highway right-of-way. Terrestrial habitat that will be impacted by project construction is likely to be of low quality for terrestrial wildlife because it is likely to be within existing highway right-of-way and/or degraded by proximity to existing urban development. Erosion could occur from construction activities. Appropriate avoidance and minimization methods (silt fencing, no-work zones, erosion control BMPs) would reduce potential impacts to the riparian areas. Riparian habitat along the Oregon and Washington banks of the Columbia River will be impacted by construction activities including any of the following: deconstruction of existing structures, construction of new bridge elements, access to work areas, workers on foot, vehicles, survey crews, and other related construction presence along the banks. Riparian vegetation, including herbaceous plants, shrubs, and small trees, may be trampled or removed. Because the condition of the riparian area is currently fairly degraded due to the

urban location, construction activities may further compromise riparian function and ability to provide habitat features for terrestrial species including mammals and migratory birds. Mitigation measures will address impacts to the riparian community and are likely to result in a net improvement in riparian function relative to current conditions. See Section 9 for mitigation measures to address temporary impacts to vegetation.

Migratory birds and Species of Interest. Terrestrial resources, such as migratory birds and other SOI, would be impacted under all build alternatives because construction activity would create noise disturbance and disruption of potential nesting and/or roosting habitat as the bridge structures are deconstructed or retrofitted. With the Replacement alternative, migratory bird nesting and roosting habitat (i.e., the structures of the existing bridge) would be permanently removed (see Section 5.2.3, Impacts from the Replacement Alternative). Construction activities conducted during nesting season could cause excessive disturbance through noise and physical displacement of bridge structures, resulting in nest failure and/or the need to remove active nests.

Although the existing bridge does not provide ideal roosting habitat for bats, several bat species that may pass under the existing bridge and use it for temporary roosting may be affected by construction disturbance. Short-term effects to raccoons, bats, reptiles, and other terrestrial wildlife could result from high levels of noise, clearing/alteration of vegetation, potential impacts to water quality, and other disturbances that could affect breeding, foraging, and dispersal.

6.3.1.3 Botanical Resources

Temporary impacts to vegetation are anticipated (see discussion above relevant to terrestrial habitat). No listed or otherwise rare plants are known to occur in the project area, and are therefore not expected to be impacted.

6.3.2 Impacts Unique to Transit Alternatives and Options

There are not anticipated to be temporary ecosystem impacts that are unique to specific transit alternatives or options in Segment A.

6.3.3 Impacts Unique to Highway Alternatives and Options

There are not anticipated to be temporary ecosystem impacts that are unique to specific highway alternatives or options in Segment A.

6.4 Segment B: Mill Plain District to North Vancouver

Segment B is characterized primarily by urban development, and therefore does not currently contain a substantial amount of intact natural habitat or other ecosystem resources. Therefore, few temporary impacts to ecosystem resources are anticipated in this segment.

6.4.1 Impacts Common to All Alternatives

6.4.1.1 Aquatic Resources

Impacts to Burnt Bridge Creek are expected to be long-term. See Sections 5.2.3, Replacement Crossing and 5.2.4, Supplemental Crossing.

6.4.1.2 Terrestrial Resources

Terrestrial habitat. Terrestrial habitat is likely to be temporarily impacted for construction access along highway right-of-way. Riparian areas may also be temporarily impacted through vegetation removal. Trees, shrubs, and herbaceous vegetation that serve as food, cover, and breeding habitat for terrestrial species may be cut back or removed. These areas will be replanted after project completion. Terrestrial habitat that will be impacted by project construction is likely to be of low quality for terrestrial wildlife because it is likely to be within existing highway right-of-way and/or degraded by proximity to existing urban development. Erosion could occur in and near the riparian buffer to Burnt Bridge Creek. Appropriate avoidance and minimization methods (silt fencing, no-work zones, erosion control BMPs) would reduce potential impacts to the riparian areas. See Section 9 for mitigation measures to address temporary impacts to vegetation.

Migratory birds and Species of Interest. Terrestrial resources, such as migratory birds and other SOI, would be impacted under all build alternatives because construction activity would create noise disturbance and disruption of potential nesting and/or roosting habitat. Construction activities conducted during nesting season could cause excessive disturbance through noise and physical removal of habitat (e.g., trees, shrubs and herbaceous vegetation), resulting in nest failure and/or the need to remove active nests.

Short-term effects to raccoons, bats, reptiles, and other terrestrial wildlife could result from high levels of noise, clearing/alteration of vegetation, potential impacts to water quality, and other disturbances that could affect breeding, foraging, and dispersal.

6.4.1.3 Botanical Resources

Temporary impacts to vegetation are anticipated (see discussion above relevant to terrestrial habitat). No listed or otherwise rare plants are known to occur in the project area, and are therefore not expected to be impacted.

6.4.2 Impacts Unique to Transit Alternatives and Options

.No temporary ecosystem impacts specific to transit options or alternatives are expected in Segment B. Long-term impacts to the riparian buffer at Burnt Bridge Creek are possible with the I-5 major transit alignment (see Sections 5.2.3, Replacement Crossing and 5.2.4, Supplemental Crossing).

6.4.3 Impacts Unique to Highway Alternatives and Options

There are not anticipated to be any ecosystem impacts that are unique to specific highway alternatives or options in Segment B.

7. Mitigation for Long-Term Effects

7.1 Introduction

Mitigation for impacts to aquatic, terrestrial, and botanical resources may include best management practices (BMPs), conservation measures, and avoidance and minimization measures. Recovery plans for listed species will be reviewed to determine if conservation measures could be implemented to support management recommendations and recovery efforts. Standard construction BMPs and conservation measures would be implemented in the build alternatives to avoid or minimize impacts to ecosystem resources from construction activities. Both WSDOT and ODOT utilize standard specifications and special provisions to direct contractors to avoid and minimize impacts. In addition, standard terms and conditions of approvals from regulatory agencies have been incorporated into the preliminary designs analyzed in this document. Enhancement opportunities as part of the project will be explored in detail after the locally preferred alternative has been identified. Discussions with agencies from both states and the federal government are ongoing to determine appropriate mitigation measures.

7.2 Mitigation Common to All Build Alternatives

Aquatic Resources. Impacts to listed salmonids must be addressed through avoidance and minimization measures. All Build Alternatives would impact listed fish species through the presence of large piers in the river that could provide habitat for piscivorous fish, affect local flow patterns, and impact streambed conditions through sediment deposition and bank scour. Potential measures to address these impacts include discouraging piscivorous fish and other predator use of piers, promoting aquatic habitat conservation efforts, and ensuring adherence to water quality standards. Riparian fringe habitat may also be altered during construction and as a result of new bridge design. Revegetation of riparian areas and limited use of riprap will be employed to limit long-term effects. Bio-engineered bank protection may also be considered to address impacts to riparian areas and vegetation. A Hydraulic Project Approval (HPA) will be required by WDFW, under which mitigation actions may be necessary for construction activities that will affect fish and shellfish habitat in the form of the flow and bed of state waters (see Section 10).

Impact avoidance and minimization are also addressed through project design alternatives that were considered but not advanced due to impacts to ecosystem and other resources. Certain design alternatives have also been modified to reduce impacts to resources. Examples of design alternatives that were not advanced include a dug tunnel between Vancouver and Portland; significant damming of the Columbia River during project implementation; and placement of a park and ride facility on Cold Canyon. Examples of design alternatives that have been modified include minimization of piers in the river, and avoiding Vanport wetlands and the Delta Park area.

Terrestrial Resources. In general, long-term impacts to terrestrial resources are fairly minimal and would not require extensive mitigation. Long-term impacts to terrestrial resources will be addressed through avoidance and minimization measures, replanting vegetation, and addressing habitat modification for migratory birds, particularly for peregrine falcons. Habitat for peregrine falcons on the existing bridge structures would be removed if a Replacement bridge alternative is chosen. Peregrine falcons exhibit high site fidelity and are likely to return to the bridge in successive years to utilize the structures for various life stages. Installing nesting boxes and/or platforms on the new bridge to offset loss of the existing bridge structure could address long-term effects to peregrine falcon habitat. Discussions with state and federal natural resource agencies are ongoing regarding the design and implementation of artificial habitat, and the level of mitigation required for impacts to peregrine falcon habitat.

Native migratory birds (e.g., swallows) are not known to consistently utilize the existing bridge structures for nesting or other life stages. Impacts to migratory bird habitat are addressed under mitigation for temporary effects (see Section 9). Current habitat conditions for migratory birds in the project area, especially along the river banks, are fairly poor and are dominated by urban built environment, with ornamental shrubs and trees providing habitat structure. Opportunities to replant riparian vegetation and to incorporate shrub and tree plantings with improved habitat structure in the project area to improve natural habitat conditions will be identified through ongoing discussions with the regulatory agencies.

Bats have not been documented to use the existing bridge structures for roosting or maternal colonies; however, the new bridge design could accommodate potential bat roosting use of the bridges through installation of bat boxes, designing roughened surfaces, and other methods. Discussions with state and federal natural resource agencies are ongoing regarding the style of and need for incorporating bat habitat into bridge design.

Riparian habitat in the project area on both the Oregon and Washington banks is fairly degraded and provides limited habitat for terrestrial wildlife for passage, cover, breeding, feeding, and dispersal. To address the current condition of much of the riparian vegetative community in the project area, as well as the impacts to riparian vegetation from project construction, opportunities to incorporate the improvement of riparian function and habitat, either on-site or off-site within the basin, will be addressed through ongoing discussions with the regulatory agencies.

Impacts to wildlife passage will be addressed through avoidance and minimization. Placement of new structures or replacement of existing structures along the I-5 alignment creates obstructions to movement of wildlife. This is particularly true along riparian zones. Movement of piers and other structures away from streambanks will be addressed to the extent possible during the design phase. Although little intact riparian habitat suitable for passage is currently present along the Columbia River and North Portland Harbor, placement of obstructions would create an additional passage obstacle for several decades, thereby limiting potential future connectivity projects. Efforts to improve riparian conditions through replanting riparian vegetation will be considered and discussed with the regulatory agencies.

Impacts to wetlands as a result of project work may occur in Segment A; impacts to potential jurisdictional waters may occur in Segment B. Wetlands would be impacted by the placement of a new I-5 Southbound on-ramp from North Marine Drive, and by the BRT Hayden Island alignment. Compensatory mitigation for these impacts could require the creation of new wetlands or restoration or enhancement of existing wetlands in the same watershed. Potential mitigation sites will be identified after the selection of a locally preferred alternative, but acquired properties may provide suitable conditions for establishing a mitigation site. Discussions with state and federal natural resource agencies are ongoing regarding wetland mitigation.

Stormwater treatment will be done for potential stormwater impacts and will address mitigation requirements to some extent. Additional long-term mitigation measures will be discussed with regulatory agencies and project sponsors during ESA consultation procedures.

Botanical Resources. No long-term impacts requiring mitigation are anticipated for botanical resources. No sensitive, listed, or otherwise rare plant species are known to occur in the API. Vegetation removal, including riparian vegetation, will be temporary and these areas will be replanted (see Section 8).

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8. Mitigation for Temporary Effects

8.1 Introduction

Mitigation for impacts to aquatic, terrestrial, and botanical resources will include best management practices (BMPs), conservation measures, and avoidance and minimization measures. Standard construction BMPs and conservation measures would be implemented in the Build Alternatives to avoid impacts to ecosystem resources from construction activities. Enhancement opportunities will be explored in detail after the locally preferred alternative has been identified. Discussions with agencies from state and federal regulatory agencies are ongoing to determine appropriate mitigation measures.

8.2 Mitigation Common to All Build Alternatives

Aquatic Resources. All build alternatives would impact listed fish species through in-water work that could result in increased turbidity and suspended sediments, underwater noise, temporary localized dewatering, and potential contaminant spills. Avoidance and minimization measures to address these impacts would apply to all phases of construction. Impact avoidance would be addressed to the extent possible by redesigning project components with adverse impacts. Impact minimization would be addressed by implementing BMPs (e.g., sediment and erosion control, no-work zones, appropriate flagging and fencing), timing in-water work to occur outside of critical fish migration seasons, using coffer dams around in-water work sites, and using confined bubble curtains and bubble trees around pile driving and other activities that may cause adverse impacts from noise. Measures to minimize turbidity would be implemented any time that work on the streambed occurs. Monitoring will likely be required to assess impacts to fish from in-water work.

Terrestrial Resources. All build alternatives will impact terrestrial resources, such as migratory birds and species of interest, through noise impacts and removal or degradation of habitat. Mitigation measures to address these impacts include impact avoidance and impact minimization. Impact avoidance would be addressed through timing vegetation removal to occur outside of nesting season for migratory birds. Demolition of existing structures, if necessary, would also be scheduled outside of nesting seasons (i.e., July-December) for peregrine falcons and other migratory birds to avoid direct impacts to active nests. Nesting platforms or boxes could be installed on new structures to replace lost nesting habitat if the existing bridge is removed.

Impact minimization will be addressed by implementing BMPs for erosion and sediment control to protect riparian buffers and sensitive terrestrial habitats (e.g., for riparian species such as pond turtles), appropriate flagging and signing, and other relevant conservation measures. Canada geese and swallows are known to nest on the concrete piers but are not expected on steel structure portions of the bridge. The I-5 bridge could be inspected at least one full year prior to commencement of construction activities to

determine whether any SOI or migratory birds are using the bridge for nesting or roosting. If such species are present, exclusionary devices may be installed on the bridge during the non-nesting season to prevent the bridge from being used for nesting or roosting when construction activities begin. If high disturbance activities must take place during nesting season, the CRC project team would coordinate with USFWS, ODFW, and WDFW to establish work buffer zones around the nest during nesting season. Monitoring will likely be required to assess impacts to peregrine falcons and other migratory birds.

To address temporary loss of riparian vegetation resulting from project impacts, mitigation measures could include streambank revegetation and reshaping to restore habitat function, removal of noxious weeds in certain areas, and revegetation of disturbed areas with native species.

Botanical Resources. No sensitive, listed, or otherwise rare plant species are known to occur in the API. Vegetation removal, including riparian vegetation, is addressed above (see Terrestrial Resources).

9. Permits and Approvals

9.1 Federal

Work associated with this project will be subject to the following federal regulations relevant to protecting fish, wildlife, and their habitat:

- Endangered Species Act. 1973. 16 USC 1531-1544, as amended.
- Migratory Bird Treaty Act. 1936. 16 USC 703-712, as amended.
- Bald and Golden Eagle Protection Act. 1940. 16 USC 668a-d, as amended.
- Magnuson-Stevens Fishery Conservation Management Act. 1976. Public Law 94-265, as amended.
- Marine Mammal Protection Act (MMPA). Title I. 1972. 16 USC 1361-1389, 16 USC 1401-1407, 1411-1417, and 1421-1421h, as amended.
- Clean Water Act. 1977. 33 USC 1251-1376, as amended.

9.1.1 Endangered Species Act

The Endangered Species Act (ESA) prohibits the incidental take of any federally listed species. Take is defined in the law to include harass and harm; harm is further defined to include any act which actually kills or injures federally listed species, including acts that may modify or degrade habitat in a way that significantly impairs essential behavioral patterns of the species. Under Section 7 of the ESA, any federal agency that permits, funds, carries out, or otherwise authorizes an action is required to ensure that the action will not jeopardize the continued existence of listed species or result in the destruction or adverse modification of designated critical habitat.

An incidental take permit, obtained through a formal Section 7 consultation with NMFS and/or USFWS, will be required if there is potential for the project to adversely impact federally listed species or their critical habitat. Informal consultations occur for projects that result in a "not likely to adversely affect" determination; formal consultations occur for projects that are "likely to adversely affect" listed species.

9.1.2 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) regulates the unauthorized taking of migratory bird eggs, young, or adults. Under the MBTA, a permit is required from USFWS if nests of migratory birds are destroyed during the breeding season. The breeding season in the project area is approximately March through August, although some birds may breed outside this period. Taking the necessary steps to deter nesting, if possible, in order to preclude the need for a permit to remove active nests and/or eggs is generally preferable to obtaining a permit.

9.1.3 Bald and Golden Eagle Protection Act

Administered by the USFWS, this law provides for the protection of the bald eagle (*Haliaeetus leucocephalus*) and the golden eagle (*Aquila chrysaetos*) by prohibiting, except under certain specified conditions, the taking, possession and commerce of such birds. Golden eagles are not likely to occur within the APIs.

Bald eagles, now delisted, are primarily protected under the Bald and Golden Eagle Protection Act (BGEPA). The BGEPA prohibits unregulated take and makes it illegal to kill, wound, pursue, shoot, shoot at, poison, capture, trap, collect, molest or disturb bald or golden eagles. If disturbance will occur in potential violation of the act, a permit to authorize take of eagles is required. This permit authorizes incidental take of bald and golden eagles, as well as incidental take of bald eagles that complies with the terms and conditions of a previously granted Section 7 incidental take statement. Projects permitted under the BGEPA do not need a permit under the MBTA.

9.1.4 Magnuson-Stevens Fishery Conservation Management Act

The Magnuson-Stevens Act (MSFCMA) affords protection to Essential Fish Habitat (EFH), which may include streams, lakes, ponds, wetlands, other currently viable water bodies, and most of the habitat historically accessible to salmon. Under MSFCMA, NMFS is required to provide EFH conservation and enhancement recommendations to federal and state agencies for actions that adversely affect EFH. Consultation with NMFS on effects to EFH will occur in conjunction with a Section 7 ESA consultation.

9.1.5 Marine Mammal Protection Act

The Marine Mammal Protection Act (MMPA) is administered by NMFS and provides for the protection of marine mammals by prohibiting, except under certain specified conditions, the taking, possession, and commercial use of such mammals. Under the MMPA, “take” includes to harass, hunt, capture, or kill, or attempt to harass, hunt, capture or kill any marine mammal. Previous analysis of the impact area suggests that marine mammals do utilize this portion of the Columbia River. No specific permit is issued under MMPA; however, impacts to listed marine mammals would be covered under an ESA Section 7 incidental take permit.

9.1.6 Clean Water Act

Impacts to jurisdictional wetlands or other waters will require a Section 404 permit from the U.S. Army Corps of Engineers (USACE). For activities that may result in discharge to waters of the state or U.S., Section 401 of the CWA requires certification that the project will comply with water quality requirements and standards. Dredging, filling, and other activities that alter a waterway require a Section 404 permit and Section 401 certification. The appropriate state agency must also certify that the project meets state water quality standards and does not endanger waters of the state or U.S. or wetlands. Certifications are issued by DEQ in Oregon and by Ecology in Washington.

9.2 State

9.2.1 Oregon

Work on the Columbia River Crossing will be subject to the following Oregon state regulations relevant to protecting fish, wildlife, and their habitat:

- Oregon Endangered Species Act. 2003. Oregon Revised Statutes (ORS) 496.171-192 and Oregon Administrative Rule (OAR) 635-100. Salem, OR.
- Fish Passage; Fishways; Screen Devices; Hatcheries Near Dams. 2001. ORS 509.580-910 and OAR 635-412-0005 to 0040. Salem, OR.
- Goal 5: Natural Resources, Scenic and Historic Areas, and Open Spaces. 1973. OAR 660-15-0000 (5). Salem, OR.
- Oregon's Removal-Fill Law. 2002. ORS 196.800 to 990 and ORS 196.600 to 692. Issuance and Enforcement of Removal-Fill Authorizations, OAR 141-085-0005 to 141-089-0615 and Water Quality Standards, 340-041. Salem, OR.

9.2.1.1 Oregon Endangered Species Act

The Oregon ESA applies to actions of state agencies on state-owned or leased lands. In general, the Oregon ESA is much more limited in scope than the federal ESA. The ODFW is responsible for fish and wildlife protected under the Oregon ESA, and the Oregon Department of Agriculture (ODA) is responsible for plants. The ODFW or ODA may issue a permit to any person for the incidental take of a state-listed threatened or endangered species if it determines that such take will not adversely impact the long-term conservation of the species or its habitat. The department may issue the permit under such terms, conditions and time periods necessary to minimize the impact on the species or its habitat. An incidental take permit may be issued for individuals of more than one state-listed species. An incidental take permit for state-listed species not covered under the federal ESA may be required from ODFW or ODA.

9.2.1.2 Fish Passage; Fishways; Screen Devices; Hatcheries Near Dams

Oregon's fish passage law has several triggers that initiate compliance requirements. All new culverts, bridges, and dams must meet the current ODFW guidelines for fish passage. If passage is not possible, the law allows for waivers or exemptions to be approved by the ODFW fish passage coordinator or the Oregon Fish and Wildlife Commission, depending on the amount of habitat that will be removed from fish usage. Waivers allow for fish passage to be accomplished off-site, but still within the watershed if a net benefit to fish is shown. Exemptions allow the applicant not to provide passage at the specific site, but passage could be required in the future if watershed conditions change. If the I-5 CRC project does not meet ODFW guidelines for fish passage, a waiver or exemption will be required.

9.2.1.3 Goal 5: Natural Resources, Scenic and Historic Areas, and Open Spaces

Goal 5 requires local governments in Oregon to protect natural resources and conserve scenic and historic areas and open spaces by adopting programs to protect these resources. Permitting may be required through local government Goal 5 ordinances. Goal 5 planning related to ecosystem resources within the I-5 CRC project includes the following:

- Fish and wildlife areas and habitats should be protected and managed in accordance with the Oregon Fish and Wildlife Commission's fish and wildlife management plans.
- Stream flow and water levels should be protected and managed at a level adequate for fish, wildlife, pollution abatement, recreation, aesthetics and agriculture.
- Significant natural areas that are historically, ecologically or scientifically unique, outstanding or important, including those identified by the State Natural Area Preserves Advisory Committee, should be inventoried and evaluated.
- Plans should provide for the preservation of natural areas consistent with an inventory of scientific, educational, ecological, and recreational needs for significant natural areas.

9.2.1.4 Oregon's Removal-Fill Law

Impacts to jurisdictional wetlands or other waters of the state (e.g., fill or removal activities below the bankfull stage or the line of non-aquatic vegetation, whichever is higher) require a removal-fill permit from Oregon Department of State Lands (DSL). This permit would typically be obtained in conjunction with a federal Section 404 permit (see Section 11.1.6) via a joint permit application for impacts to wetlands and jurisdictional waters; a wetland delineation and conceptual mitigation plan would also be required.

9.2.1.5 Wildlife Policy

It is the policy of the State of Oregon that wildlife shall be managed to prevent serious depletion of any indigenous species. An in-water blasting permit is required from ODFW if the project alternatives include in-water blasting. This permit is required if explosives are used when removing any obstruction in any waters of this state, in constructing any foundations for dams, bridges or other structures, or in carrying on any trade or business. ODFW issues in-water blasting permits only if they contain conditions for preventing injury to fish and wildlife and their habitat. An application for an in-water blasting permit must be submitted to ODFW no less than 90 days before the anticipated in-water blasting for a major project, and no less than 30 days before the anticipated in-water blasting for a minor project. The application must include information on fish and wildlife habitat within the area that would be affected by the proposed blasting; the predicted effects of the proposed blasting on these habitats; the predicted effects of the proposed blasting on beds and banks of the waters of the state, adjacent areas of the riparian vegetation and wetlands; the potential for dewatering waters of the state as a result of substrate disturbance; information on fish and wildlife species in the area that would be affected by

the proposed blasting (including age class) and the predicted effects of the proposed blasting on these species; and any existing environmental assessments, environmental impact statements, or other environmental data pertaining to the project.

9.2.2 Washington

Work on the Columbia River Crossing will be subject to the following Washington state regulations relevant to protecting fish, wildlife, and their habitat:

- State Environmental Protection Act (SEPA). 1971. Revised Code of Washington (RCW) 43.21C, and Washington Administrative Code (WAC) 197-11 and WAC 468-12. Olympia, WA.
- Habitat buffer zones for bald eagles. 1984. RCW 77.12.655. Bald eagle protection rules. 1986. WAC 232-12-292. Olympia, WA.
- Shoreline Management Act of 1971. 1971. RCW 90.58, WAC 173-18-100 and WAC 173-22. Olympia, WA.
- Hydraulic Code. 1949. Chapter 77.55 RCW. Olympia, WA.
- Fishways, flow, and screening. 1949. RCW 77.57, as amended. Olympia, WA.
- Clean Water Act certification

9.2.2.1 State Environmental Protection Act (SEPA)

SEPA requires all governmental agencies to consider the environmental impacts of a proposed action before making decisions. An environmental impact statement (EIS) must be prepared for all proposals with probable significant adverse impacts on the quality of the environment. State and local agencies may approve an EIS prepared under NEPA to fulfill the SEPA evaluation requirement.

9.2.2.2 Habitat Buffer Zones for Bald Eagles

Government agencies must notify the WDFW if a landowner is applying for a permit for a land-use activity that involves land containing or adjacent to an eagle nest or communal roost site. WDFW will determine whether the proposed activity would adversely affect bald eagle nests or communal roosts sites; if so, a site management plan is required.

9.2.2.3 Shoreline Management Act of 1971

Under the Shoreline Management Act (SMA), each city and county is required to adopt a shoreline master program that is based on state guidelines and that may be tailored to the specific geographic, economic, and environmental needs of the community. A permit will be required from the City of Vancouver for project activities occurring along the shoreline of the Columbia River or Burnt Bridge Creek.

9.2.2.4 Hydraulic Code

The Hydraulic Code is intended to ensure that required construction activities are performed in a manner to prevent damage to the state's fish, shellfish, and their habitat.

An Hydraulic Permit Approval (HPA) from WDFW will be required for work occurring within waters of the state (defined as all salt and fresh waters waterward of the ordinary high water line and within the territorial boundary of the state).

9.2.2.5 Fishways, Flow, and Screening

Washington's fish passage regulations describe requirements for fish screens or bypasses when a lake, river, or stream containing game fish will be diverted, and for fishways, if an obstruction will be placed in a stream. An HPA will be required (see Hydraulic Code above), and a permit from Ecology will be required if water is diverted.

9.2.2.6 Clean Water Act Certification

This certification would typically be obtained from Ecology in conjunction with a federal Section 404 permit and a 401 certification (see Section 11.1.6) via a joint permit application for impacts to wetlands and jurisdictional waters; a wetland delineation and conceptual mitigation plan would also be required.

9.3 Local

9.3.1 Oregon

Work on the Columbia River Crossing will be subject to the following Oregon local regulations relevant to protecting fish, wildlife, and their habitat:

- Environmental Zones. 1994. City of Portland Code (CPC) 33.430, as amended. Portland, OR.
- Tree Cutting. 2002. CPC 20.42. Portland, OR.

9.3.1.1 Environmental Zones

Permits are required for development or disturbance within environmental zones.

The environmental zones provide for fish habitat protection through the designation of environmental protection or conservation zones. Development and/or disturbances within these zones must be at least 50 feet from the boundary of any wetland. Development within these zones requires a permit application and additional information. Natural resource management plans (NRMPs) may be developed and approved, and may contain regulations that supersede or supplement the environmental zone regulations. These regulations will apply when a building permit or development permit application is requested within the resource area of the environmental conservation zone and is subject to the Development Standards of Section 33.430.110-170. These regulations do not apply to building or development permit applications for development that has been approved through environmental review. Environmental review is overseen by the City of Portland Land Use Review process.

9.3.1.2 Tree Cutting

A permit to cut trees on private or public property within the APIs may be required from the City of Portland. Urban Forestry also regulates the cutting and planting of trees on public property, including street trees located on the public right-of-way. Permits are required to plant, prune, remove, or cut the roots of any tree located on public property.

9.3.2 Washington

Work on the Columbia River Crossing will be subject to the following Washington local regulations relevant to protecting fish, wildlife, and their habitat:

- Critical Areas Protection Ordinance. 2005. City of Vancouver - Vancouver Municipal Code (VMC) 20.740; Fish and Wildlife Habitat Conservation Areas. 2005. VMC 20.740.110. Vancouver, WA.
- Shoreline Management Area. 2005. VMC 20.760. Vancouver, WA.
- Critical Areas and Shorelines. 2005. Clark County Code. Title 40.4. Vancouver, WA.
- SEPA Regulations. 2004. VMC 20.790.
- Street Trees. VMC 12.04; and Tree Conservation. VMC 20.770. Vancouver, WA.
- Water Resources Protection, VMC 14.26

9.3.2.1 Critical Areas Protection Ordinance (City of Vancouver)

The CAO applies to habitat for any life stage of state or federally designated endangered, threatened, or sensitive fish or wildlife species, priority habitats and habitats of local importance, riparian management areas and riparian buffers, and water bodies. Critical Areas Protection also regulates development in the floodplain and in erosion hazard areas, both of which occur in the project's primary and secondary APIs. A critical areas report will be required as part of the submittal for a Critical Areas Permit, which is required for project activities occurring on properties containing critical areas or buffers. A Critical Areas Report for a riparian management area or riparian buffer must include an evaluation of habitat functions using the Clark County Habitat Conservation Ordinance Riparian Habitat Field Rating Form or another habitat evaluation tool approved by the WDFW.

9.3.2.2 Shoreline Management (City of Vancouver)

A Substantial Development Permit will be required for project activities occurring within areas regulated by the Shoreline Management Master Program (see discussion above in the Washington state section).

9.3.2.3 Critical Areas and Shorelines (Clark County)

Clark County has designated Critical Areas in accordance with the Growth Management Act (GMA). A permit may be required if the project occurs in habitat conservation areas, wetlands protected by Clark County Code, or along unincorporated Clark County shorelines.

9.3.2.4 State Environmental Protection Act (SEPA)

The NEPA EIS will be submitted to state and local agencies who may adopt the NEPA EIS to fulfill SEPA requirements (see discussion above in the Washington state section).

9.3.2.5 Street Trees

Street Trees and Tree Conservation municipal codes require permits if the project alternative results in the cutting of trees on public or private property. There are two kinds of permits required for trees in the City: one for street trees and one for private trees. If the tree is in the public right-of-way, a street tree permit is required.

9.4 Regional and Local Resource Protection

9.4.1 Washington

Priority Habitats: The Washington Department of Fish and Wildlife (WDFW) has established priority habitat areas within the state. Priority habitats are those habitats with "unique or significant value to a variety of different species" (WDFW 2006), and may consist of a unique vegetation type or dominant plant species, a described successional stage, or a specific structural element. Washington has identified 18 priority habitat types. Within the primary API, established priority habitats include Riparian, Urban Natural Open Space, and Oak Woodland. These priority habitats were not field-verified during the September 2005 surveys.

Riparian: Riparian habitats are those areas adjacent to aquatic systems with flowing water that contain elements of both aquatic and terrestrial ecosystems that mutually influence each other. In riparian systems, perennial or intermittent water bodies influence the vegetation, water tables, soils, microclimate, and wildlife of terrestrial ecosystems. The biological and physical properties of the aquatic ecosystems are influenced by adjacent vegetation, nutrient and sediment loading, terrestrial wildlife, and organic and inorganic debris. Riparian habitats begin at the OHW and extend to the portion of the terrestrial landscape influenced by, or directly influencing, the aquatic ecosystem. Riparian habitat includes the entire extent of the floodplain and riparian areas of wetlands directly connected to stream courses (WDFW 2006).

The criteria used by WDFW for establishing priority riparian habitats include high fish and wildlife density, high fish and wildlife species diversity, important fish and wildlife breeding habitat, important wildlife seasonal ranges, important fish and wildlife movement corridors, high vulnerability to habitat alteration, and unique or dependent species (WDFW 2006).

Urban Natural Open Space: Urban Natural Open Spaces are isolated remnants of natural habitat larger than 4 hectares (ha) (10 acres [ac]) and surrounded by urban development, although local considerations may be given to smaller open space areas (WDFW 2006). Natural open spaces in urban areas are priority habitat due to the limited amount of such habitat. One or more priority species may reside within or adjacent to the open space and

use it for breeding and/or feeding or the open space may function as a corridor connecting other priority habitats, especially those that would otherwise be isolated.

Oak Woodland: Oak Woodland priority habitats are those habitats with stands of pure oak or oak/conifer associations where canopy coverage of the oak component of the stand is at least 25 percent, or where total canopy coverage of the stand is less than 25 percent but where oak accounts for 50 percent or more of the canopy coverage present (oak savannah). In urban areas, single oaks or stands less than 0.4 ha (1 ac) are considered a priority when valuable to fish and wildlife. The criteria for this priority habitat are comparatively high fish and wildlife density, high fish and wildlife species diversity, limited and declining availability, high vulnerability to habitat alteration, and dependent species.

Critical Areas: The Growth Management Act (GMA) requires cities and counties to designate and protect "critical areas," including fish and wildlife habitat, wetlands, flood hazard areas, geologic hazard areas, and critical aquifer recharge areas. Both Clark County and the City of Vancouver have passed ordinances designating critical areas. The City of Vancouver has jurisdiction only over critical areas within its boundary. Clark County has jurisdiction over critical areas in the unincorporated areas of the County.

City of Vancouver: The City of Vancouver protects priority habitat areas through its Critical Areas Protection Ordinance. Critical areas include fish and wildlife habitat conservation areas, wetlands, frequently flooded areas, critical aquifer recharge areas, and geologic hazard areas as defined by the GMA. Fish and wildlife habitat conservation areas include, but are not limited to, habitat for any life stage of state-designated or federally designated endangered, threatened, and sensitive fish or wildlife species, priority habitats and habitats of local importance, riparian management areas and riparian buffers, and water bodies. The City of Vancouver also applies the WDFW priority habitat designations.

Clark County: In Clark County, mapped critical areas include Riparian Priority Habitat, Other Priority Habitats and Species (PHS), and Locally Important Habitats and Species. Locally Important Habitats and Species areas are areas legislatively designated and mapped by the County because of unusual or unique habitat that warrants protection due to qualitative species diversity or habitat system health indicators. Such areas are designated as critical, sensitive, or both critical and sensitive.

9.4.2 Oregon

City of Portland: The City of Portland applies two environmental overlay zones—protection and conservation—to various sites throughout the city to protect natural resources. The "conservation" overlay zone is intended to conserve important natural resources and their functions. This zone applies to areas where natural resources can be protected while allowing environmentally sensitive development. Environmental zoning is applied to all development and site disturbance activities. The Columbia River, North Portland Harbor, and Columbia Slough are zoned "conservation."

The environmental protection overlay zone offers the highest level of protection for the city's sensitive natural resources. This zone typically covers a stream, streamside area, wetland, or large forested area, and is essentially a "no-build" zone because development in these areas would degrade Portland's most important and sensitive natural resources. Some projects may be allowed if there is a clear public benefit (trails and interpretive facilities) or if there is no feasible project location outside of the protection zone (access). No lands in the primary API are in designated preservation zones.

Metro: In 2004, Metro updated its December 2002 inventory of riparian and upland habitat. Metro defines riparian habitats as land and vegetation located near rivers, streams, lakes and wetlands; upland habitats are natural areas providing wildlife with food and shelter and allowing movement from one habitat to another. Based on this inventory, Metro identified regionally significant habitat. These areas were then mapped with a ranking of "low, medium, and high" based on their capacity to protect fish and wildlife (Metro 2005).

10. References

Britton, E. Wildlife Biologist, Washington Department of Transportation. Personal Communication. 26 September 2007.

Bureau of Land Management (BLM). 1998. Survey protocols for Survey and Manage Strategy 2 vascular plants: species information. Available online at: http://www.blm.gov/or/plans/surveyandmanage/SP/VascularPlants/cover.htm. Site accessed 8 August 2007.

City of Portland. 2007. Chapter 33.430 Environmental Zones. Available online at: http://www.portlandonline.com/.

Clark County, Washington. 2006. Draft Environmental Impact Statement for the Comprehensive Growth Management Plan of Clark County, Battle Ground, Camas, La Center, Ridgefield, Vancouver, Washougal, and Yacolt.

Clark County, Washington. 2007. Final Environmental Impact Statement for the Comprehensive Growth Management Plan of Clark County, Battle Ground, Camas, La Center, Ridgefield, Vancouver, Washougal, and Yacolt.

David Evans and Associates. 2006. Columbia River Crossing Hydrographic and Geophysical Investigation: High Resolution Bathymetric Mapping, River Bed Imaging, and Subbottom Investigation. Prepared for the Oregon Department of Transportation and the Washington State Department of Transportation.

Ecology (Washington Department of Ecology). 2006. 303(d) Listings. Available online at: http://www.ecy.wa.gov/programs/wq/303d/.

Gray, S. Personal Communication. Fisheries Biologist, Washington Department of Fish and Wildlife. 7 September 2007.

Hitchcock, C.L., A. Cronquist, M. Ownbey, and J.W. Thompson. 1969. Vascular Plants of the Northwest. University of Washington Press, Seattle, Washington.

Hecht, S.A., D.H. Baldwin, C.A. Mebane, T. Hawkes, S.J. Gross, and N.L. Scholz. 2007. An overview of sensory effects on juvenile salmonids exposed to dissolved copper: Applying a benchmark concentration approach to evaluate sublethal neurobehavioral toxicity. Technical White Paper. NMFS, Office of Protected Resources, Lacey, WA. 45 pp.

Hennings, L. Senior Natural Resources Scientist, Metro. Personal Communication. 21 September 2007.

Hulse, D., S. Gregory, and J. Baker, Eds. 2002. Willamette River Basin Planning Atlas: Trajectories of Environmental and Ecological Change. Pacific Northwest Ecosystem Research Consortium, Oregon State University, Corvallis, OR.

Isaacs, F.B. and R.G. Anthony. 2004. Bald eagle nest locations and history of use in Oregon and the Washington portion of the Columbia River Recovery Zone, 1971 through 2004. Oregon Cooperative Fish and Wildlife Research Unit, Oregon State University, Corvallis, Oregon.

Johnson, D.H. and T.A. O'Neil. 2001. Wildlife-Habitat Relationships in Oregon and Washington. Oregon State University Press, Corvallis, Oregon. 736 pp.

Litman, T. 2005. Evaluating Transportation Land Use Impacts. Victoria Transport Policy Institute. Victoria, BC. Available at www.vtpi.org/landuse.pdf.

Mason, Bruce, and Girard (MBG). 2005. Wildlife Hot Spots Along Highways in Northwestern Oregon. Prepared for the Oregon Department of Transportation. 55 pp.

Metro. 2005. Urban Growth Management Functional Plan, Title 13, "Nature in Neighborhoods." Appendix C to Ordinance No. 05-1077C. 1 pp. Available online at: http://www.metro-region.org/library_docs/nature/092305-4_ord_05-1077c_ex_c_t13.pdf. Site accessed 8 August 2007.

Metro. 2007. Fish and wildlife habitat protection: Habitat Classes. Available online at: http://www.metro-region.org/.

Meyer, Ben. Personal communication. Fisheries Biologist, National Marine Fisheries Service. 27 September 2007.

Moore, T and T. Sanchez. 2001. A Guidebook for Evaluating the Indirect Land Use and Growth Impacts of Highway Improvements: Final Report. SPR Project 327. ODOT Research Group, Salem OR.

NatureServe Explorer. 2007. Available online at: http://www.natureserve.org/explorer/

National Marine Fisheries Service (NMFS). 2008a. Marine/Anadromous Fish Species Under the Endangered Species Act (ESA). Available online at: http://www.nmfs.noaa.gov/pr/species/esa/fish.htm.

National Marine Fisheries Service (NMFS). 2008b. Salmon Essential Fish Habitat. Available online at: http://www.nwr.noaa.gov/Salmon-Habitat/Salmon-EFH/Index.cfm.

National Marine Fisheries Service (NMFS). 2002. Endangered Species Act Section 7 Consultation and Magnuson-Stevens Act Essential Fish Habitat Consultation: Biological Opinion for the Columbia River Federal Navigation Channel Improvements Project.

National Oceanic and Atmospheric Administration (NOAA). 2007. Seal & Sea Lion Facts of the Columbia River & Adjacent Nearshore Marine Areas. Available online at: http://www.nwr.noaa.gov/Marine-Mammals/Seals-and-Sea-Lions/upload/CR-Pinniped-FS.pdf.

Omernik, J.M. 1987. Ecoregions of the Coterminous United States: Map Supplement. Association of American Geographers 77(1):118-125.

Oregon Department of Environmental Quality (DEQ). February 1991. Total Maximum Daily Load for 2,3,7,8-TCDD in the Columbia River Basin.

Oregon Department of Environmental Quality (DEQ). September 2002. Total Maximum Daily Load (TMDL) for Lower Columbia River Total Dissolved Gas.

Oregon Department of Environmental Quality (DEQ). 2007. Oregon's 2004/2006 Integrated Report Online Database. Available online at: http://www.deq.state.or.us/wq/assessment/rpt0406/search.asp.

Oregon Department of Transportation (ODOT). 2003. Peregrine Falcon Management Plan - 2002-2007. Available online at: http://egov.oregon.gov/ODOT/HWY/GEOENVIRONMENTAL/docs/researchperegrine_falcon_plan.pdf.

Oregon Natural Heritage Information Center (ORNHIC). 2003. Rare, Threatened and Endangered Plants and Animals of Multnomah County. Oregon Natural Heritage Program. Portland, Oregon.

Oregon Natural Heritage Information Center (ORNHIC). 2005. Oregon Threatened or Endangered Plant Field Guide. Available online at: http://oregonstate.edu/ornhic/plants/index.html.

Oregon Natural Heritage Information Center (ORNHIC). 2007. Rare, Threatened and Endangered Plants and Animals of Multnomah County. Oregon Natural Heritage Program. Portland, Oregon.

Parametrix. 2005 and 2006. Botany field surveys. Parametrix, Inc., Portland, Oregon.

Parsons Brinckerhoff. 2001. Land Use-Transportation Literature Review For the I-5 Trade Corridor Regional Land Use Committee. I-5 Trade Corridor Project. Portland, Oregon.

Popper, A.N., T.J. Carlson, A.D. Hawkins, B.L. Southall, and R.L. Gentry. Interim criteria for injury of fish exposed to pile driving operations: a white paper. Available online at: http://www.dot.ca.gov/hq/env/bio/fisheries_bioacoustics.htm.

Salmonscape. 2008. Washington Department of Fish and Wildlife. Available online at: http://198.238.33.67/mapping/salmonscape/index.html.

StreamNet Northwest Interactive Mapper. 2008. Pacific State Marine Fisheries Commission. Available online at: http://map.streamnet.org/snetmapper/viewer.htm.

Thompson, R. Environmental Specialist, Bureau of Environmental Services—Watershed Services, City of Portland, Oregon. Personal communication. 26 September 2007.

U.S. Army Corps of Engineers (USACE). 2001. Columbia River Channel Improvements Project Biological Assessment. Portland District, Portland, Oregon.

U.S. Army Corps of Engineers (USACE). 1989. Columbia River and Tributaries Review Study: Project Data and Operating Limits, North Pacific Division, CRT 69. Available online at: http://www.nwd-wc.usace.army.mil/TMT/basin.html.

U.S. Fish and Wildlife Service (USFWS). 2002. Chapter 20, Lower Columbia River Recovery Unit, Washington. 89 pp. *In*: Bull Trout (*Salvelinus confluentus*) Draft Recovery Plan. Portland, Oregon.

U.S. Fish and Wildlife Service (USFWS). 2003 and 2006. Threatened and Endangered Species System (TESS). Available online at: http://ecos.fws.gov/tess_public/servlet/gov.doi.tess_public.servlets.UsaLists?state=all.

U.S. Geological Survey (USGS). 2007. Oregon Water Science Center Data Grapher. Available online at: http://or.water.usgs.gov/cgi-bin/grapher/graph_setup.pl?basin_id=tdg&site_id=453439122223900.

Weinheimer, J. District Fish Biologist, Washington Department of Fish and Wildlife. Personal Communication. 7 September 2007.

Washington Department of Fish and Wildlife (WDFW). 2005 and 2007. Priority Habitats and Species. Available online at: http://wdfw.wa.gov/hab/phsvert.htm.

Washington Department of Natural Resources, Natural Heritage Program (WDNR-NHP). 2000 and 2007. Field Guide to Selected Rare Vascular Plants of Washington. Available online at: http://www.dnr.wa.gov/nhp/refdesk/fguide/htm/fsfgabc.htm.