INTERSTATE 5 COLUMBIA RIVER CROSSING

Water Quality and Hydrology Technical Report for the Final Environmental Impact Statement

Columbia River CROSSING

May 2011

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Cover Sheet

Interstate 5 Columbia River Crossing

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TABLE OF CONTENTS

List of Exhibits

Appendices

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ACRONYMS

Acronym	Description
ADT	Average Daily Traffic
API	Area of Potential Impact
BES	City of Portland Bureau of Environmental Services
BMP	Best Management Practice
BNSF	Burlington Northern Santa Fe Railroad
BPA	Bonneville Power Administration
CD	collector-distributor
cfs	cubic feet per second
CIA	contributing impervious area
CMA	calcium magnesium acetate
CRC	Columbia River Crossing
CTR	Commute Trip Reduction (Washington)
C-TRAN	Clark County Public Transportation Benefit Area
CWA	Clean Water Act
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
DEIS	Draft Environmental Impact Statement
DEQ	Oregon Department of Environmental Quality
DO	dissolved oxygen
DOT	U.S. Department of Transportation
DSL	Oregon Department of State Lands
ECO	Employee Commute Options (Oregon)
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ESCP	erosion and sediment control plan
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
InterCEP	Interstate Collaborative Environmental Process
JARPA	Joint Aquatic Resource Permits Application
LPA	Locally Preferred Alternative
LRV	light rail vehicle

MAX	Metropolitan Area Express
NAVD88	North American Vertical Datum of 1988
NEPA	National Environmental Policy Act
NGVD	National Geodetic Vertical Datum
NMFS	National Marine Fisheries Service
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
ODOT	Oregon Department of Transportation
OHW	ordinary high water line
OTC	Oregon Transportation Commission
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PDX	Portland International Airport
PGIS	pollutant-generating impervious surface
PIR	Portland International Raceway
PNS	Pacific Northwest Snowfighters
RM	River mile
ROD	Record of Decision
RTC	Regional Transportation Commission
SDWA	Safe Drinking Water Act
SPCCP	Spill Prevention, Control, and Countermeasures Plan
SPUI	Single-Point-Urban Interchange
sq.ft.	square feet
SSA	sole source aquifer
SWPPP	Stormwater Pollution Prevention Plan
2,3,7,8-TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
TDM	transportation demand management
TESCP	Temporary Erosion and Sediment Control Plan
TMDL	Total Maximum Daily Load
TriMet	Tri-County Metropolitan Transportation District
TSM	transportation system management
TSS	Total suspended solids
UIC	underground injection control
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

VMC	Vancouver Municipal Code
WPCF	water pollution control facility
WSDOT	Washington State Department of Transportation
WTC	Washington Transportation Commission

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1. Summary

1.1 Introduction

This Water Quality and Hydrology Technical Report provides and evaluation of two alternatives – the Locally Preferred Alternative (LPA) and the No-Build Alternative. Both of these alternatives are described in this section.

1.2 Description of Alternatives

This technical report evaluates the CRC project's locally preferred alternative (LPA) and the No-Build Alternative. The LPA includes two design options: The preferred option, LPA Option A, which includes local vehicular access between Marine Drive and Hayden Island on an arterial bridge; and LPA Option B, which does not have arterial lanes on the light rail/multi-use path bridge, but instead provides direct access between Marine Drive and the island with collector-distributor (CD) lanes on the two new bridges that would be built adjacent to I-5. In addition to the design options, if funding availability does not allow the entire LPA to be constructed in one phase, some roadway elements of the project would be deferred to a future date. This technical report identifies several elements that could be deferred, and refers to that possible initial investment as LPA with highway phasing. The LPA with highway phasing option would build most of the LPA in the first phase, but would defer construction of specific elements of the project. The LPA and the No-Build Alternative are described in this section.

1.2.1 Adoption of a Locally Preferred Alternative

Following the publication of the Draft Environmental Impact Statement (DEIS) on May 2, 2008, the project actively solicited public and stakeholder feedback on the DEIS during a 60-day comment period. During this time, the project received over 1,600 public comments.

During and following the public comment period, the elected and appointed boards and councils of the local agencies sponsoring the CRC project held hearings and workshops to gather further public input on and discuss the DEIS alternatives as part of their efforts to determine and adopt a locally preferred alternative. The LPA represents the alternative preferred by the local and regional agencies sponsoring the CRC project. Local agency-elected boards and councils determined their preference based on the results of the evaluation in the DEIS and on the public and agency comments received both before and following its publication.

In the summer of 2008, the local agencies sponsoring the CRC project adopted the following key elements of CRC as the LPA:

- A replacement bridge as the preferred river crossing,
- Light rail as the preferred high-capacity transit mode, and
- Clark College as the preferred northern terminus for the light rail extension.

The preferences for a replacement crossing and for light rail transit were identified by all six local agencies. Only the agencies in Vancouver – the Clark County Public Transit Benefit Area Authority (C-TRAN), the City of Vancouver, and the Regional Transportation Council (RTC) – preferred the Vancouver light rail terminus. The adoption of the LPA by these local agencies does not represent a formal decision by the federal agencies leading this project – the Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) – or any federal funding commitment. A formal decision by FHWA and FTA about whether and how this project should be constructed will follow the FEIS in a Record of Decision (ROD).

1.2.2 Description of the LPA

The LPA includes an array of transportation improvements, which are described below. When the LPA differs between Option A and Option B, it is described in the associated section. For a more detailed description of the LPA, including graphics, please see Chapter 2 of the FEIS.

1.2.2.1 Multimodal River Crossing

Columbia River Bridges

The parallel bridges that form the existing I-5 crossing over the Columbia River would be replaced by two new parallel bridges. The eastern structure would accommodate northbound highway traffic on the bridge deck, with a bicycle and pedestrian path underneath; the western structure would carry southbound traffic, with a two-way light rail guideway below. Whereas the existing bridges have only three lanes each with virtually no shoulders, each of the new bridges would be wide enough to accommodate three through-lanes and two add/drop lanes. Lanes and shoulders would be built to full design standards.

The new bridges would be high enough to provide approximately 95 feet of vertical clearance for river traffic beneath, but not so high as to impede the take-offs and landings by aircraft using Pearson Field or Portland International Airport to the east. The new bridge structures over the Columbia River would not include lift spans, and both of the new bridges would each be supported by six piers in the water and two piers on land.

North Portland Harbor Bridges

The existing highway structures over North Portland Harbor would not be replaced; instead, they would be retained to accommodate all mainline I-5 traffic. As discussed at the beginning of this chapter, two design options have emerged for the Hayden Island and Marine Drive interchanges. The preferred option, LPA Option A, includes local vehicular access between Marine Drive and Hayden Island on an arterial bridge. LPA Option B does not have arterial lanes on the light rail/multi-use path bridge, but instead provides direct access between Marine Drive and the island with collector-distributor lanes on the two new bridges that would be built adjacent to I-5.

LPA Option A: Four new, narrower parallel structures would be built across the waterway, three on the west side and one on the east side of the existing North Portland Harbor bridges. Three of the new structures would carry on- and off-ramps to mainline I-5. Two structures west of the existing bridges would carry traffic merging onto or exiting off of I-5 southbound. The new structure on the east side of I-5 would serve as an on-ramp for traffic merging onto I-5 northbound.

The fourth new structure would be built slightly farther west and would include a two-lane arterial bridge for local traffic to and from Hayden Island, light rail transit, and a multi-use path for pedestrians and bicyclists. All of the new structures would have at least as much vertical clearance over the river as the existing North Portland Harbor bridges.

LPA Option B: This option would build the same number of structures over North Portland Harbor as Option A, although the locations and functions on those bridges would differ, as described below. The existing bridge over North Portland Harbor would be widened and would receive seismic upgrades.

LPA Option B does not have arterial lanes on the light rail/multi-use path bridge. Direct access between Marine Drive and the island would be provided with collector-distributor lanes. The structures adjacent to the highway bridge would carry traffic merging onto or exiting off of mainline I-5 between the Marine Drive and Hayden Island interchanges.

1.2.2.2 Interchange Improvements

The LPA includes improvements to seven interchanges along a 5-mile segment of I-5 between Victory Boulevard in Portland and SR 500 in Vancouver. These improvements include some reconfiguration of adjacent local streets to complement the new interchange designs, as well as new facilities for bicyclists and pedestrians along this corridor.

Victory Boulevard Interchange

The southern extent of the I-5 project improvements would be two ramps associated with the Victory Boulevard interchange in Portland. The Marine Drive to I-5 southbound on-ramp would be braided over the I-5 southbound to the Victory Boulevard/Denver Avenue off-ramp. The other ramp improvement would lengthen the merge distance for northbound traffic entering I-5 from Denver Avenue. The current merging ramp would be extended to become an add/drop (auxiliary) lane which would continue across the river crossing.

Potential phased construction option**:** The aforementioned southbound ramp improvements to the Victory Boulevard interchange may not be included with the CRC project. Instead, the existing connections between I-5 southbound and Victory Boulevard could be retained. The braided ramp connection could be constructed separately in the future as funding becomes available.

Marine Drive Interchange

All movements within this interchange would be reconfigured to reduce congestion for motorists entering and exiting I-5 at this location. The interchange configuration would be a single-point urban interchange (SPUI) with a flyover ramp serving the east to north movement. With this configuration, three legs of the interchange would converge at a point on Marine Drive, over the I-5 mainline. This configuration would allow the highest volume movements to move freely without being impeded by stop signs or traffic lights.

The Marine Drive eastbound to I-5 northbound flyover ramp would provide motorists with access to I-5 northbound without stopping. Motorists from Marine Drive eastbound would access I-5 southbound without stopping. Motorists traveling on Martin Luther King Jr. Boulevard westbound to I-5 northbound would access I-5 without stopping at the intersection.

The new interchange configuration changes the westbound Marine Drive and westbound Vancouver Way connections to Martin Luther King Jr. Boulevard and to northbound I-5. These two streets would access westbound Martin Luther King Jr. Boulevard farther east. Martin Luther King Jr. Boulevard would have a new direct connection to I-5 northbound.

In the new configuration, the connections from Vancouver Way and Marine Drive would be served, improving the existing connection to Martin Luther King Jr. Boulevard east of the interchange. The improvements to this connection would allow traffic to turn right from Vancouver Way and accelerate onto Martin Luther King Jr. Boulevard. On the south side of

Martin Luther King Jr. Boulevard, the existing loop connection would be replaced with a new connection farther east.

A new multi-use path would extend from the Bridgeton neighborhood to the existing Expo Center light rail station and from the station to Hayden Island along the new light rail line over North Portland Harbor.

LPA Option A: Local traffic between Martin Luther King Jr. Boulevard/Marine Drive and Hayden Island would travel via an arterial bridge over North Portland Harbor. There would be some variation in the alignment of local streets in the area of the interchange between Option A and Option B. The most prominent differences are the alignments of Vancouver Way and Union Court.

LPA Option B: With this design option, there would be no arterial traffic lanes on the light rail/multi-use path bridge over North Portland Harbor. Instead, vehicles traveling between Martin Luther King Jr. Boulevard/ Marine Drive and Hayden Island would travel on the collector-distributor bridges that would parallel each side of I-5 over North Portland Harbor. Traffic would not need to merge onto mainline I-5 to travel between the island and Martin Luther King Jr. Boulevard/Marine Drive.

***Potential phased construction option*:** The aforementioned flyover ramp could be deferred and not constructed as part of the CRC project. In this case, rather than providing a direct eastbound Marine Drive to I-5 northbound connection by a flyover ramp, the project improvements to the interchange would instead provide this connection through the signal-controlled SPUI. The flyover ramp could be constructed separately in the future as funding becomes available.

Hayden Island Interchange

All movements for this interchange would be reconfigured. The new configuration would be a split tight diamond interchange. Ramps parallel to the highway would be built, lengthening the ramps and improving merging speeds. Improvements to Jantzen Drive and Hayden Island Drive would include additional through, left-turn, and right-turn lanes. A new local road, Tomahawk Island Drive, would travel east-west through the middle of Hayden Island and under the I-5 interchange, improving connectivity across I-5 on the island. Additionally, a new multi-use path would be provided along the elevated light rail line on the west side of the Hayden Island interchange.

LPA Option A: A proposed arterial bridge with two lanes of traffic, one in each direction, would allow vehicles to travel between Martin Luther King Jr. Boulevard/ Marine Drive and Hayden Island without accessing I-5.

LPA Option B: With this design option there would be no arterial traffic lanes on the light rail/multi-use path bridge over North Portland Harbor. Instead, vehicles traveling between Martin Luther King Jr. Boulevard/Marine Drive and Hayden Island would travel on the collector-distributor bridges that parallel each side of I-5 over North Portland Harbor.

SR 14 Interchange

The function of this interchange would remain largely the same. Direct connections between I-5 and SR 14 would be rebuilt. Access to and from downtown Vancouver would be provided as it is today, but the connection points would be relocated. Downtown Vancouver I-5 access to and from the south would be at C Street rather than Washington Street, while downtown connections to and from SR 14 would be made by way of Columbia Street at 4th Street.

The multi-use bicycle and pedestrian path in the northbound (eastern) I-5 bridge would exit the structure at the SR 14 interchange, and then loop down to connect into Columbia Way.

Mill Plain Interchange

This interchange would be reconfigured into a SPUI. The existing "diamond" configuration requires two traffic signals to move vehicles through the interchange. The SPUI would use one efficient intersection and allow opposing left turns simultaneously. This would improve the capacity of the interchange by reducing delay for traffic entering or exiting the highway.

This interchange would also receive several improvements for bicyclists and pedestrians. These include bike lanes and sidewalks, clear delineation and signing, short perpendicular crossings at the ramp terminals, and ramp orientations that would make pedestrians highly visible.

Fourth Plain Interchange

The improvements to this interchange would be made to better accommodate freight mobility and access to the new park and ride at Clark College. Northbound I-5 traffic exiting to Fourth Plain would continue to use the off-ramp just north of the SR 14 interchange. The southbound I-5 exit to Fourth Plain would be braided with the SR 500 connection to I-5, which would eliminate the non-standard weave between the SR 500 connection and the off-ramp to Fourth Plain as well as the westbound SR 500 to Fourth Plain Boulevard connection.

Additionally, several improvements would be made to provide better bicycle and pedestrian mobility and accessibility, including bike lanes, neighborhood connections, and access to the park and ride.

SR 500 Interchange

Improvements would be made to the SR 500 interchange to add direct connections to and from I-5. On- and off-ramps would be built to directly connect SR 500 and I-5 to and from the north, connections that are currently made by way of 39th Street. I-5 southbound traffic would connect to SR 500 via a new tunnel underneath I-5. SR 500 eastbound traffic would connect to I-5 northbound on a new on-ramp. The 39th Street connections with I-5 to and from the north would be eliminated. Travelers would instead use the connections at Main Street to connect to and from 39th Street.

Additionally, several improvements would be made to provide better bicycle and pedestrian mobility and accessibility, including sidewalks on both sides of 39th Street, bike lanes, and neighborhood connections.

***Potential phased construction option*:** The northern half of the existing SR 500 interchange would be retained, rather than building new connections between I-5 southbound to SR 500 eastbound and from SR 500 westbound to I-5 northbound. The ramps connecting SR 500 and I-5 to and from the north could be constructed separately in the future as funding becomes available.

1.2.2.3 Transit

The primary transit element of the LPA is a 2.9-mile extension of the current Metropolitan Area Express (MAX) Yellow Line light rail from the Expo Center in North Portland, where it currently ends, to Clark College in Vancouver. The transit element would not differ between LPA and LPA with highway phasing. To accommodate and complement this major addition to the region's transit system, a variety of additional improvements are also included in the LPA:

- Three park and ride facilities in Vancouver near the new light rail stations.
- Expansion of Tri-County Metropolitan Transportation District's (TriMet's) Ruby Junction light rail maintenance base in Gresham, Oregon.
- Changes to C-TRAN local bus routes.
- Upgrades to the existing light rail crossing over the Willamette River via the Steel Bridge.

Operating Characteristics

Nineteen new light rail vehicles (LRV) would be purchased as part of the CRC project to operate this extension of the MAX Yellow Line. These vehicles would be similar to those currently used by TriMet's MAX system. With the LPA, LRVs in the new guideway and in the existing Yellow Line alignment are planned to operate with 7.5-minute headways during the "peak of the peak" (the two-hour period within the 4-hour morning and afternoon/evening peak periods where demand for transit is the highest) and 15-minute headways during off-peak periods.

Light Rail Alignment and Stations

Oregon Light Rail Alignment and Station

A two-way light rail alignment for northbound and southbound trains would be constructed to extend from the existing Expo Center MAX station over North Portland Harbor to Hayden Island. Immediately north of the Expo Center, the alignment would curve eastward toward I-5, pass beneath Marine Drive, then rise over a flood wall onto a light rail/multi-use path bridge to cross North Portland Harbor. The two-way guideway over Hayden Island would be elevated at approximately the height of the rebuilt mainline of I-5, as would a new station immediately west of I-5. The alignment would extend northward on Hayden Island along the western edge of I-5, until it transitions into the hollow support structure of the new western bridge over the Columbia River.

Downtown Vancouver Light Rail Alignment and Stations

After crossing the Columbia River, the light rail alignment would curve slightly west off of the highway bridge and onto its own smaller structure over the Burlington Northern Santa Fe (BNSF) rail line. The double-track guideway would descend on structure and touch down on Washington Street south of 5th Street, continuing north on Washington Street to 7th Street. The elevation of 5th Street would be raised to allow for an at-grade crossing of the tracks on Washington Street. Between 5th and 7th Streets, the two-way guideway would run down the center of the street. Traffic would not be allowed on Washington between 5th and 6th Streets and would be two-way between 6th and 7th Streets. There would be a station on each side of the street on Washington between 5th and 6th Streets.

At 7th Street, the light rail alignment would form a couplet. The single-track northbound guideway would turn east for two blocks, then turn north onto Broadway Street, while the single-track southbound guideway would continue on Washington Street. Seventh Street will be converted to one-way traffic eastbound between Washington and Broadway with light rail operating on the north side of 7th Street. This couplet would extend north to 17th Street, where the two guideways would join and turn east.

The light rail guideway would run on the east side of Washington Street and the west side of Broadway Street, with one-way traffic southbound on Washington Street and one-way traffic northbound on Broadway Street. On station blocks, the station platform would be on the side of the street at the sidewalk. There would be two stations on the Washington-Broadway couplet, one pair of platforms near Evergreen Boulevard, and one pair near 15th Street.

East-west Light Rail Alignment and Terminus Station

The single-track southbound guideway would run in the center of 17th Street between Washington and Broadway Streets. At Broadway Street, the northbound and southbound alignments of the couplet would become a two-way center-running guideway traveling east-west on 17th Street. The guideway on 17th Street would run until G Street, then connect with McLoughlin Boulevard and cross under I-5. Both alignments would end at a station east of I-5 on the western boundary of Clark College.

Park and Ride Stations

Three park and ride stations would be built in Vancouver along the light rail alignment:

- Within the block surrounded by Columbia, Washington 4th and 5th Streets, with five floors above ground that include space for retail on the first floor and 570 parking stalls.
- Between Broadway and Main Streets next to the stations between 15th and 16th Streets, with space for retail on the first floor, and four floors above ground that include 420 parking stalls.
- At Clark College, just north of the terminus station, with space for retail or C-TRAN services on the first floor, and five floors that include approximately 1,910 parking stalls.

Ruby Junction Maintenance Facility Expansion

The Ruby Junction Maintenance Facility in Gresham, Oregon, would need to be expanded to accommodate the additional LRVs associated with the CRC project. Improvements include additional storage for LRVs and other maintenance material, expansion of LRV maintenance bays, and expanded parking for additional personnel. A new operations command center would also be required, and would be located at the TriMet Center Street location in Southeast Portland.

Local Bus Route Changes

As part of the CRC project, several C-TRAN bus routes would be changed in order to better complement the new light rail system. Most of these changes would re-route bus lines to downtown Vancouver where riders could transfer to light rail. Express routes, other than those listed below, are expected to continue service between Clark County and downtown Portland. The following table (Exhibit 1-1) shows anticipated future changes to C-TRAN bus routes.

Exhibit 1-1. Proposed C-TRAN Bus Routes Comparison

C-TRAN Bus Route	Route Changes
#4 - Fourth Plain	Route truncated in downtown Vancouver
#41 - Camas / Washougal Limited	Route truncated in downtown Vancouver
#44 - Fourth Plain Limited	Route truncated in downtown Vancouver
#47 - Battle Ground Limited	Route truncated in downtown Vancouver
#105 - I-5 Express	Route truncated in downtown Vancouver
#105S - I-5 Express Shortline	Route eliminated in LPA (The No-Build runs articulated buses between downtown Portland and downtown Vancouver on this route)

Steel Bridge Improvements

Currently, all light rail lines within the regional TriMet MAX system cross over the Willamette River via the Steel Bridge. By 2030, the number of LRVs that cross the Steel Bridge during the 4-hour PM peak period would increase from 152 to 176. To accommodate these additional trains, the project would retrofit the existing rails on the Steel Bridge to increase the allowed light rail speed over the bridge from 10 to 15 mph. To accomplish this, additional work along the Steel Bridge lift spans would be needed.

1.2.2.4 Tolling

Tolling cars and trucks that use the I-5 river crossing is proposed as a method to help fund the CRC project and to encourage the use of alternative modes of transportation. The authority to toll the I-5 crossing is set by federal and state laws. Federal statutes permit a toll-free bridge on an interstate highway to be converted to a tolled facility following the reconstruction or replacement of the bridge. Prior to imposing tolls on I-5, Washington and Oregon Departments of Transportation (WSDOT and ODOT) would have to enter into a toll agreement with U.S. Department of Transportation (DOT). Recently passed state legislation in Washington permits WSDOT to toll I-5 provided that the tolling of the facility is first authorized by the Washington legislature. Once authorized by the legislature, the Washington Transportation Commission (WTC) has the authority to set the toll rates. In Oregon, the Oregon Transportation Commission (OTC) has the authority to toll a facility and to set the toll rate. It is anticipated that prior to tolling I-5, ODOT and WSDOT would enter into a bi-state tolling agreement to establish a cooperative process for setting toll rates and guiding the use of toll revenues.

Tolls would be collected using an electronic toll collection system: toll collection booths would not be required. Instead, motorists could obtain a transponder that would automatically bill the vehicle owner each time the vehicle crossed the bridge, while cars without transponders would be tolled by a license-plate recognition system that would bill the address of the owner registered to that license plate.

The LPA proposes to apply a variable toll on vehicles using the I-5 crossing. Tolls would vary by time of day, with higher rates during peak travel periods and lower rates during off-peak periods. Medium and heavy trucks would be charged a higher toll than passenger vehicles. The traffic-related impact analysis in this FEIS is based on toll rates that, for passenger cars with transponders, would range from $1.00 during the off-peak to $2.00 during the peak travel times (in 2006 dollars).

1.2.2.5 Transportation System and Demand Management Measures

Many well-coordinated transportation demand management (TDM) and transportation system management (TSM) programs are already in place in the Portland-Vancouver Metropolitan region and supported by agencies and adopted plans. In most cases, the impetus for the programs is from state-mandated programs: Oregon’s Employee Commute Options (ECO) rule and Washington’s Commute Trip Reduction (CTR) law.

The physical and operational elements of the CRC project provide the greatest TDM opportunities by promoting other modes to fulfill more of the travel needs in the project corridor. These include:

- Major new light rail line in exclusive right-of-way, as well as express bus and feeder routes;

- Modern bicycle and pedestrian facilities that accommodate more bicyclists and pedestrians, and improve connectivity, safety, and travel time;
- Park and ride lots and garages; and
- A variable toll on the highway crossing.

In addition to these fundamental elements of the project, facilities and equipment would be implemented that could help existing or expanded TSM programs maximize capacity and efficiency of the system. These include:

- Replacement or expanded variable message signs or other traveler information systems in the CRC project area;
- Expanded incident response capabilities;
- Queue jumps or bypass lanes for transit vehicles where multi-lane approaches are provided at ramp signals for entrance ramps;
- Expanded traveler information systems with additional traffic monitoring equipment and cameras, and
- Active traffic management.

1.2.3 LPA Construction

Construction of bridges over the Columbia River is the most substantial element of the project, and this element sets the sequencing for other project components. The main river crossing and immediately adjacent highway improvement elements would account for the majority of the construction activity necessary to complete this project.

1.2.3.1 Construction Activities Sequence and Duration

The following table (Exhibit 1-2) displays the expected duration and major details of each element of the project. Due to construction sequencing requirements, the timeline to complete the initial phase of the LPA with highway phasing is the same as the full LPA.

Exhibit 1-2. Construction Activities and Estimated Duration

Element	Estimated Duration	Details
Columbia River bridges	4 years	• Construction is likely to begin with the bridges. • General sequence includes initial preparation, installation of foundation piles, shaft caps, pier columns, superstructure, and deck.
Hayden Island and SR 14 interchanges	1.5 - 4 years for each interchange	• Each interchange must be partially constructed before any traffic can be transferred to the new structure. • Each interchange needs to be completed at the same time.
Marine Drive interchange	3 years	• Construction would need to be coordinated with construction of the southbound lanes coming from Vancouver.
Demolition of the existing bridges	1.5 years	• Demolition of the existing bridges can begin only after traffic is rerouted to the new bridges.
Three interchanges north of SR 14	4 years for all three	• Construction of these interchanges could be independent from each other or from the southern half of the project. • More aggressive and costly staging could shorten this timeframe.

Element	Estimated Duration	Details
Light rail	4 years	• The river crossing for the light rail would be built with the bridges. • Any bridge structure work would be separate from the actual light rail construction activities and must be completed first.
Total Construction Timeline	6.3 years	• Funding, as well as contractor schedules, regulatory restrictions on in-water work, weather, materials, and equipment, could all influence construction duration. • This is also the same time required to complete the smallest usable segment of roadway – Hayden Island through SR 14 interchanges.

1.2.3.2 Major Staging Sites and Casting Yards

Staging of equipment and materials would occur in many areas along the project corridor throughout construction, generally within existing or newly purchased right-of-way or on nearby vacant parcels. However, at least one large site would be required for construction offices, to stage the larger equipment such as cranes, and to store materials such as rebar and aggregate. Suitable sites must be large and open to provide for heavy machinery and material storage, must have waterfront access for barges (either a slip or a dock capable of handling heavy equipment and material) to convey material to the construction zone, and must have roadway or rail access for landside transportation of materials by truck or train.

Three sites have been identified as possible major staging areas:

1. Port of Vancouver (Parcel 1A) site in Vancouver: This 52-acre site is located along SR 501 and near the Port of Vancouver’s Terminal 3 North facility.
2. Red Lion at the Quay hotel site in Vancouver: This site would be partially acquired for construction of the Columbia River crossing, which would require the demolition of the building on this site, leaving approximately 2.6 acres for possible staging.
3. Vacant Thunderbird hotel site on Hayden Island: This 5.6-acre site is much like the Red Lion hotel site in that a large portion of the parcel is already required for new right-of-way necessary for the LPA.

A casting/staging yard could be required for construction of the over-water bridges if a precast concrete segmental bridge design is used. A casting yard would require access to the river for barges, including either a slip or a dock capable of handling heavy equipment and material; a large area suitable for a concrete batch plant and associated heavy machinery and equipment; and access to a highway and/or railway for delivery of materials.

Two sites have been identified as possible casting/staging yards:

1. Port of Vancouver Alcoa/Evergreen West site: This 95-acre site was previously home to an aluminum factory and is currently undergoing environmental remediation, which should be completed before construction of the CRC project begins (2012). The western portion of this site is best suited for a casting yard.
2. Sundial site: This 50-acre site is located between Fairview and Troutdale, just north of the Troutdale Airport, and has direct access to the Columbia River. There is an existing barge slip at this location that would not have to undergo substantial improvements.

1.2.4 The No-Build Alternative

The No-Build Alternative illustrates how transportation and environmental conditions would likely change by the year 2030 if the CRC project is not built. This alternative makes the same assumptions as the build alternatives regarding population and employment growth through 2030, and also assumes that the same transportation and land use projects in the region would occur as planned. The No-Build Alternative also includes several major land use changes that are planned within the project area, such as the Riverwest development just south of Evergreen Boulevard and west of I-5, the Columbia West Renaissance project along the western waterfront in downtown Vancouver, and redevelopment of the Jantzen Beach shopping center on Hayden Island. All traffic and transit projects within or near the CRC project area that are anticipated to be built by 2030 separately from this project are included in the No-Build and build alternatives. Additionally, the No-Build Alternative assumes bridge repair and continuing maintenance costs to the existing bridge that are not anticipated with the replacement bridge option.

1.3 Long-term Effects

Three surface waters, the Columbia Slough, Columbia River, and Burnt Bridge Creek, lay within the drainage area of the main project area and receive stormwater runoff from the project corridor directly. Both Burnt Bridge Creek and the Columbia Slough ultimately drain to the Columbia River. Fairview Creek, which will not receive stormwater runoff from the project corridor directly, is a tributary to the Columbia Slough. Therefore, any hydrologic or water quality impacts within these drainages may ultimately lead to a long-term effect on the Columbia River.

The water quality of each of these watersheds is impaired in some way as shown Exhibit 1-3.

Exhibit 1-3. Water Quality-Limited Waterways within the Project Area

Waterway	303(d) Listing Factors	Established TMDLs
Columbia Slough	Toxics (lead, iron, manganese) Temperature	Toxics (lead, PCBs, DDE/DDT, dieldrin, dioxin) Eutrophication (pH, dissolved oxygen, phosphorus, and chlorophyll *a*) Bacteria
Columbia River (includes North Portland Harbor)	**In Oregon:** Toxics (PCBs, PAHs, DDT/DDE, arsenic) Eutrophication (dissolved oxygen) Temperature **In Washington:** Toxics (PCBs) Eutrophication (dissolved oxygen) Temperature	Dioxin Total Dissolved Gas
Burnt Bridge Creek	Eutrophication (dissolved oxygen) Bacteria Temperature	None
Fairview Creek	E. Coli Fecal Coliform	Toxics (lead, PCBs, DDE/DDT, dieldrin, dioxin) Eutrophication (pH, dissolved oxygen, phosphorus, and chlorophyll *a*) Bacteria Temperature

Note: TMDL = total maximum daily load

Long-term effects from the No-Build Alternative may include effects to water quality and stormwater. Long-term effects to hydrology are not anticipated as a result of the No-Build Alternative. If the CRC project were not constructed, the hydrologic regime of project waterways would remain unchanged. The No-Build Alternative would adversely affect the quality of receiving waters in the long-term. Pollutant-loading of project waterways is currently influenced by a high percentage of untreated stormwater across the project corridor. If the LPA were not constructed this stormwater would likely remain untreated. Refer to Section 4.3 for further detail. The No-Build Alternative would not increase impervious surface and therefore, not increase stormwater volumes. However, average daily traffic (ADT) would increase with the No-Build Alternative and pollutant loads and concentrations would increase, though quantification is not possible. Yet, as previously stated, the majority of the stormwater would remain untreated.

Without mitigation in the form of required and updated stormwater treatment, the potential long-term effects from the construction of the LPA to the water quality and hydrology of surface waters would be attributed primarily to increased stormwater volumes from expanded impervious surfaces. Increased impervious surface would also increase the pollutant load and may increase pollutant concentrations.

An overall increase in impervious surfaces within the project area is likely to result in increased stormwater runoff rates and volumes. Without mitigation, this would affect the hydrology of project waterways. The Columbia River and Columbia Slough are large, tidally influenced waterbodies, and the project-related increase in stormwater quantity would not result in a measurable increase of flows in these surface waters. Burnt Bridge Creek and Fairview Creek are smaller waterbodies and more prone to be affected by increased stormwater quantity resulting from increased impervious surfaces. However, engineered water quality facilities would also be designed to reduce the rate of runoff from the project to these two waterbodies to pre-development conditions.

Oregon requires runoff from the entire contributing impervious area (CIA) be treated to reduce pollutants regardless of degree to which the surfaces would contribute pollutants to runoff. Using this approach, runoff from bike-pedestrian paths would be required to be treated in the same manner as runoff from highways. In contrast, Washington State focuses on requiring treatment for runoff from the pollutant-generating impervious surfaces (PGIS).

ODOT defines the CIA as consisting of all impervious surfaces within the strict project limits, and impervious surface owned or operated by ODOT outside the project limits that drain to the project via direct flow or discrete conveyance. The National Marine Fisheries Service (NMFS) has expanded this definition for the project to include impervious areas that are not owned by ODOT but drain onto the project footprint.

WSDOT and Washington State Department of Ecology (Ecology) define PGIS as surfaces that are considered a significant source of pollutants in stormwater runoff, including:

- highways, ramps and non-vegetated shoulders;
- light rail transit guideway subject to vehicular traffic;
- streets, alleys, and driveways; and
- bus layover facilities, surface parking lots, and the top floor of parking structures.

The following types of impervious area are considered non-PGIS:

- light rail transit guideway not subject to vehicular traffic except the occasional use by emergency or maintenance vehicles (referred to as an exclusive guideway);

- light rail transit stations; and
- bicycle and pedestrian paths.

An exclusive light rail transit guideway is considered non-PGIS for two reasons: LRVs are electric; and other potential sources of pollution such as bearings and gears are sealed to prevent the loss of lubricants. Light rail vehicle braking is almost exclusively accomplished via regenerative (power) braking, which avoids any friction or wear on the vehicle brake pads. Consequently, very few pollutants are generated. In Washington State, NMFS and USFWS concurred with Sound Transit’s conclusion that this type of guideway is considered non-PGIS (NMFS No.WSB-01-457). Therefore, the stormwater runoff generated from the guideway did not require treatment before being discharged to the receiving water. In Oregon, runoff from exclusive guideways would require treatment before being released.

In addition, Washington State differentiates between stormwater runoff treatment requirements for new and rebuilt versus resurfaced impervious surface, while state and local jurisdictions in Oregon do not. In Washington State, water quality treatment is only required for runoff from new and rebuilt PGIS, while the state of Oregon requires treatment for all impervious surfaces, PGIS or non-PGIS, for the CRC project.

LPA Option A would increase the total impervious area by approximately 42 acres not including the Ruby Junction facility. Option B would increase this figure by an additional 0.7 acres. Not including the Ruby Junction facility, the LPA Option A would result in approximately 204 acres (203 acres for Option B) of new and rebuilt impervious surface and 34 acres of resurfaced pavement. This could reduce natural infiltration rates and increase stormwater pollutant 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. However, with the construction of new conveyance systems and water quality facilities, untreated PGIS would be reduced from the current 219 acres to approximately 8 acres for both LPA options.

Improvements to stormwater treatment on new and resurfaced impervious surfaces, including the I-5 and North Portland Harbor bridges, would result in a net improvement for water quality in the Columbia River, North Portland Harbor, Burnt Bridge Creek, and Fairview Creek, with the exception of a slight increase in dissolved copper levels at the Columbia Slough. Most of the runoff generated by the existing highway corridor is not treated before being discharged. All new and rebuilt impervious surfaces, as well as most resurfaced and existing pavement within the CIA, would be treated in accordance with current stormwater treatment standards before being discharged to project area receiving streams. On the Washington side of the alignment, the project would exceed state stormwater treatment standards.

The LPA would install a number of stormwater treatment facilities to reduce pollutants (including sediment and metals) and to provide flow control for runoff discharged to Burnt Bridge and Fairview Creeks; flow control is not required for discharges to Columbia Slough, North Portland Harbor or Columbia River. Although the Columbia Slough is exempt from flow control, the discharge of runoff from the project area to the water body is regulated by the operation of drainage district pump stations. At present, the project area provides infiltration for only about 21 acres of existing impervious surface within the existing project CIA. The completed LPA would provide treatment or infiltration for a total of 290 acres of impervious surface. Treatment would comply with current standards before being discharged to project area water bodies. Added treatment of existing impervious surface that is not currently treated would result in a net benefit to water quality and water quantity in the project area water bodies.

In addition, traffic congestion on the I-5 and North Portland Harbor bridges and the roadways in the project area would be decreased. Traffic analysis of the LPA projected that the 2030 average weekday traffic across the I-5 crossing is expected to be 178,500 vehicles. This is lower than the 184,000 daily vehicle trips predicted under the No-Build Alternative because of the introduction of high-capacity transit and a toll on the I-5 crossing. Consequently, with the construction of the LPA, idling and brake pad wear are expected to decrease, as would the amount of total copper and other pollutants generated.

1.4 Temporary Effects

Temporary effects are generally associated with construction activities. Therefore, no temporary effects to water quality and hydrology due to project construction would occur as a result of the implementation of the No-Build Alternative. However, there may be temporary effects related to land use changes and traffic projects that are planned within the project area as part of the No-Build Alternative.

Temporary effects of the LPA are those immediate impacts resulting from construction, demolition, and associated activities. Temporary effects would result from construction activities such as soil-mixing, in-water work, ground disturbance, pile driving, demolition of the existing bridge structure, installation of cofferdams and other temporary construction activities. Temporary effects to hydrology include placing obstructions in the water column and altering groundwater flows by pumping during depressed roadway construction. Temporary water quality impacts include turbidity due to sediment disturbance associated with in-water work, toxic contamination due to disturbance of hazardous sediments during in-water work, and toxic contamination due to accidental equipment leaks or spills in the vicinity of project waterways. Temporary effects to stormwater include turbid overland flows due to soil disturbance and installation and maintenance of treatment facilities along the project corridor and in staging and casting areas.

Sediment disturbance during in-water work would result from several components of in-water work. Barges would be used at the Columbia River and North Portland Harbor during new bridge construction and demolition of the existing structure for transportation of materials and waste disposal. Barges would be stabilized by spuds or temporary piles that are driven into the riverbed’s alluvium using pushing or vibratory methods. Temporary piles would also be driven in the alluvium of the Columbia River and North Portland Harbor to support temporary work bridges utilizing vibratory methods. During in-water work, cofferdams would be installed that would contain turbid water produced by the installation of the permanent drilled shafts or permanent piles to support the bridge superstructure. Sediment may be disturbed during the removal of the cofferdams. During the demolition of the existing structures, riverbanks may be disturbed and riverbed sediments would be disturbed when the timber piles of the I-5 bridges and the steel piles of the North Portland Harbor Bridge are either extracted or cut off below the mudline.

There are no known records of contaminated sediments in the Columbia River portion of the project area (USACE 2009). Therefore, there is very little risk that in-water work in the Columbia River would resuspend contaminated sediments. At North Portland Harbor, contaminated sediments have been identified, but they are likely outside of the project footprint. Disturbance to river sediments in general would be minimized by debris removal as opposed to dredging. There would be limited targeted sediment disturbance related to potential removal of riprap or concrete within North Portland Harbor. A diver-assisted clamshell bucket would be used to remove the material. The total amount of material removed would be up to 90 cubic yards over approximately 2,433 square feet occurring up to 7 days during construction. Material would likely be large riprap and concrete; therefore, some disturbance of sediments would occur. If it is found that there is potential for in-water work to disturb contaminated sediments, they would be analyzed in accordance with regulatory criteria, removed from the river, and disposed of properly. Removed sediments would be disposed of in a permitted upland disposal site, if required.

Potential sources of toxic contaminants associated with the proposed action include refueling track-mounted equipment located on the barges or work bridges, lead-based paint from the existing bridge, turbidity and concrete debris from wire-saw-cut concrete during demolition, "green" concrete (concrete that has not fully cured) associated with bridge construction, and potential spills from any construction equipment, and materials accidentally entering the Columbia River and North Portland Harbor during over-water work. Full containment of fuel, other hazardous materials, and green concrete would be required to prevent these materials from entering the Columbia River and North Portland Harbor in accordance with project specifications described in Section 6.3.

Without proper management, land-based construction activities may create temporary adverse effects on water quality in nearby water bodies. Adverse impacts may result from the erosion of disturbed areas, the accidental release of fuels and soluble or water-transportable construction materials, the use of fertilizers, pesticides, and herbicides during restoration activities following construction, and sediment and contaminants migrating to the ground or surface water from pressure or steam cleaning of equipment prior to or following construction activities.

Exhibit 1-4 summarizes the areas that could be disturbed during construction by watershed. The table includes all areas within the LPA right-of-way but does not include potential areas of construction in or over water or additional land that could be required outside the right-of-way for casting or staging. While potential casting and staging sites have been identified, the project is not at the level of design development where such areas can be quantified.

Exhibit 1-4. Areas of Potential Disturbance during Construction

Watershed	Potential Area of Temporary Disturbance
Columbia Slough	105 acres
Columbia River - Oregon	70 acres
Columbia River - Washington State	170 acres
Burnt Bridge Creek	55 acres
Fairview Creek	15 acres

National Pollutant Discharge Elimination System (NPDES) Construction Stormwater Discharge Permits would regulate the discharge of stormwater from construction sites. Currently, standards with regards to turbidity are based on in-stream turbidity increases resulting from construction. New U.S. Environmental Protection Agency (EPA) regulations that are anticipated to be in effect when the project would be constructed require that stormwater discharges meet an effluent standard of 280 NTU. These permits include discharge water quality standards, runoff monitoring requirements, and provision for preparing a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP contains all the elements of a Temporary Erosion and Sediment Control Plan (TESCP) and Spill Prevention Control and Countermeasures Plan (SPCCP). These are described in further detail in Section 6.3.

A recent EPA decision designates the Troutdale Aquifer in the Vancouver region as a Sole Source Aquifer (SSA). This project uses federal funds and must, therefore, produce an SSA report discussing potential groundwater impacts. An SSA report was prepared and submitted to the EPA in 2009.

1.5 Proposed Mitigation

Conservation and mitigation measures would be employed for the LPA so that hydrology, water quality, and stormwater impacts associated with road, bridge, or transit construction are largely avoided or minimized. The LPA would not be constructed until state, federal, and local agencies approve the proposed conservation and mitigation measures. The following summarizes the measures that would be taken to avoid long-term and temporary adverse effects.

1.5.1 Hydrology

The LPA would increase the impervious surface area along the project corridor, which may reduce land infiltration. However, increased infiltration opportunities offered by the project in the form of stormwater facilities are anticipated to be more than double the increase in new, rebuilt, or resurfaced impervious surface area post-project. Furthermore, the extent of impervious surfaces added by the project would be minimized to the greatest extent practicable during the design phase of the CRC project.

Impacts to groundwater hydrology would be minimized by pumping groundwater only where dewatering is necessary to complete construction.

To minimize long-term impacts to hydrology, further hydraulic analysis and a flood-rise analysis for the Columbia River structures would be conducted to ensure that there are no adverse effects of the project to the Columbia River's hydrologic regime. If flood-rise exceeds the allowable limit, the rise would be mitigated through floodplain excavation (cut/fill balance) activities. However, at this time, preliminary calculations indicate that no floodway impacts are expected to occur as a result of construction. Therefore, floodway mitigation is not anticipated.

1.5.2 Water Quality

To minimize long-term effects to water quality, a stormwater conveyance and treatment system would be developed in final design of the LPA. The stormwater design would meet the requirements of ODOT and WSDOT for those portions of the project within DOT right-of-way, and would meet city of Portland and Vancouver regulations for those portions of the project along city-managed roads. In addition, the project has agreed to adopt the requirements of the NMFS for water quality facilities, which means that the project must treat stormwater runoff from the entire CIA regardless of whether it is considered pollutant-generating or whether it is new, rebuilt, resurfaced, or existing impervious surface. If any impervious surface cannot be treated due to geographic constraints, mitigation will be required to offset for water quality impacts to project waterways. Stormwater treatment is discussed in more detail in Section 1.5.3.

Re-vegetation with native plants of construction easements and other areas related to LPA construction would occur after the project is completed. A 5-year monitoring plan of re-vegetated areas would be implemented to ensure the survival of the restored vegetation.

For temporary impacts to water quality, the contractor would prepare a TESCP, and a Source Control Plan would be implemented for all projects requiring clearing, vegetation removal, grading, ditching, filling, embankment compaction, or excavation. The Best Management Practices (BMPs) in the plans would be used to control sediments from all vegetation removal or ground disturbing activities. The TESCP would be implemented to prevent construction water and turbid overland flow from entering receiving waters.

The contractor would prepare a SPCCP prior to beginning construction. The SPCCP would identify the appropriate spill containment materials as well as the method of implementation. Spill containment materials would be kept onsite. All elements of the SPCCP would be available at the project site at all times. Please refer to Section 6.3.3.2 for further detail. The SPCCP would be designed and utilized to prevent the toxic contamination of receiving waters in the project corridor.

Short-term groundwater pumping in depressed road sections may create a cone of depression that increases the risks of contamination from nearby contaminated sites. Sites with existing soil or groundwater contamination near construction areas would be further studied and tested before any groundwater pumping occurs, in order to avoid causing such contamination to spread. For each contaminated site that poses a threat to groundwater quality, remedial actions would be determined and implemented to prevent the spread of contaminants. Design elements may be altered based on site conditions if deemed necessary to prevent contaminant spreading.

During in-water construction in the Columbia River and North Portland Harbor, the LPA would use appropriate BMPs to minimize turbidity and release of pollutants. Disturbance to river sediments would be minimized by debris removal as opposed to dredging. Potential removal of riprap or concrete within North Portland Harbor would be accomplished with a clamshell bucket. In addition, the contractor would prepare a Water Quality Sampling Plan for conducting water quality monitoring for all parts of the LPA occurring in water to ensure that water quality limits are not exceeded as a result of construction. Operation of construction equipment used for in-water work activities would occur from a floating barge, work bridge deck, existing roads, or the streambank (above the ordinary high water line [OHW]) in order to implement proper containment practices. Only the operational portion of construction equipment would enter the active stream channel (below OHW). Process water generated on site from construction, demolition, or washing activities would be contained and treated to meet applicable water quality standards before entering or re-entering surface waters. Section 6.3.3.4 provides more detail.

1.5.3 Stormwater

A conceptual stormwater management approach has been developed that specifies the stormwater treatment and flow control necessary to minimize long-term stormwater impacts from the LPA. Stormwater treatment is summarized for each of the receiving waters below. Flow control is required for both Burnt Bridge and Fairview creeks.

For the Columbia Slough drainage, water quality facilities are proposed for the majority of 51.6 acres of new, rebuilt, and resurfaced PGIS (0.3 more acres for Option B), 4.3 acres of new sidewalk and bike/pedestrian paths, and 2.1 acres that currently comprises the existing bridge over North Portland Harbor. Runoff from the bridge currently drains via scuppers to the water surface or ground below. At this time, no options have been identified to treat runoff from about 7.1 acres of new and resurfaced I-5 impervious surface immediately north of Victory Boulevard. The primary issue is that the proximity of the outfall in this location to the highway embankment does not leave adequate space to construct a water quality facility such as a bioretention pond or swale. As design work progresses, the project team will continue to develop and evaluate options to treat runoff from this area.

For the LPA footprint on the Oregon side of Columbia River, water quality facilities are proposed for about 52.8 acres of the PGIS area (0.4 more acres for Option B) and for approximately 2.2 acres of existing PGIS. Water quality facilities are also proposed for 7.6 acres that consists of the new bicycle and pedestrian path across Hayden Island, sidewalks, and light rail transit guideway, all of which are non-PGIS.

For the LPA footprint on the Washington side of the Columbia River, water quality facilities are proposed for approximately 97.8 acres of new and rebuilt PGIS and 36.9 acres of resurfaced and existing PGIS. Water quality facilities are also proposed for 13.3 acres of new sidewalks and bike-pedestrian paths and 5.0 acres of existing non-PGIS.

Within the Burnt Bridge Creek drainage, two new bioretention ponds are proposed to treat runoff from approximately 8.2 acres of new, rebuilt, and resurfaced PGIS, 1.9 acres of existing PGIS, and 0.2 acres of new non-PGIS sidewalks and bike-pedestrian paths. An existing infiltration pond at the Main Street interchange would not be modified by the construction of the LPA. The LPA would reduce the total impervious surface draining to this facility by about 1.7 acres.

Within the Fairview Creek drainage, redevelopment of the Ruby Junction facility would result in a net decrease in impervious area of 0.5 acres. Since the City of Gresham's requirements for stormwater treatment and flow control would need to be met, runoff from impervious areas would be either infiltrated or treated to reduce pollutants of concern before being released to Fairview Creek.

To minimize temporary effects to stormwater, a TESCP and SPCCP would be designed and implemented throughout the construction of the LPA. These are summarized above in Section 1.7.2 and further detail is included in Section 6.3.3.

2. Methods

2.1 Introduction

This evaluation has been applied two geographic study areas for determining environmental effects: the primary area of potential impact (API) and secondary APIs. The primary API addresses direct temporary and long-term impacts. The secondary API addresses indirect impacts primarily related to traffic flow and development patterns. The secondary API is addressed in the Indirect Effects Technical Report included in the FEIS.

2.2 Study Area

The evaluation of the direct effect on water quality and hydrology for the LPA applied one geographic study area for determining environmental effects: the primary API (Exhibit 2-1), which was then divided into receiving waters: the Columbia Slough, Columbia River and North Portland Harbor, Burnt Bridge Creek, and Fairview Creek.

2.2.1 Primary API

The primary API is the area where direct impacts from construction and operation of proposed project alternatives would occur. Most physical project changes would occur in this area, although mitigation could still occur outside of it.

As currently defined, the primary API extends about five miles from north to south. It starts north of the I-5/Main Street interchange in Washington, and runs south to the I-5/Victory Boulevard interchange in Oregon. North of the river, the API expands west into downtown Vancouver, and east near Clark College to include potential high capacity transit alignments and park and ride locations. Around the actual river crossing, the eastern and western sides each extend 0.25 miles from the I-5 right-of-way. South of the river crossing, this width narrows to 300 feet on each side.

2.2.2 Ruby Junction Maintenance Facility

Ruby Junction is an existing TriMet Operations and Maintenance Facilities located in Gresham, Oregon, along NW Eleven Mile Avenue and south of E Burnside (Exhibit 2-2). This facility would be expanded by approximately 10.4 acres over several construction phases to support additional LRVs required by the proposed CRC and Portland-Milwaukie Light Rail projects. Portions of three of the 14 parcels that would be added to the maintenance facility are located within the 100-year floodplain of Fairview Creek. This site is not part of the primary API but is discussed in this technical report in terms of the effects on Fairview Creek due to the expansion of the facility.

2.2.3 Watersheds

Watersheds (or portions of watersheds) have been used as the fundamental geographic area for the evaluation of project alternatives. Water bodies and their associated watersheds located in the primary and secondary APIs demonstrate varying levels of water quality, different designated uses, and various management scenarios.

Waterbodies and their drainage areas were delineated using GIS data, Gazetteer maps (DeLorme 2004), information from local governments, the Ecology Watershed Planning Program, local drainage districts, and the Columbia Slough Watershed Council.

Watersheds and sub-watersheds that would be directly affected by project construction and generated runoff are those found in the primary API and near Ruby Junction and include: Columbia Slough, Columbia River (which includes North Portland Harbor), the Columbia Slope (which drains directly to the Columbia River), Burnt Bridge Creek, and Fairview Creek.

Watersheds and sub-watersheds that may be indirectly affected by project operation and potential growth-inducing impacts are found within the secondary API and include: Willamette River, Columbia Slough, Columbia Slope, and Burnt Bridge Creek.

2.2.4 Contributing Impervious Area

The CIA, which encompasses both PGIS and non-PGIS, includes new and rebuilt impervious surfaces created by the project and existing impervious areas that would contribute runoff to those newly created surfaces. The CIA does not include runoff from impervious areas outside the project footprint that flow through the project to outfalls that would not be modified by the project.

The total CIA for the project is estimated to be 298 acres and comprises:

- Approximately 204 acres of new and rebuilt PGIS created by the project within the project footprint. Runoff from about 201 acres would be treated or infiltrated.
- Approximately 34 acres of existing PGIS within the project footprint would be resurfaced. Runoff from approximately 29 acres would be treated or infiltrated.
- Runoff from approximately 4 acres comprising the existing North Portland Harbor Bridge would be directed to new water quality facilities at the adjacent interchanges.
- Runoff from about 29 acres of existing PGIS would contribute stormwater runoff to the project from outside the footprint. All 29 acres would be treated or infiltrated by project stormwater treatment facilities.
- Approximately 26 acres of new non-PGIS exclusive light rail guideway, bike-pedestrian paths and sidewalks would be created within the project footprint and approximately 5 acres of existing non-PGIS outside the project footprint would contribute runoff to the project primarily via gutter flow. Runoff from the whole 31 acres of non-PGIS area would be treated or infiltrated in project stormwater treatment facilities.

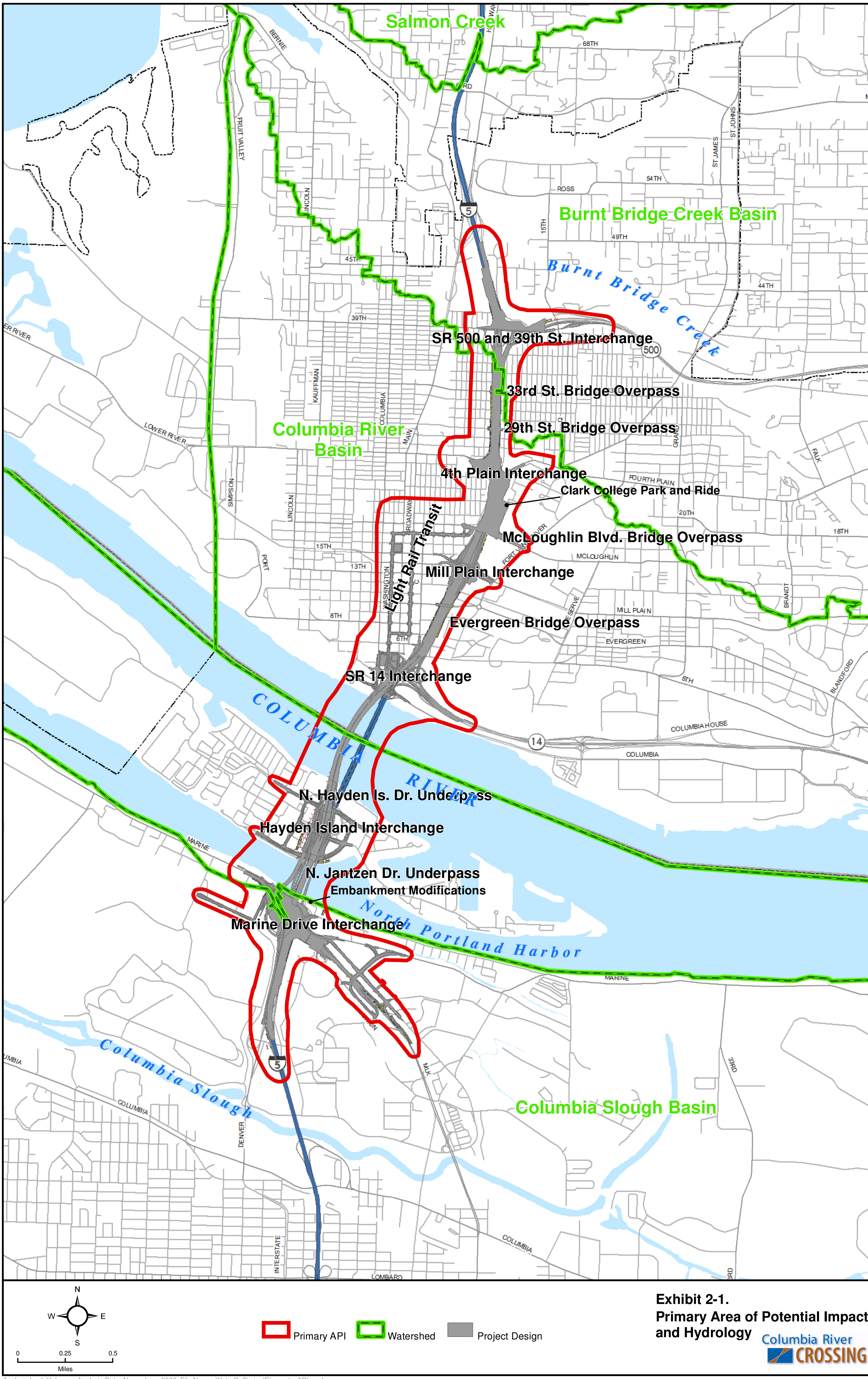

Exhibit 2-1.
Primary Area of Potential Impact and Hydrology

Columbia River CROSSING

Analysis by J. Koloszar; Analysis Date: November - 2009; File Name: WaterQ_ProjectElements_API.mxd

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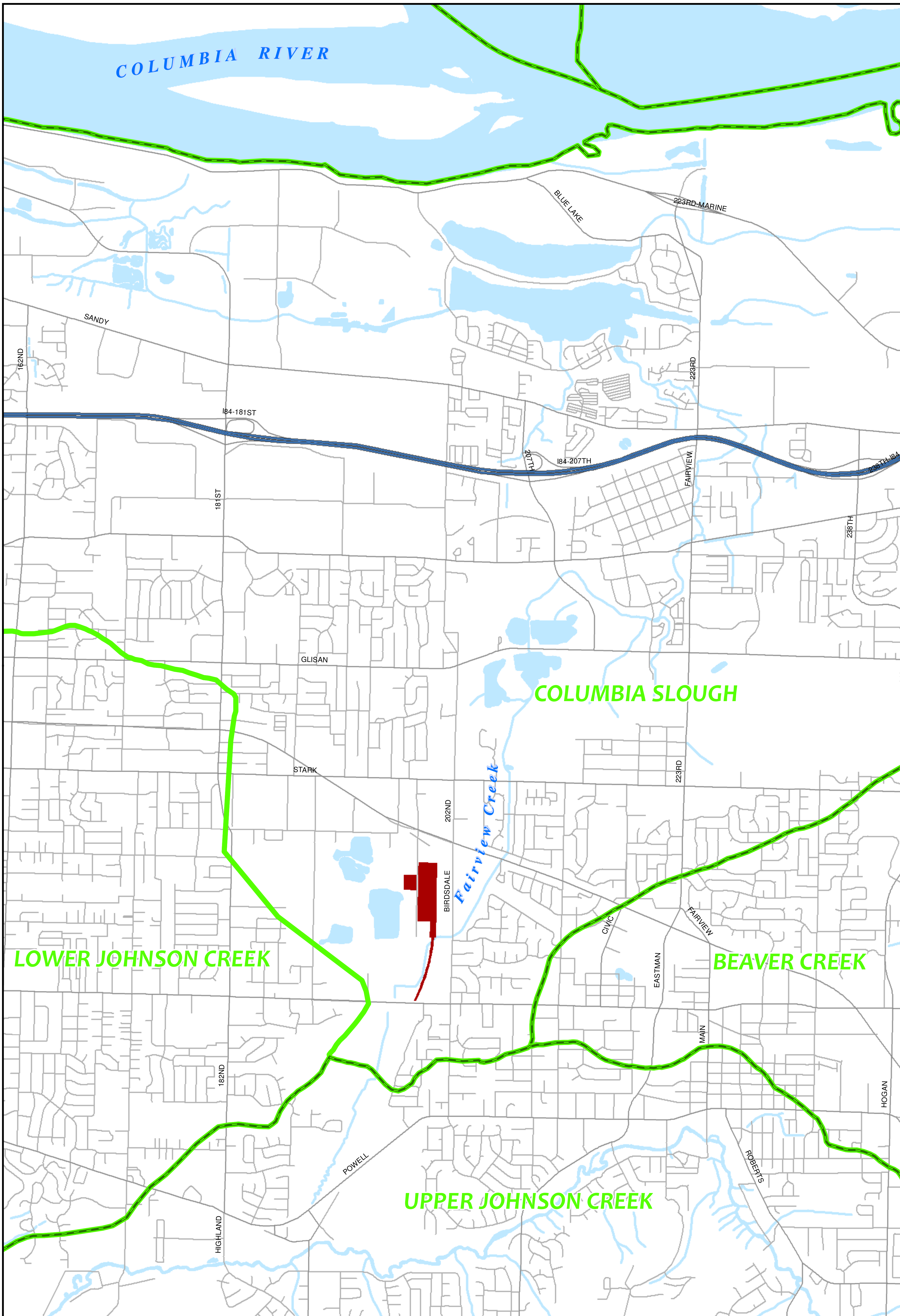

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Primary API
Standard Secondary API
Watershed
Ruby Junction

Exhibit 2-2.
Ruby Junction Maintenance Facility and Hydrology

Columbia River CROSSING

Analysis by J. Koloszar; Analysis Date: January - 2011; File Name: WaterQ_RubyJunction.mxd

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2.3 Effects Guidelines

The following guidelines from the Federal Transit Administration (FTA) were used to evaluate both water quality and stormwater system impacts:

1. If the proposed project would violate a National Pollutant Discharge Elimination System (NPDES) permit for stormwater discharges;
2. If the proposed project is likely to contaminate surface or ground waters that would result in an exceedance of federal, state, or local water quality standards;
3. If the proposed project is noncompliant with an approved Water Quality Management Plan or Total Maximum Daily Load (TMDL); or
4. If the proposed project area would become flooded or induce flooding as a result of stormwater increases or floodplain constriction.

2.4 Data Collection 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 project team used the following methods and data sources to identify existing conditions and provide the required information for the alternatives analysis.

1. The following studies and plans from local, state, and federal agencies were obtained and reviewed. Those sources identified with an asterisk were found to be the most useful sources of information given their comprehensiveness, more recent data, and overall reliability. Sources included the following:
    - *Burnt Bridge Creek Water Quality Data Trend Analysis, 1998
    - Burnt Bridge Creek Regional Wetland Bank and Greenway Trails Project Biological Evaluation, 2003
    - Burnt Bridge Creek Water Quality Monitoring Report, 1994
    - Burnt Bridge Creek TMDL Quarterly Progress Reports, 2008
    - Burnt Bridge Creek Water Quality Monitoring – Quality Assurance Plan, 2008
    - Comprehensive Conservation and Management Plan for the Lower Columbia River, 1999
    - Columbia Slough Background Report, 1989
    - Columbia Slough Implementation Plan, 1992
    - *Columbia Slough TMDL, 1998
    - *Columbia Slough Revitalization Report and Program EA, 1995
    - Columbia Slough Sediment Project Annual Report, 2006
    - Columbia Slough Watershed Action Plan, 2003
    - *Columbia Slough Watershed Characterization, 2005
    - Columbia Slough Watershed Water Quality Technical Report, 2003
    - Columbia River Crossing Hydrographic and Geophysical Investigation: High Resolution Bathymetric Mapping, River Bed Imaging and Subbottom Investigation, 2006

- Environmental Contaminants and their Effects on Fish in the Columbia River Basin, 2004
- Columbia River Basin National Stream Quality Accounting Network (NASQAN) Program
- Columbia Slope Basin Comprehensive Stormwater Management Plan, 1993
- Columbia River Estuary Water Quality Data, 2006
- Interim Salmon Recovery Plan for the Lower Columbia River Subbasin
- Water Quality of the Lower Columbia River Basin: Analysis of Current and Historical Water-Quality Data through 1994, 1996
- Total Dissolved Gas TMDL for the Lower Columbia River, 2002
- TMDL for 2,3,7,8-TCDD in the Columbia River Basin, 1991
- ESA Recovery Planning for Salmon and Steelhead in the Willamette and Lower Columbia River Basins, 2005
- City of Portland Watershed Management Plan, 2005
- U.S. Geological Survey (USGS) NASQAN Program water quality data for the Columbia Basin
- Lower Columbia River Bi-State Water Quality Program – The Health of the River 1990-1996 Integrated Technical Report, 1996
- Water-quality data, Columbia River Estuary, 2004-2005: USGS Data Series 213
- Biomonitoring of Environmental Status and Trends (BEST): Environmental Contaminants and their Effects on Fish in the Columbia River Basin, 2004
- Portland International Raceway Natural Resources Management Plan
- Ducks Unlimited/City of Portland Science Fish and Wildlife Program
- Willamette River Basin Water Quality Study – Oregon Department of Environmental Quality, 1995
- Washington State's Water Quality Assessment [303(d)], Washington Department of Ecology
- Oregon's 2004/2006 Integrated Report Online Database, Oregon Department of Environmental Quality

2. The project team reviewed maps and GIS data, including those showing topography, soils, and floodplains during the analysis used to develop the DEIS.
    - *Infrastructure*: This information was used to develop impervious area estimates and evaluate runoff potential from project alternatives.
    - *Topography*: Topographic maps were used to delineate drainages in areas where as-built and infrastructure records providing drainage information were not available.
    - *Flood Insurance Rate Maps (FIRM, Floodway Maps, and flood insurance study reports)*: This information was used to identify 100-year floodplains and floodways located in the project's APIs.

- *Land use maps.* The project team coordinated with land use map reviews conducted as part of the Land Use Technical Report to obtain necessary information regarding land use in each of the project area watersheds.

3. The project team reviewed available water quality characterization studies, Section 303(d) listings, TMDLs, municipal water quality management plans and regulations, and other water quality, water quantity, and floodplains data to determine if streams located in the project area would be affected directly or indirectly by the proposed alternatives. Specific data reviewed includes the following:
   - Existing and proposed drainage patterns at the proposed project site.
   - Designated beneficial uses of project area streams.
   - Water quality status in project area receiving waters including existing and anticipated 303(d) listings, TMDLs, and Water Quality Management Plans.
4. The project team reviewed the conceptual stormwater design, which proposes how stormwater may be conveyed, treated, and discharged.
5. The project team consulted with local, state, and federal water quality and stormwater agency representatives and interested parties.
6. The project team made field visits to project area waterways, road alignments and stormwater outfall locations. During site reconnaissance surveys, the project team collected data on existing conditions of project area waterways and existing stormwater facilities and proposed locations for such facilities.
7. The project team calculated new and existing impervious surfaces using CAD and GIS mapping.
8. The project team calculated total disturbed area related to both in-water and out-of-water construction to assess short-term impacts.

Annual pollutant load estimates were conducted using *Method 1: WSDOT Data-FHWA Method* as outlined in the Washington State Department of Transportation's (WSDOT) guide entitled "Quantitative Procedures for Surface Water Impact Assessment (WSDOT 2009a)." This method was selected because it provides estimates of pollutant loading for a wide range of ADT volume highways (1,700-93,000) using data derived from observations made on highways in Western Washington since 2001. It is directly applicable to the project location and is based on recently collected WSDOT data. Existing impervious area data was obtained from CRC's Stormwater Management Technical Memorandum (Appendix A).

2.5 Analysis Methods

2.5.1 Long-term Operational Impacts

Beneficial and adverse potential long-term operational impacts of the project alternatives on drainage systems and surface and ground water resources for the duration of the project were determined by analyzing and reviewing the following:

- *Floodplain Impacts*. Floodplain impacts of the various alternatives were compared by estimating the approximate footprint of each alternative in local floodplains (e.g., loss of storage) and the extent of potential conveyance constrictions created by bridge crossings.
- *Stream Shading Impacts*. The location and extent of vegetation removal within 50 feet of a waterway was considered for each alternative.

- *Groundwater Infiltration Impacts*. Increased impervious area can result in reduced groundwater recharge which in some cases can impact groundwater. For this project these impacts are minor. They were assessed by accounting for the total area of impervious surface over land resulting from new construction. Bridge segments directly over North Portland Harbor and the Columbia River were not included in the impervious tally for this particular impact analysis. Impervious surface area was further distinguished by drainage basin.
- *Surface Water Quality Impacts*. Long-term surface water quality impacts were assessed based on comparisons of impervious surface areas requiring stormwater collection and by proximity to surface waters. Roadway located underneath another roadway, such as an overpass, was not included in the total for impervious surface area for the impact analysis in the DEIS. However, because these roadways are pollutant-generating, they were added to the impact analysis for the FEIS. Where new construction replaces existing impervious surface, the effectiveness of treating the existing road runoff was accounted for. Existing runoff characteristics were determined from topographic maps and field observations. The drainage basins for the impervious discharge of additional runoff were determined to assess the extent of interbasin transfers of stormwater runoff. A pollutant load analysis was performed for key constituents found in road runoff using *Method 1: WSDOT Data-FHWA Method*. Potential erosion impacts were assessed through examination of topographic maps, proximity of ground disturbance to drainage channels/streams, and vegetation loss.
- *Groundwater Quality Impacts*. Long-term groundwater impacts were assessed generally in all areas affected by construction and more specifically in those areas lying in proximity of federal, state, and locally designated groundwater/wellhead protection zones.
- *Existing Drainage System Constraints*. Local jurisdictions were contacted for information about existing drainage system constraints.
- *Beneficial Impacts*. Since stormwater treatment would be provided in areas not currently receiving treatment, beneficial impacts are discussed.

2.5.2 Short-term Construction Impacts

Construction activities can impact surface water quality by allowing increased erosion, disturbing the banks and beds of water bodies, discharging construction materials and chemicals accidentally, and removing shading vegetation.

Groundwater quality could be affected by direct infiltration of contaminants during below-grade construction and by infiltration of contaminated surface water.

Potential short-term construction impacts were determined by evaluating the total area of demolition and construction activities of each project alternative, the total area of below-grade construction for each alternative, and implementation of impact minimization measures.

The short-term construction analysis focuses on the:

- Area of total disturbance;
- Impacts from fine sediment and contaminants (such as hydraulic oil, fuel, etc.);
- Erosion/soil characteristics;
- Streambank/slope steepness; and
- Amount of in-water work.

2.6 Coordination

The CRC project team, together with state and federal resource agencies, FHWA and FTA, formed the Interstate Collaborative Environmental Process (InterCEP) Agreement, in order to coordinate various state and federal environmental regulatory issues through the National Environmental Policy Act of 1969 (NEPA) process. Through the InterCEP, coordination with representatives of Oregon Department of Environmental Quality (DEQ), Ecology, and the EPA, among others, occurred over several meetings between 2005 and the present.

The InterCEP process also gave these agencies the opportunity to review and comment on, and ultimately concur with project Evaluation Criteria used to screen alternatives, and the Range of Alternatives carried into the DEIS and FEIS.

On July 7, 2009, a meeting at the CRC office in Vancouver, Washington was held to discuss the FEIS LPA design and provide a coordination opportunity for FEIS technical report writers and their ODOT and WSDOT technical reviewers. The goals of the discussion about the LPA design, was to note changes from the LPA design included in the DEIS.

On July 14, 2010, the CRC team met with agency representatives from the DEQ and NMFS to discuss the appropriate guidance to use for designing the project's stormwater facilities in order to gain NMFS approval and Clean Water Act 401 Certification from DEQ. As a result of this meeting and further coordination with these agencies, the approach to stormwater treatment was changed and treatment of nearly the entire CIA was incorporated into the project design.

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3. Affected Environment

3.1 Introduction

Resources in the CRC project area are divided into two APIs, primary and secondary. The secondary API is discussed in the Indirect Effects Technical Report included in the FEIS. For purposes of this technical report, the API is further broken down by receiving waters. The following discussion describes the baseline conditions of those receiving waters in terms of hydrology, water quality, and stormwater.

3.2 Regional Conditions

3.2.1 Surface Water Hydrology

The Columbia River and North Portland Harbor dominate the topography of the project area. The North Portland Harbor is part of the same body of water as the Columbia River; it is named differently to distinguish that part of the water body south of Hayden Island (North Portland Harbor) from that part of the water body north of the island (Columbia River). The project corridor lies within the Columbia River main valley, with the exception of a small area north of the SR 500 interchange that is located in the Burnt Bridge Creek watershed (Exhibit 2-1). Burnt Bridge Creek flows into Vancouver Lake before discharging to the Columbia River. In addition, runoff from the Delta Park area between North Portland Harbor and the lower Columbia Slough, which used to be part of the Columbia River floodplain, is now discharged to the lower Columbia Slough via pump stations. The Columbia Slough is part of the Lower Willamette River watershed.

The Ruby Junction maintenance facility that would be expanded as part of the project is located in Gresham, Oregon, east of the project corridor. Some of the parcels included in the expansion lie within the 100-year floodplain of Fairview Creek. Fairview Creek discharges into the upper Columbia Slough further downstream of the maintenance facility.

Project area elevations vary from approximately 10 feet in the Columbia River floodplain south of North Portland Harbor to about 220 feet at the drainage divide between the Columbia River and Burnt Bridge Creek valleys. South of the Columbia River, the project is located entirely in a relatively flat and low-lying floodplain. Drainage within the floodplain is not well-defined, and the Columbia Slough, which is located parallel to the Columbia River floodplain, actually discharges into the Willamette River. North of the Columbia River, the project corridor is located within the gently sloped river valley.

The secondary API for the project contains eight mapped surface water features (Exhibit 2-1). Three of these surface waters, including the Columbia Slough, Columbia River, and Burnt Bridge Creek, lay within the drainage area of the main project area and would receive project runoff directly. Both Burnt Bridge Creek and the Columbia Slough ultimately drain to the Columbia River. Therefore, any hydrologic or water quality impacts within these drainages may lead to a long-term effect on the Columbia River.

Exhibit 3-1 shows the average monthly discharges for each of these watercourses based on data available from USGS gaging stations. The information provides an indication of the relative size of each waterbody and permits a comparison of estimated project runoff with discharges in waterbodies receiving that runoff.

Exhibit 3-1. Average Monthly Discharge (cubic feet per second) of Receiving Waters

Month	Columbia Slough at Portland (USGS 14211820)[a]	Columbia River at Vancouver (USGS 14144700)[b]	Burnt Bridge Creek near Mouth (USGS 14211902)[c]
January	162	156,000	46
February	151	163,000	53
March	135	170,000	39
April	85	204,000	21
May	29[d]	286,000	19
June	65[e]	415,000	14
July	79	291,000	9.1
August	74	153,000	7.4
September	63	117,000	7.0
October	96	116,000	9.8
November	112	122,000	34
December	123	138,000	41

a USGS 2010a.
b USGS 2010b.
c USGS 2010c.
d Average monthly reverse flow from the Willamette River was recorded in 1997, 2006, and 2008.
e Average monthly reverse flow from the Willamette was recorded in 1990.

North Portland Harbor, a branch of the Columbia River, and the Columbia River mainstem are the only watercourses that cross under I-5 within the primary API. Burnt Bridge Creek crosses I-5 north of the primary API.

Federal Emergency Management Agency (FEMA) designated floodplains located within the project's primary API include the Columbia Slough, the Columbia River, and Burnt Bridge Creek (Exhibit 2-1). As shown, these floodplains are confined to the immediate vicinity of project streams due to levees, or in the case of Burnt Bridge Creek, steeper slopes.

3.2.2 Local Climate

The climate within the project area is characterized by short, dry and warm summers, with a typically cool and wet spring, fall, and winter. The Coast Range offers limited shielding from the Pacific Ocean storms while the Cascades provide an orographic lift of moisture-laden westerly winds, resulting in moderate rainfall. Nearly 90 percent of the average annual rainfall of 36.3 inches occurs from October through May. The maximum 24-hour rainfall of 4.44 inches occurred in October 1994. Snowfall accumulations are rarely more than 2 inches, and usually melt within a couple of days (NOAA 2009). The 2-year, 24-hour rainfall event that is utilized as a water quality design storm is 2.5 inches (NOAA 1973) for the City of Portland.

Average monthly temperatures taken at Portland International Airport (PDX) vary from 39.6 ºF in January to 68.6 ºF in August. The maximum and minimum recorded temperatures are 107 ºF and -3 ºF. These temperatures occurred in August 1981 and February 1950, respectively. Surface winds seldom exceed sustained wind speeds of 50 mph and have rarely exceeded 75 mph (NOAA 2009).

3.2.3 Groundwater

Within the Portland Basin Aquifer System on the Oregon side of the project corridor, the project area is located on the unconsolidated sedimentary aquifer of the upper sedimentary subsystem (McFarland and Morgan 1996). This aquifer consists primarily of late Pleistocene catastrophic flood deposits and Columbia River alluvium. Recharge of the aquifer is primarily by direct infiltration of precipitation, though injection wells and wastewater from septic systems are locally important. Median hydraulic conductivity (the rate at which groundwater flows through soil and bedrock) of the aquifer is high, approximately 200 feet per day.

South of the Columbia River, several wells have been identified within the primary API and are likely screened within the unconsolidated sedimentary aquifer. These wells are used for a variety of industrial, irrigation, and municipal purposes. For further details on these wells, refer to the Section 4.6 of the Geology and Soils Technical Report.

North of the Columbia River, the I-5 corridor and other project facilities are underlain by the unconsolidated sedimentary aquifer and the Troutdale Aquifer. The Troutdale Aquifer is a water supply for the City of Vancouver and has been designated by the EPA as an SSA. An SSA is an aquifer "which supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer, and for which there is no alternative source or combination of alternative drinking water sources which could physically, legally and economically supply those dependent upon the aquifer." Under this designation, proposed federal financially assisted projects which have the potential to contaminate the aquifer are subject to EPA notification and review. Therefore, an SSA report for the project was already prepared and submitted to the EPA in 2009.

Consistent with the SSA designation and with critical areas management dictated by Washington state law, Special Wellhead Protection Areas have been designated within the Washington portion of the project. As shown in Exhibit 3-2 "contribution" zones are delineated based on the amount of time that groundwater contamination would take to spread into each zone. There are two Special Wellhead Protection Areas within the secondary API and one that overlaps with the primary API.

The City of Vancouver has designated the entire area within the city boundary as a Critical Aquifer Recharge Area. Therefore, certain actions are prohibited and are listed in the Vancouver Municipal Code (VMC) 14.26.120. These actions include such things as hazardous material municipal waste disposal. Exhibit 3-2 shows the two Special Wellhead Protection Areas designated by Vancouver, one of which overlaps with the primary API. These areas are surrounded by 1,000- and 1,900-foot buffers and are subject to the prohibitions of the Critical Aquifer Recharge Area. In addition, the Special Wellhead Protection Areas are subject to further provisions.

3.2.4 Relevant Land Use Issues

South of the Columbia River, land west and east of I-5 between Victory Boulevard and North Portland Harbor generally has an Industrial and Open Space zoning designation, respectively. On Hayden Island, land in the vicinity of the project corridor is zoned Commercial.

North of the Columbia River, areas on the west side of I-5 have extensive residential and commercial development. Pearson Field, Clark College, and Fort Vancouver Historic Reserve, which are low density developments, are located east of I-5, between SR 14 and Fourth Plain Boulevard.

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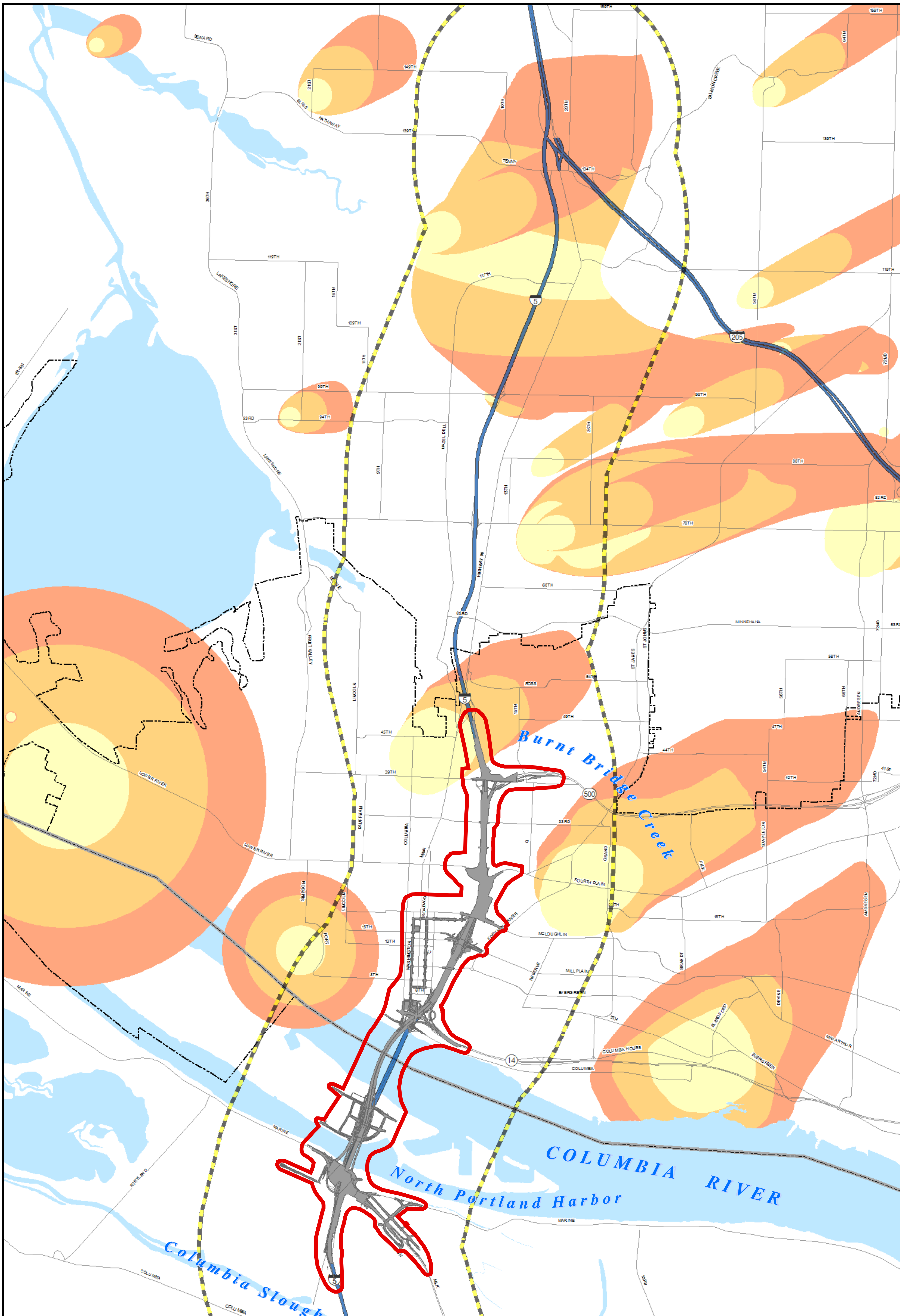

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- Project Design
- Primary API
- Standard Secondary API
- Special Wellhead Protection Areas
- Zone of Contribution Year 1
- Zone of Contribution Year 5
- Zone of Contribution Year 10

Exhibit 3-2.
Wellhead Protection Zones

Columbia River CROSSING

Analysis by J. Koloszar; Analysis Date: January, 2011; File Name: WaterQ_WellheadProtection.mxd

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3.2.5 Storm Drainage

In general, continuous curbs and concrete barriers confine runoff from I-5 to the highway, and closed (pipe) drainage systems convey flows to surface water outfalls. Runoff from the bridges across North Portland Harbor and Columbia River drains through scuppers to the water surface or ground below.

The intent of project stormwater management strategies is to reduce the potential impact on water quality and discharge from project-related changes in impervious area. Existing stormwater treatment within the project's drainage area occurs in only a few areas. At the Victory Boulevard interchange there is currently a stormwater quality manhole that reduces sediment load in runoff in the Columbia Slough drainage area. Sediment reduction alone would not provide adequate reduction in pollutants (especially dissolved metals reduction) to meet the requirements of the DEQ and the City of Portland for the Columbia Slough. For this reason, stormwater runoff from the impervious area served by the manhole is not considered to be treated as the site currently exists. An infiltration pond in the Burnt Bridge Creek drainage area reduces sediment, metals (includes dissolved metals) and other pollutants from runoff, which is considered to be adequate treatment. However, overflows from this infiltration pond are discharged to a wet pond in this vicinity that provides only sediment reduction (Appendix A). Therefore, the wet pond is not considered to be adequate stormwater treatment. Exhibit 3-3 shows the existing conditions of the stormwater treatment along the project corridor by watershed.

Exhibit 3-3. Existing Stormwater Drainage

Receiving Waterbody	Location Along the LPA Corridor	Total Impervious Area	Impervious Area Infiltrated	Treated Impervious Area Draining to Outfall(s)	Untreated Impervious Area Draining to Outfall(s)
Columbia Slough	Victory Boulevard interchange to the Southwest Marine Drive interchange	44.4	3.0	0.0	41.4
Columbia River – Oregon State	Marine Drive west of I-5 to the Columbia River bridges	62.4	0.0	0.0	62.4
Columbia River – Washington State	Columbia River bridges to Downtown Vancouver	132.9	3.0	0.0	129.9
Burnt Bridge Creek	I-5 near SR 500	16.5	14.5	0.0	2.0
Fairview Creek	Ruby Junction Maintenance Facility	16.8	15.3	1.5	0.0
	Totals:	**273.0**	**35.8**	**1.5**	**235.7**

Note: Table Information provided in Appendix A, Stormwater Management Technical Memo.

3.3 Watersheds within the Affected Area

3.3.1 Columbia Slough

The Columbia Slough is a slow-moving, low-gradient drainage channel running nearly 19 miles from Fairview Lake in the east to the Willamette River in the west. The Slough is a remnant of the historic system of lakes, wetlands, and channels that dominated the south floodplain of the Columbia River. The Slough and areas to its north are now intensively managed to provide drainage and flood control with pumps, weirs, and levees (CH2M HILL 2005). The Columbia Slough Watershed drains approximately 37,741 acres of land in portions of Troutdale, Fairview, Gresham, Maywood Park, Wood Village, and Multnomah County. The Slough and surrounding area was historically used by Native Americans for fishing, hunting, and gathering food (BES 2006).

In July 2005, an ROD was issued in regards to a cleanup program devised by the DEQ and the City of Portland. The Columbia Slough Sediment Program aims to remediate widespread sediment contamination through source control contamination reduction, contaminant removal by dredging “hot spots,” and long-term monitoring to ensure the program’s effectiveness (BES 2006). On October 4, 2010, a news release was published stating that the DEQ and the City of Portland have agreed to extend the cleanup program through 2015. This program includes specific tasks to control sources of pollution, treat stormwater runoff, and clean up contaminated sediments in the Lower Columbia Slough, Whitaker Slough, and Buffalo Slough. DEQ has also signed agreements with ODFW and the Multnomah County Drainage District in regards to cleanup activities in the Columbia Slough (DEQ 2010).

The Slough is divided into upper, middle, and lower reaches. The Upper and Middle Sloughs receive water inputs from Fairview Lake, groundwater, and stormwater from PDX and other industrial, commercial, and residential neighborhoods in the surrounding area. Flows and water levels in the Upper and Middle Sloughs are managed to ameliorate low dissolved oxygen issues, while allowing for withdrawals, flood control, and recreation (City of Portland 2009).

The project area crosses the Lower Slough at river mile (RM) 6.5 (CH2M HILL 2005). The Lower Slough extends from the Peninsula Drainage Canal to the Willamette River, less than 1 mile south of its confluence with the Columbia River. It experiences from 1 to 2 feet of tidal fluctuation in its water surface elevation. Water levels are generally unmanaged, but are affected by the management of the dams on the Columbia and Willamette Rivers. The channel bottom in the Lower Slough ranges from elevation 2.0 to 4.5 feet NGVD and the water surface elevation has been known to be as low as 3.1 feet NGVD and as high as 28.8 feet NGVD (USGS 2010a). The channel is generally between 100 and 200 feet wide. The Lower Slough receives water inputs from combined sewer overflows, stormwater, Smith and Bybee Wetlands, leachate from the St. John’s Landfill, and the Upper Columbia Slough (City of Portland 2009). The majority (99 percent) of combined sewer overflows to the Columbia Slough have been controlled. However, thirteen combined sewer overflow outfall pipes remain, and may overflow into the Columbia Slough once every 10 years in summer and once every five years in winter on average (BES 2010).

The I-5 crossing of the Columbia Slough is in a highly urbanized area. Riparian habitat along the Slough has been largely replaced by buildings and paved surfaces, though grasses, trees, and shrubs are present, especially along the south bank. However, riparian areas along the Slough are generally not adequate to provide shade, bank stabilization, sediment control, pollution control, or streamflow moderation. The predominant land use around the Slough in the project vicinity is light industrial, with some residential. The Slough connects to the Willamette River approximately 6.5 miles west of the project area, within a mile of the confluence of the Columbia and Willamette Rivers (City of Portland 2009).

Historically, the Columbia Slough consisted of multiple channels in a braided floodplain of wetlands, lakes, and waterways. However, much of the Slough’s wetland habitat has been filled, dredged, channelized, and/or degraded by current and past land uses. There are remnant wetlands and restored wetland in the Slough watershed that provide some thermoregulation and nutrient removal. DEQ has listed irrigation, domestic and industrial water supply, livestock watering, anadromous fish passage, salmonid fish rearing, salmonid fish spawning, resident fish and aquatic life, wildlife and hunting, fishing, boating, water contact recreation, aesthetic quality, and hydropower as beneficial uses of the Columbia Slough (City of Portland 2009).

3.3.1.1 Hydrology

The Columbia Slough area is highly urbanized and contains a complex system of roadways, including I-5, state highways, local access roads, residential streets, parking lots, and other impervious surface. The Columbia Slough has undergone profound hydrologic alteration. Originally, the Columbia Slough was a side channel of the Columbia River. Today, the Columbia Slough's original inlet is blocked at the upstream end, and it no longer receives flows from the Columbia River. Numerous dikes, pumps, and weirs regulate flows to, from, or within in the stream.

The USGS monitors flows of the Columbia Slough within the Lower Slough at RM 0.6. Average discharge recorded by USGS during the 7 years of the most recent monitoring, ending in 2008, was 97.8 cubic feet per second (cfs). Maximum daily discharge occurred December 5, 1995 and was 2,400 cfs. Minimum daily discharge occurred February 7, 1996, and was 6,700 cfs. Flows of the Lower Slough are tidally influenced. Average monthly discharges are shown in Exhibit 3-1. Tides can cause flow direction to be reversed (USGS 2008a). The levee (at RM 8.5) between the Lower Slough and Middle Slough prevents reverse flows from entering the Middle Slough (BES 2009). Above the Lower Slough flows are regulated by piped water, levees, and pumps (BES 2010).

3.3.1.2 Water Quality

The City of Portland Bureau of Environmental Services (BES) has undertaken intensive water quality monitoring on the Columbia Slough since 1994. BES collects water quality data from three sites in the Lower Slough, including continuous measurements of temperature, pH, dissolved oxygen, and conductivity.

DEQ placed the Slough on the state's 303(d) list in 1994/1996. The Columbia Slough is 303(d) listed for lead, iron, manganese, and temperature. TMDLs have been established for pH, dissolved oxygen, phosphorous, chlorophyll *a*, bacteria, lead, PCBs, DDE/DDT, dieldrin, and dioxin (DEQ 1998, DEQ 2010).

<u>Temperature</u>

Although there is no established TMDL for temperature in the Columbia Slough, a draft Columbia Slough TMDL is in preparation (BES 2005). This draft TMDL applies a 20.0ºC salmonid rearing criterion to the Lower Slough, which is hydrologically connected to the Willamette River. Water temperature in the Lower Slough does not meet this standard during the summer. The main cause of elevated water temperatures is likely the installation of levees which alter the Slough's physical features. Elevated water temperatures are also likely due to the lack of shade sources, long water residence time in a shallow channel, the altered hydrological cycle with reduced aquifer recharge and groundwater inflow during summer months, and tidal influence from the Willamette River (bringing cooler water in the summer and warmer water in the fall and early winter) (City of Portland 2009).

Sediment/Turbidity

The in-stream target for total suspended solids (TSS) is 25 mg/L in the Columbia Slough, calculated from a DEQ-established benchmark of 50 mg/L of TSS for stormwater discharges to the Slough (NPDES 1200-COLS permit). Downstream of the project vicinity, in the Portland International Raceway (PIR) area, less than 50 percent of BES sampling met the target. Generally, however, TSS improves as one moves upstream of the confluence with the Willamette River. Upstream of the project area, near the Vancouver Avenue crossing of the Slough, greater than 90 percent of sampling met the target.

The Slough contains fine, silty sediment with a relatively high organic matter content. It gradually accumulates sediment, a process known as aggrading. Major sources of TSS in the Slough include stormwater from streets, parking lots, driveways, agricultural runoff (in the Upper and Middle Slough), construction activities, sediment resuspension, and bank erosion (City of Portland 2009).

Water quality is somewhat compromised by excessive sediment and turbidity. The Columbia Slough near the project area is considered not properly functioning for suspended sediment and turbidity. Appropriate erosion and sediment control BMPs would be implemented to minimize and avoid sediment discharges and elevated turbidity.

Chemical Contamination/Nutrients

The Columbia Slough is 303(d) listed for lead, iron, manganese, and temperature. TMDLs have been established for pH, dissolved oxygen, phosphorous, chlorophyll *a*, bacteria, lead, PCBs, DDE/DDT, dieldrin, and dioxin (DEQ 1998).

Low levels of sediment contamination are found throughout the Slough, with the main risks being PCBs and pesticides in fish tissues. There were no sources of PCBs identified within the Columbia Slough Watershed (City of Portland 2009).

The Lower Slough consistently exceeds the upper pH limit of the water quality standard in the spring and summer and the chlorophyll *a* standards in the spring, summer, and fall (City of Portland 2009).

Transportation, land uses, stormwater runoff, industrial discharges, contaminated sites, auto wrecking yards, sediments, and air emissions are the main contributors to lead in the Columbia Slough. Other sources of chemical contamination and nutrients include illegal dumping and hazardous spills (City of Portland 2009). Lead samples taken in the lower Slough met the dissolved lead standard, and 70 to 90 percent of the samples taken in the project area also met the total lead standard (City of Portland 2009).

In addition to the contaminants listed above, dissolved copper, a neurotoxicant that damages the olfactory abilities of fish, is also known to occur in the Columbia Slough. Dissolved copper associated with highway runoff is a result of brake pad wear and vehicle exhaust; concentrations typically found in road runoff are within the range shown to affect predator avoidance and other behaviors (Hecht et al. 2007). Concentrations found in runoff are influenced by a number of factors, including traffic volume, congestion, adjacent land uses, air quality, and the frequency and duration of storms.

3.3.1.3 Stormwater Drainage

Conditions in the Columbia Slough, such as slow moving water and existing water quality problems, make this waterbody more sensitive to TSS and other contaminants than other waterbodies within the project area.

Based on data available from NRCS, surficial soils in this area are mainly comprised of the Sauvie-Rafton-Urban land complex. These soils belong to Hydrologic Group D and have a low infiltration rate and high runoff potential. A soil survey conducted for Multnomah County indicates that water tables in this area are at a depth of less than one foot. While borehole logs available for the project area confirm the high groundwater table, they also indicate that the soils can be highly variable. Land west of I-5 generally has an industrial zoning designation while land to the east is generally designated as open space. Open space includes sports facilities such as baseball diamonds.

In this stormwater drainage area, I-5, Marine Drive, and Martin Luther King Jr. Boulevard are elevated on embankments or structures. The stormwater conveyance systems that serve these elevated roadways do not convey runoff from outside the right-of-way. These embankments are also part of a levee system. Surface runoff from I-5 and roads within the project footprint is generally confined to the roadway surface by continuous concrete barriers or curbs, and is collected almost entirely by closed gravity drainage systems with inlets and stormwater pipes. The one notable exception is Martin Luther King Jr. Boulevard east of I-5 where runoff is conveyed from the south shoulder. Stormwater runoff from the project area in this vicinity drains to a system of sloughs before being discharged to the Columbia Slough via PIR, Schmeer Road, or Pen 2 - NE 13th pump stations. These pump stations, which are sized to handle the 1 in 100-year runoff, have installed capacities of 19,700, 40,000, and 32,000 gallons per minute, respectively. Note that Marine Drive west of I-5, while within the confines of the levee system, drains to outfalls along North Portland Harbor and is included in the Columbia River South stormwater drainage area.

The existing impervious area within the project footprint in this watershed is approximately 44 acres. Runoff from about 3 acres (Martin Luther King Jr. Boulevard and Union Court) is dispersed and infiltrated. There are no flow control measures for runoff within the project footprint beyond the regulation of discharges to Columbia Slough provided by pump station operation. In addition, there are no engineered water quality facilities except for a manhole sediment trap located at the Victory Boulevard interchange that treats runoff from approximately 6 acres of impervious surfaces at the interchange (not within the project footprint).

3.3.2 Columbia River and North Portland Harbor

The I-5 bridges are located at RM 106 of the Columbia River. Shallow and near-shore habitat is present in the action 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 (USACE 2001).

The Columbia River is highly constrained within the project area: landform and bridge footings are the dominant and subdominant floodplain constrictions, respectively. Ten bridge footings are currently located below OHW. A flood control levee runs along the south bank of North Portland Harbor and forms a boundary between the adjacent neighborhoods and the harbor. Sandy beaches created by dredge disposal are also present along the Lower Columbia River. Shoreline erosion rates are likely slower than they were historically due to flow regulation and river bank protection. The river channel is deeper and narrower than historical conditions (USACE 2001).

The North Portland Harbor is a large side channel of the Columbia River located along the southern bank of Hayden Island. The channel branches off the Columbia River approximately 2 river miles upstream (east) of the existing bridge site, and flows approximately 5 river miles downstream (west) before rejoining the mainstem Columbia River.

For the stormwater analysis of the Columbia River watershed, the watershed has been divided into the south and north sides of the river. The south side entails the entire project CIA in Oregon, including Hayden Island, the North Portland Harbor bridges, and the Columbia River bridges south of the Oregon-Washington state line. The north side entails the entire project CIA in Washington and the Columbia River bridges north of the Oregon-Washington state line.

3.3.2.1 Hydrology

Development of the hydropower system on the Columbia River has significantly influenced peak seasonal discharges and the velocity and timing of flows in the river. The Columbia River estuary historically received annual spring freshet flows that were 75 to 100 percent higher on average than current freshet flows. Historical winter flows (October through March) also were approximately 35 to 50 percent lower than current flows (ISAB 2000).

The Columbia River is also tidally influenced in its lower reaches below the Bonneville Dam, which includes the project area. Flows and water surface elevations in this area are influenced by tidal fluctuations, resulting in minimal streamflow at times and daily elevation changes. On rare occasions, reverse flow may occur.

The Columbia River in vicinity to the project area is highly urbanized and contains a complex system of roadways, including I-5, state highways, local access roads, residential streets, parking lots, and other impervious surfaces. Historic off-channel areas have been filled, rechanneled, diverted, and otherwise developed for urban and agricultural use over the past 150 years. The channelization of the basin in addition to the development of the hydropower system has altered the historical hydrologic regime.

3.3.2.2 Water Quality

<u>Temperature</u>

Within the project area, the Columbia River does not meet DEQ standards for temperature and is 303(d) listed. Year-round water temperatures in the project vicinity exceed the standard for salmon and steelhead migration corridors of a 20 ºC average 7-day maximum. No Total Maximum Daily Load (TMDL) for temperature has been proposed at this time (DEQ 2009).

Upstream river flows are highly controlled by dams and diversions on the mainstem Columbia and its tributaries, contributing to elevated water temperatures in the action area. Riparian vegetation that could play a role in regulating water temperatures is lacking in the vicinity of the project area. However, due to the size of the Columbia River the role riparian vegetation could play in temperature regulation would be minor if at all.

<u>Sediment/Turbidity</u>

Suspended sediment (e.g., sand, silt, and clay particles) is a naturally occurring component of the riverine habitat in the action area, and has historically been influenced by flow and currents, rain events, and geologic events (e.g., earthquakes and volcanic activity). The movement and deposition of suspended sediments in the water column and through the river system are an important component of habitat-forming processes that contribute to the creation and maintenance of shallow water habitats capable of sustaining emergent and riparian vegetation.

Turbidity in the project area is very low. From October 2002 to September 2007, Ecology conducted water quality sampling in the project vicinity approximately 3 miles upstream of the I-5 bridges (Ecology 2009c). Of 36 samples, all were 12 nephelometric turbidity units (NTU) or under. Twenty-eight were 5 NTUs or under. This is extremely low turbidity.

Chemical Contamination/Nutrients

The Columbia River and North Portland Harbor do not meet the Oregon DEQ standards and are 303(d) listed for the following parameters: temperature, polychlorinated biphenyls (PCBs), polyaromatic hydrocarbons (PAHs), dichloro-diphenyl-trichloroethane (DDT) metabolites (e.g., DDE), arsenic, and dissolved oxygen (DEQ 2009b). The Columbia River is on the Washington Department of Ecology's 303(d) list for temperature, PCBs, and dissolved oxygen (Ecology 2009b). In addition to the 303(d) listings, EPA has issued a TMDL for the Columbia River for dioxin (EPA 1991) and approved a TMDL for the Lower Columbia River for total dissolved gas (DEQ and Ecology 2002).

In addition to the contaminants listed above, dissolved copper, a neurotoxicant that damages the olfactory abilities of fish, is also known to be present above naturally occurring levels in the Columbia River. Dissolved copper associated with highway runoff is a result of brake pad wear and vehicle exhaust; concentrations typically found in road runoff are within the range shown to affect salmonid predator avoidance and other behaviors (Hecht et al. 2007). Concentrations found in runoff are influenced by a number of factors, including traffic volume, congestion, adjacent land uses, air quality, and the frequency and duration of storms.

Two sites near the LPA footprint have been identified that indicate elevated levels of contamination: Diversified Marine; and Schooner Creek Boat Works; both are located in North Portland Harbor. At Diversified Marine, heavy metals, BTEX (benzene, toluene, ethylbenzene, and xylene), PAHs, CVOCs (chlorinated volatile organic compounds), and PCBs are potentially contaminating soil, groundwater, river sediments, and surface water. The EPA completed a preliminary assessment of the site. The EPA sampled river sediments at a distance of 200 to 250 feet from shore. The samplings showed that elevated metal levels were below levels of significant concern 200 feet downstream from the site. The DEQ is concerned about shoreline releases of metals, petroleum hydrocarbons, PCBs, and semivolatile organic compounds (SVOCs).

At Schooner Creek Boat Works (a.k.a. Pier 99), the EPA completed a site investigation in August 2009. The data collected indicates that site soils are contaminated with heavy metals, PAHs, PCBs, DDT, phthalates, and tributyltin at concentrations that pose a potential risk to on-site workers, adjoining residents, on-site plants and wildlife, and nearby aquatic life. Sediments at the boat dock area are contaminated with metals, PAHs, and DDT that represents potential toxic and bioaccumulative threats to aquatic life.

3.3.2.3 Columbia River South Stormwater Drainage (Oregon)

Surficial soils on Hayden Island comprise the Pilchuck-Urban land complex based on available NRCS data. They are Hydrologic Group A soils that have a high infiltration rate and consist mainly of deep, well-drained to excessively-drained sands or gravelly sands. Available borehole information confirms this description. While limited peizometer data indicates that the groundwater table is about 15 feet below ground, the phreatic surface is expected to respond to changes in river level given the highly permeable nature of the soils. The land on either side of

I-5 on Hayden Island is highly developed and comprises service-related businesses such as retail stores and restaurants, and their parking lots.

As in the Columbia Slough drainage, I-5 is elevated on an embankment across Hayden Island in the Columbia River watershed on the Oregon side. Surface runoff from the I-5 and local roads within the project footprint is generally confined to the roadway surface by continuous concrete barriers or curbs. Except for the North Portland Harbor and Columbia River bridges, runoff is collected entirely by closed gravity drainage systems with inlets and stormwater pipes that discharge directly to the North Portland Harbor or Columbia River. Runoff from the bridges is discharged through scuppers directly to the water surface below. The existing impervious area within the project footprint in this stormwater drainage area is approximately 62 acres; there are no flow control measures or engineered water quality facilities. There is a manhole sediment trap located at the Victory Boulevard interchange that treats runoff from approximately 6 acres of impervious surfaces at the interchange. The sediment trap is located outside of the project footprint, but within the CIA.

As in the Columbia Slough drainage area, the project footprint within this watershed is located in what was part of the Columbia River floodplain. The portion south of North Portland Harbor is protected against flooding by a levee system while material dredged from the Columbia River has been used to raise the overall ground surface on Hayden Island east of the BNSF railroad tracks above the 1 in 100-year flood elevation.

3.3.2.4 Columbia River North Stormwater Drainage (Washington)

This drainage area comprises the project footprint from the Oregon-Washington state line in the south to the SR 500 interchange in the north. It comprises the current I-5 corridor as well as Vancouver city streets on which the light rail guideway would be located. The existing impervious area within the project footprint is approximately 133 acres and there are no flow control measures or engineered water quality facilities with the exception of approximately 3 acres of SR 14 from which runoff is dispersed or infiltrated.

Within the project footprint, the land comprises the gently-sloping Wind River and Lauren surficial soils. These soils belong to Hydrologic Group B and have a moderate infiltration rate. While depths to water table are not provided, borehole logs available for the area indicate groundwater levels are close to water levels in the Columbia River. In addition, piezometer readings taken by WSDOT in the SR 14 interchange area demonstrate the water table, at least at that particular location, responds to changes in river level.

Surface runoff from I-5 and local streets is generally confined to the roadway by continuous curbs and concrete barriers, and is collected almost entirely by closed drainage systems. The only exceptions are the Columbia River bridges and a few ditches adjacent to the highway. These closed systems discharge runoff directly to the Columbia River via outfalls in the vicinity of the existing highway bridges while runoff from the bridges themselves drains through scuppers to the river below. A pump station located southeast of the SR 14 interchange discharges runoff from lower lying portions of the interchange to the Columbia River during high river levels.

The vertical grade of I-5 is generally below the surrounding areas. As a result, the drainage system serving the highway also conveys runoff from built-up areas outside the highway right-of-way. These areas, which are extensive, are estimated to comprise over 50 percent of the total drainage area served by this system, and their contribution to flows was an important consideration when developing the approach to stormwater management in this watershed.

3.3.3 Burnt Bridge Creek

Burnt Bridge Creek is a small tributary to the lower Columbia River. It originates in an area east of Vancouver, Washington, near the Vancouver suburb of Mill Plain, and flows west (roughly paralleling SR 500 for approximately 5 miles) to its outlet at Vancouver Lake. The lake then drains into the Lower Columbia River via Lake River.

The I-5 corridor is located in the vicinity of RM 2 of Burnt Bridge Creek. Within the project area, the stream passes through a valley surrounded primarily by residential development. Stream slope is between 0 and 2 percent, but approximately 80 percent of the stream has a gradient of less than 0.1 percent (PBS 2003).

Burnt Bridge Creek enters the project area east of 15th Avenue near Leverich Park, northeast of the SR 500/I-5 interchange. In the park area, the creek has substantial overhead cover from large-diameter trees and shrubs in some areas, and sparse cover by widely spaced large-diameter trees in areas maintained by park staff. In the more open areas within the park, the banks are highly eroded by regular visitor usage and mowing of herbaceous vegetation in the vicinity of the channel. Substrate within the park consists of fine sediments and gravels (WDFW/MHCC 1999).

From Leverich Park, the Burnt Bridge Creek channel passes under Leverich Park Way through a concrete culvert and onto City of Vancouver property adjacent to I-5. The channel is armored for approximately 100 feet, after which it continues north, parallel to I-5 and Leverich Park Way, through a silt-dominated channel. The vegetation surrounding this portion of the channel is dominated by reed canarygrass *(Phalaris arundinacea)* with some overhanging blackberry (*Rubus* sp.) and dogwood (*Cornus* sp.). Site observations indicate that the channel banks are undercut due to the growth habit of reed canarygrass and eroded due to the presence of nutria (*Myocastor coypus*).

Approximately 500 feet north of the culvert, Leverich Park Way bends to the west and the Burnt Bridge Creek channel passes under the roadway through a large corrugated metal pipe culvert. The channel continues north through a densely vegetated, privately owned area for about 200 feet. No permission to enter this area was granted during field visits to assess habitat and site characteristics. The channel continues north with a WSDOT wetland mitigation site bounding the channel to the west and Bonneville Power Administration (BPA) property and private land bounding the channel to the east. From the concrete culvert under Leverich Park Way downstream to where Burnt Bridge Creek exits the project area, the channel is dominated by fine sediments (PBS 2003) and has moderate to dense overhanging vegetation consisting of deciduous and coniferous tree and shrub species.

In 2004, the City of Vancouver initiated the Burnt Bridge Creek Greenway Improvement Project. The objective of this project was to enhance water quality, riparian habitat, and recreation (through trail connections). Stormwater treatment facilities were also added and include infiltration basins, bioswales, vortex manholes, water quality ponds, and wetlands.

3.3.3.1 Hydrology

Average daily discharge at Burnt Bridge Creek for 1999 and 2000 were 29.8 cfs and 19.9 cfs respectively (USGS 2010c). Burnt Bridge Creek experiences seasonal fluctuation in flow, with seasonal lows occurring between July and October and highs occurring between December and March. During low flow periods, streamflow is primarily fed by groundwater discharge. The project area is highly urbanized and contains a complex system of roadways, including I-5, state highways, local access roads, residential streets, parking lots, and other impervious surfaces. The extensive urbanization of the project area has increased peak flows, reduced base flows, and altered flow timing in comparison to historical conditions. However, flow control elements have been added as part of the Greenway Project.

3.3.3.2 Water Quality

Temperature

Desirable water temperatures for young salmonids during downstream migration range from 6.7 to 13.3ºC (44 to 56ºF). In freshwater, temperatures greater than 23ºC (73.4ºF) are lethal for juvenile salmonids, and temperatures greater than 21ºC (70ºF) are lethal for adult salmonids (USACE 2001). Several listed salmonids are present in Burnt Bridge Creek in the vicinity of the project area, which the Ecosystems Technical Report discusses in more detail. A temperature gauge at Leverich Park (gauge BBC 2.6), within the action area, indicated that from mid-May through late September, 2008, the highest annual running 7-day average of maximum temperatures exceeded 17.5ºC (63.5ºF) ninety-two times (Ecology 2008). Therefore, water temperatures in the vicinity of the project area likely exceed the NMFS standard of 18 ºC (64ºF) for salmonid migration and rearing in late summer.

Sediment/Turbidity

Suspended sediment (e.g., sand, silt, and clay particles) is a naturally occurring component of the riverine habitat in the action area, and has historically been influenced by flow and currents, rain events, and geologic events (e.g., earthquakes and volcanic activity). Turbidity within the watershed is lowest between July and August, which coincides with the period when the majority of flow within the stream is contributed via groundwater. In general, turbidity is not considered to be a parameter of concern in Burnt Bridge Creek (Ecology 2009c). Water quality is consequently not compromised by excessive sediment and turbidity; however, habitat-forming processes requiring recruitment of suspended sediments are limited.

Contamination/Nutrients

Burnt Bridge Creek is not listed as having water quality issues related to chemical contaminants. However, the upper reaches of the stream pass through farmland where the use of chemical fertilizers and pesticides is likely. Furthermore, stormwater runoff is routed to the creek in several locations through pipes and ditches (Ecology 2009a).

Water quality in Burnt Bridge Creek has been monitored extensively since the early 1970s and shows impairments typical of urban streams (COV 2007). Sixteen segments of Burnt Bridge Creek are considered impaired by fecal coliform bacteria, dissolved oxygen (DO), and temperature by the 303(d) list (Ecology 2009b). The draft 2008 303(d) list also has 12 segments of Burnt Bridge Creek listed as impaired by pH (Ecology 2009b). Naturally occurring concentrations of phosphorus in the groundwater, coupled with nutrient inputs from urban and agricultural runoff, has supported nuisance growths of algae and further degraded the aquatic habitat (COV 2007).

Nine samples for assessing bacteria, pH, and DO were taken between July and August 2008 at the Leverich Park gauge. Bacteria was above water quality standards in six of the nine samples, pH was above standards in one of the nine samples, and DO was not above standards in any of the samples (Ecology 2009b).

Ecology has not yet approved any TMDLs for Burnt Bridge Creek. However, the Burnt Bridge Creek TMDL Advisory Committee is currently conducting monitoring which would result in the determination of the required pollution reductions and the development of a detailed clean-up plan (Ecology 2009a). The Burnt Bridge Creek Water Quality Improvement Project, coordinated by Ecology, is conducting intensive water quality monitoring of surface water, groundwater, and stormwater.

3.3.3.3 Stormwater Drainage

The project footprint within this watershed includes approximately 17 acres of existing impervious area, including the SR 500 interchange and portions of I-5 to the north and SR 500 to the east. Surficial soils in this area typically consist of Wind River loams. These soils belong to Hydrologic Group B and are considered to have a moderate infiltration rate. Residential developments are located south of the SR 500 interchange. There is a school to the northwest of the SR 500 interchange and a park to the northeast. Available information suggests that the groundwater table in this area is deep.

Typical of an urban environment, surface runoff from the highways and local streets is generally confined to the roadway by continuous curbs and concrete barriers, and is conveyed almost entirely by closed drainage systems. In contrast to the other watersheds, runoff from the entire PGIS within this portion of the project footprint currently contains some form of treatment. Runoff from about 15 acres within the project footprint is conveyed to an infiltration pond at the Main Street interchange, and any runoff that is not infiltrated is conveyed to a wet pond north of SR 500.

The infiltration pond is considered to provide adequate stormwater treatment in terms of water quality (dissolved metals reduction) and flow reduction. The primary stormwater treatment function of the wet pond, however, is to reduce sediment and is therefore not considered to provide adequate stormwater treatment. For this reason, runoff from the area served by this pond is not considered as receiving stormwater treatment according to the CRC project’s stormwater treatment analysis.

3.3.4 Fairview Creek

Fairview Creek is a 5-mile-long urban stream that originates in a wetland near Grant Butte in Gresham and drains to Fairview Lake, a tributary to the eastern portion of the Columbia Slough. Historically, the creek had been a tributary of the Columbia River, but the water from the wetlands was diverted into an artificial channel that drained into the Columbia Slough, which is a tributary of the Willamette River. In 1960, water managers built a dam along Fairview Creek to create Fairview Lake for water storage and recreation. Fairview Creek has two named tributaries, No Name Creek, and Clear Creek (BES 2005).

The Ruby Junction Maintenance Facility on NW Eleven Mile Avenue in Gresham, Oregon, is the location for a proposed expansion of an existing TriMet transit maintenance facility. The existing facility would be expanded by approximately 10.4 acres (from 22.8 to 33.2 acres) over several construction phases. Portions of three of the 14 parcels that would be added to the maintenance facility are located within the 100-year floodplain of Fairview Creek. These three parcels presently contain several buildings and some paved surfaces. No new structures are planned to be constructed in the floodplain, but some impervious surface would be added and some would be replaced or converted to pervious outside the floodplain. Overall, there would be a net reduction of 0.5 acres of PGIS.

3.3.4.1 Hydrology

The Fairview Creek drainage basin is 6.5 square miles and receives stormwater runoff from Gresham, Wood Village, and Fairview. As previously stated, Fairview Creek is impounded by a dam that forms Fairview Lake. During summer months, starting in May, the lake's water levels are maintained at 10 feet NGVD. In winter months, starting in October, water elevation is lowered to 8.5 feet NGVD. This accounts for an exaggerated hydrologic regime.

Average flow in Fairview Creek at the USGS gauging station near Glisan Street, approximately 1.4 miles downstream of the Ruby Junction Operations Facility, was 5.86 cfs from 1993 to 2008. Minimum daily discharge during this period was 0.24 cfs and maximum daily discharge was 119 cfs (USGS 2008b). The 100-year floodplain for Fairview Creek is approximately 1,288 feet wide at its widest point, and covers approximately two parcels of the proposed expansion area (Metro 2003).

3.3.4.2 Water Quality

The DEQ has placed Fairview Creek on its 303(d) list for E. coli (year-round) and fecal coliform (fall/winter/spring); it has approved TMDLs for bacteria and spring/summer temperature (City of Portland 2008; DEQ 2009). In addition, Fairview Creek is included in the TMDLs for the Columbia Slough since it is a tributary. No additional water quality data was available for this creek.

Excessive fine sediments have been shown to settle in the streambeds of Fairview Creek. This has been caused by the erosion of upland areas and deposit of sediments by stormwater that is discharged into the creek. These sediments degrade native fish spawning areas and limit suitable habitat for benthic organisms (BES 2005).

3.3.4.3 Stormwater Drainage

The TriMet Ruby Junction Maintenance Facility within the Fairview Creek drainage area has a total approximate area of about 22.8 acres of which 16.8 are existing PGIS. This facility would be expanded to meet the needs of the CRC and TriMet's Portland-Milwaukie Light Rail projects, both of which are expected to be constructed at approximately the same time.

Runoff from the impervious area in the southwest portion of the existing Ruby Junction Maintenance Facility currently drains to Fairview Creek through proprietary cartridge filters. This portion of the site (1.5 acres) comprises a paint booth and body shop and a parking lot. Stormwater from the rest of the existing impervious area (15.3 acres) is infiltrated through the use of dry wells, ultimately recharging the groundwater aquifer and contributing to flows in waterbodies within the Columbia Slough watershed.

4. Long-term Effects

4.1 Introduction

This section describes the long-term effects to occur from the CRC project to the following:

- hydrology,
- water quality, and
- stormwater.

Effects to each of these elements are organized by project waterway and address long-term effects.

"Long-term effects" refers to effects that occur as a result of the project, including those that manifest later in time or are permanent. Long-term effects may impact resources beyond the project footprint.

4.2 Long-term Effects to Hydrology

This section describes potential hydrologic impacts from the project, which includes potential flooding, alterations in peak flows and increased runoff volumes to local receiving waters, and decreased water infiltration and groundwater recharge. Flooding may occur as a result of increases in stormwater discharge and floodplain/channel constriction.

Other than the installation of piers within the Columbia River and North Portland Harbor and the expansion of the Ruby Junction Maintenance Facility, no new or expanded project facilities would encroach upon the 100-year floodplain for any stream or river within the affected project area. New roads within the floodplain would avoid floodplains altogether. No new structures would be constructed in Fairview Creek's 100-year floodplain at the Ruby Junction Maintenance Facility.

The Columbia River and North Portland Harbor would be the only waterways crossed by the project and subject to in-water work. However, long-term hydrologic effects may be realized by the Columbia Slough, Burnt Bridge Creek, and Fairview Creek due to an increase in impervious surfaces in each drainage basin.

An increase in impervious surface area typically increases flow volume fluctuations within receiving waters, and is associated with greater peak flows and increased total runoff volume. Flow volume fluctuations and impacts from greater peak flows and increased runoff are expected to be relatively small within those streams draining the project area because the project drains almost directly to major waterbodies that have relatively high flows. Flow controls for project-generated runoff are required for flows discharged to Fairview Creek and Burnt Bridge Creek, but not for the Columbia River or Columbia Slough. Impacts from increased runoff in the Burnt Bridge Creek drainage would be mitigated by developing a stormwater conveyance and detention system in accordance with water quantity and quality standards in place at the time of construction. All new impervious surfaces at the Ruby Junction Maintenance Facility would be infiltrated.

Project-generated runoff from a few sections of new or modified roadway that currently drain to North Portland Harbor would 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. Exhibit 4-1 provides information on total drainage areas of receiving waters and proposed increases to impervious surface areas within these areas.

Technical literature suggests that stream quality can begin to degrade when there is more than 10 percent of effective impervious surface area in a watershed (Klein 1979). A watershed that gains any amount of impervious surface area could be vulnerable to some level of degradation (with respect to habitat) if the watershed is close to or above that threshold. Each of the watersheds within the project area is composed of 10 percent or more impervious surface area; therefore, even though the increase in impervious surface area for each watershed would represent a very small fraction of the total watershed (Exhibit 4-1), the literature suggests that any incremental increase could adversely affect stream quality.

Exhibit 4-1. Impervious Surface Increases Relative to Total Drainage Areas

Watershed	Total Drainage Area (square miles)	Total Increase to Impervious Surface (square miles)	% Increase to Impervious Surface within Drainage Area
Columbia Slough	51	0.021	0.04%
Lower Columbia River	18,000	0.035	0.0002%
Burnt Bridge Creek	28	0.010	0.04%
Fairview Creek[a]	7	-0.00078	-0.01%

a Impervious area would decrease slightly in this watershed.

Impervious surfaces do not allow water to percolate into the ground; thereby increasing the amount of runoff. Decreased water infiltration also decreases groundwater recharge and the beneficial dilution effects from water entering the water table. Groundwater contributes significantly to the base flow in watercourses. In many instances, it is the base flow that maintains the minimum discharge in creeks, especially during the dry summer months.

The addition of impervious surface is unlikely to measurably affect base flows of waterways within the project area. The project area is not within the headwaters of project waterways and the drainage areas for these waterways are relatively large, which lessens the effect of decreased infiltration on base flows. This is reflected in regulations that only require flow control for runoff to Fairview and Burnt Bridge Creeks.

Furthermore, increased infiltration opportunities offered by the project in the form of stormwater facilities are anticipated to be more than double the increase in new, rebuilt, or resurfaced impervious surfaces post-project.

Though there would be 0.7 acres of additional impervious surface included in the LPA Option B, long term effects to hydrology are anticipated to be the same as those of Option A.

4.2.1 Columbia Slough

The project would alter the current hydrologic regime to a minor extent of the Columbia Slough through the addition of impervious surface and stormwater treatment. The addition of impervious surface would increase stormwater volumes. However, this would be mitigated through stormwater treatment and management design. The discharge rates of stormwater runoff volumes generated by the project that would flow into the Columbia Slough would be regulated by pumps located downstream of the project area. The Columbia Slough is exempt from flow control requirements (City of Portland 2004).

There would be 0.3 acres of additional impervious area proposed with the LPA Option B for the Columbia Slough watershed, relative to Option A. The long-term effects to hydrology for both of these options are anticipated to be similar.

4.2.2 Columbia River and North Portland Harbor

Six new pier complexes would be built for the Columbia River crossing and the original pier complexes would be removed. New piers for the North Portland Harbor bridges would be added. Given the size of the Columbia River and North Portland Harbor relative to the size of the piers and given that this section of the river is tidally influenced it is extremely unlikely that any backwater effect would be measurable. Regardless, the project would likely require a floodplain permit from the local jurisdictions. Modeling studies would be a requirement of this permit and would be conducted in a later phase. However, preliminary floodway calculations show that the project would not result in any floodway impacts. If results of the final modeling show a backwater effect that exceeds local standards, cut and fill remedies within the floodplain would likely be prescribed.

The project would provide an increased level of infiltration for stormwater runoff. This may have a net (albeit not measurable) benefit to the hydrology of the Columbia River.

In the Columbia River watershed on the Oregon side, there would be 0.4 acres of additional impervious area proposed with the LPA Option B, relative to Option A. However, the long-term effects to the hydrology of the Columbia River for both of these options are anticipated to be similar.

4.2.3 Burnt Bridge Creek

The project may slightly alter the stormwater conveyance network that drains to Burnt Bridge Creek by providing additional stormwater treatment and by rerouting some roadside ditches. This may improve the creek's hydrologic regime by providing infiltration opportunities for runoff from impervious areas. Ecology requires that runoff volumes be reduced to pre-development conditions for peak discharges between 50 percent of the 2-year event and the 50-year event.

Flow controls are required for project-generated runoff discharged to Burnt Bridge Creek. Impacts from increased runoff in Burnt Bridge Creek would be mitigated by the use of two new bioretention ponds in the vicinity of the SR 500 interchange.

Impervious surface areas are the same for both the LPA Option A and B within the Burnt Bridge Creek watershed. Therefore, long-term effects would be the same.

4.2.4 Fairview Creek

For the City of Gresham, flow control is required to the extent that stormwater discharges do not increase flows in Fairview Creek over pre-development conditions for a 25-year or greater storm event. The term "pre-developed" conditions is not explicitly defined, but has been interpreted as the condition of the land at the time a construction permit is applied for. However, the City of Gresham is in the process of revising the Public Works Standards to define "pre-developed condition" as the condition of the land prior to any development occurring.

Since the project would adhere to these flow-control requirements the hydrologic regime of Fairview Creek is not anticipated to be altered by the proposed action long-term.

4.3 Long-term Effects to Water Quality

Increased sedimentation in streams after road construction may occur if slopes are not stabilized as designed or if stormwater facilities do not function effectively in removal of sediment from runoff. Sedimentation due to erosion can be increased by two potential pathways: directly from erosion of the finished roadside embankments or from increased streambank erosion as a result of increased peak flows. The project corridor on the Oregon side of the Columbia River is relatively flat and the portion on the Washington side of the Columbia River has more topographical features. This includes the area around Burnt Bridge Creek. If flooding were to occur, this area would be susceptible to erosion hazards. However, peak flows would be managed by stormwater facilities in the Burnt Bridge Creek drainage area. Stormwater facilities would be designed to effectively remove sediments from runoff before discharging stormwater to the receiving waters along the project corridor.

Because metals and other pollutants bind to fine particles, accumulations of road-derived sediments may have elevated levels of contaminants. Runoff from transportation facilities is typically associated with a suite of pollutants, including suspended sediments, nutrients, PAHs, oils and grease, antifreeze from leaks, cadmium and zinc from tire wear, and copper from wear and tear of brake pads, bearings, metal plating, and engine parts. Fecal coliform, while not a product of roadway surfaces or activities, is known to be conveyed in road runoff. The concentration and load of these pollutants are affected by a number of factors, including traffic volumes, adjacent land uses, air quality, and the frequency, intensity, and duration of storms. Stormwater management measures would be incorporated into the design of this alternative to minimize the potential adverse impacts that road runoff can have on water quality.

The NPDES permit program, as authorized by the Clean Water Act (CWA), controls water pollution by regulating point sources that discharge pollutants into waters of the United States and compliance with designated TMDLs. Several of the waterways in the project area have TMDLs listed for certain pollutants. Project waterways and their associated 303(d) listings and designated TMDLs are shown in Exhibit 4-2 below.

Exhibit 4-2. Project Waterways with 303(d) Listings and TMDLs

Waterway	303(d) Listing Factors	Established TMDLs
Columbia Slough	• Toxics (lead, iron, manganese) • Temperature	• Toxics (lead, PCBs, DDE/DDT, dieldrin, dioxin) • Eutrophication (pH, dissolved oxygen, phosphorus, and chlorophyll *a*) • Bacteria
Columbia River (includes North Portland Harbor)	**In Oregon:** • Toxics (PCBs, PAHs, DDT/DDE, arsenic) • Eutrophication (dissolved oxygen) • Temperature **In Washington:** • Toxics (PCBs) • Eutrophication (dissolved oxygen) • Temperature	• Dioxin • Total Dissolved Gas

Waterway	303(d) Listing Factors	Established TMDLs
Burnt Bridge Creek	• Eutrophication (dissolved oxygen) • Fecal Coliform Bacteria • Temperature	• None
Fairview Creek	• E. coli • Fecal Coliform	• Toxics (lead, PCBs, DDE/DDT, dieldrin, dioxin) • Eutrophication (pH, dissolved oxygen, phosphorus, and chlorophyll *a*) • Bacteria • Temperature

Section 303(d) of the CWA requires that states are to list (the 303(d) list) impaired waterbodies do not meet applicable water quality standards based on the severity of the pollution and designated uses of the waterbodies. A TMDL is the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards and point source TMDLs are implemented in Oregon and Washington through the issuance or reissuance of NPDES permits by the DEQ and Ecology. Therefore, it is necessary for the project to demonstrate that water pollution would be minimized to the greatest extent possible to ensure compliance with NPDES permits.

Traffic models projected to the year 2030 indicate that the LPA would substantially decrease traffic congestion within the project corridor as compared to the No-Build Alternative. The reduction of braking would reduce brake pad wear. Copper is a known byproduct of brake pad wear. Therefore, decreasing congestion may potentially reduce the proportionate amount of copper carried by project runoff compared to what would be proportionately carried by the No-Build Alternative.

Annual pollutant load estimates were conducted using Method 1: WSDOT Data-FHWA Method as outlined in the WSDOT's guide entitled "*Quantitative Procedures for Surface Water Impact Assessment*." This method was selected because it provides estimates of pollutant loading for a wider range of ADT volume highways (1,700-93,000) using data derived from observations made on highways in Western Washington since 2001. It is directly applicable to the project location and is based on recently collected WSDOT data. Mean estimated annual pollutant loads, which are constants provided by this method, were used in the calculations of project pollutant loads and are shown in Exhibit 4-3.

Exhibit 4-3. Estimated Annual Pollutant Loads from Untreated and Treated Highway Runoff (Lbs/year • acre)

Pollutant	Mean Load from Untreated Runoff	Mean Load from Treated Runoff
Total Suspended Solids	769	88
Total Copper	0.16	0.04
Dissolved Copper	0.04	0.03
Total Zinc	0.98	0.21
Dissolved Zinc	0.31	0.14

Notes: Values were derived using Western Washington WSDOT source data from the January 7, 2009 HI-RUN Model Documentation.

WSDOT hasn't yet vetted the data set through a formal QA/QC process. During development of annual loading estimates, apparent discrepancies were noted in the data. If discrepancies are valid, source data and loading rate estimates will be reevaluated.

Exhibit 4-4 shows the annual pollutant load estimates for the entire project corridor for the proposed action and the No-Build Alternative. Areas that are infiltrated, are not factored into the pollutant load calculations since they are assumed to be naturally filtered through ground percolation before entering receiving waters through groundwater.

Exhibit 4-4. Annual Pollutant Load Estimates for Entire Project CIA

	No-Build Alternative	LPA Option A[a]	LPA Option B[a]
Treated PGIS (ac)	0	151.7 (146.2)	152.4 (146.9)
Infiltrated PGIS	20.5	106.8 (101.6)	106.8 (101.6)
Untreated PGIS	218.6	8.1 (8.1)	8.1 (8.1)
Total PGIS	239.1	266.6 (255.9)	267.3 (256.6)
TSS (lbs/year)	168,103.4	19,578.5 (19,094.5)	19,640.1 (19,156.1)
% Change		-88.35% (-88.64%)	-88.32% (-88.60%)
Total Cu (lbs/year)	34.98	7.36 (7.14)	7.39 (7.17)
% Change		-78.95% (-79.57%)	-78.87% (-79.49%)
Dissolved Cu (lbs/year)	8.74	4.88 (4.71)	4.90 (4.73)
% Change		-44.25% (-46.13%)	-44.01% (-45.89%)
Total Zn (lbs/year)	214.23	39.80 (38.64)	39.94 (38.79)
% Change		-81.42% (-81.96%)	-81.36% (-81.89%)
Dissolved Zn (lbs/year)	67.77	23.75 (22.98)	23.85 (23.08)
% Change		-64.95% (-66.09%)	-64.81% (-65.95%)

a Text in parentheses indicates impacts if the LPA options are constructed with Highway Phasing.

Exhibit 4-4 shows that constructing either LPA options would provide stormwater treatment across the project corridor and decrease roadway-derived pollutants. Both factors would beneficially affect the long-term water quality of the receiving waters as compared to the No-Build Alternative. Tables for each basin are included in the following sections and include the pollutant-loading analysis for LPA options A and B and the No-Build Alternative.

Another water quality concern is that the project would involve additional roadway area and, consequently, additional winter maintenance activities. Highway sanding can result in large quantities of particulate making its way into adjacent water bodies, with adverse effects to spawning beds and, occasionally, channel morphology. Chemical de-icers are a potential concern, but are relatively benign. Calcium magnesium acetate (CMA) is currently being used by ODOT in the Portland area, but magnesium chloride is becoming more common across the state. WSDOT also uses CMA in western Washington on bridges and overpasses and magnesium chloride is utilized across the state at higher elevations. CMA reduces oxygen in water, but it is used in low quantities. Studies evaluating the effect of CMA use on a small stream found no detectable change in water chemistry (Tanner and Wood 2000). Therefore, impacts from the potential use of CMA within the project area would be expected to be negligible, particularly since the frequency of use of such chemicals is relatively low. Within the project area, there are only about 20 days a year, on average, with minimum temperatures below freezing (OCS 2004). In many cases the duration of freezing temperatures or ambient conditions are such that CMA is not applied. The water quality benefits of increased highway safety could counteract potential adverse impacts from winter maintenance activities. Fewer accidents would reduce the risk of a hazardous materials spill.

WSDOT has also started making and applying its own anti-icing agent that consists of salt, de-sugared molasses, minerals, and water. This new anti-icer meets the Pacific Northwest

Snowfighters Association's (PNS) specifications for safety, environmental preservation, infrastructure protection, cost-effectiveness and performance in winter maintenance (WSDOT 2009b). However, it is not yet clear what effect this would have on receiving waters in the vicinity of the project corridor.

4.3.1 Columbia Slough

The Columbia Slough is 303(d) listed for lead, iron, manganese, and temperature. The pollutants associated with highways that have been regulated through TMDLs on this system are fecal coliform and lead. Stormwater is listed in the TMDLs as a comparatively minor source for these pollutants. While highway runoff is "stormwater," highway runoff is not explicitly called out in the TMDLs.

The effect of the pollutants found in runoff depends to a large extent on the character of the receiving waters. Given the nature of the Columbia Slough, with its slow moving water and identified water quality problems, TSS and other contaminants found in highway runoff is more of a concern within this stream than in other waterbodies within the project area. This is due to the fact that slower flows, such as at the Columbia Slough, allows water to be exposed to stormwater pollutants for a longer period of time and increases the probability that contaminated sediments would accumulate. In addition to the accumulation of contaminated sediments, slower flows also provide a stable habitat for excessive growth of algae and macrophytes during the summer, which can lead to lower dissolved oxygen levels (BES 2010). These issues compound the water quality deficiencies of the Lower Slough, making it more sensitive to added contamination inputs.

The project would increase the total PGIS in this watershed by approximately 11 acres both LPA options. This increase can largely be due to the project capturing runoff from the bridges across North Portland Harbor. The runoff from the existing bridge structures currently drains directly to the water surface below. Exhibit 4-5 shows the PGIS acreage for the No-Build Alternative and the proposed action as well as a pollutant-loading estimate for each.

Exhibit 4-5. Pollutant-Loading Estimate for the Columbia Slough Basin

	No-Build Alternative	LPA Option A	LPA Option B
Treated PGIS (ac)	0	46.4	46.7
Infiltrated PGIS	3.0	0.0	0.0
Untreated PGIS	39.8	7.1	7.1
Total PGIS	42.8	53.5	53.8
TSS (lbs/year)	30,606	9,543	9,570
% Change[a]		-68.82%	-68.73%
Total Cu (lbs/year)	6.37	2.99	3.00
% Change		-53.02%	-52.83%
Dissolved Cu (lbs/year)	1.59	1.68	1.69
% Change		5.28%	5.84%
Total Zn (lbs/year)	39.00	16.70	16.77
% Change		-57.18%	-57.02%
Dissolved Zn (lbs/year)	12.34	8.70	8.74
% Change		-29.51%	-29.17%

a Percentage change may not be precise due to rounding of values for annual loads.

As shown in Exhibit 4-5, the construction of the LPA would increase total PGIS and would decrease pollutant-loading for all pollutants shown except for dissolved copper levels where there would be a 5.28 percent increase for Option A and a 5.84 percent increase for Option B. The percentage increase in dissolved copper is much less than the 25 to 26 percent increase in PGIS, demonstrating the effectiveness of the water quality facilities proposed for the project. It should also be noted that the analysis used to produce these pollutant loading estimates are not based on enhanced stormwater treatment alone. Instead, it is based on the average of data collected from 10 basic and 3 enhanced treatment facilities. Because the majority of treatment that will be provided by the project is enhanced treatment (compost-amended vegetated filtration strips or ecology embankments), the results shown in Exhibit 4-5 are likely an overestimation of total suspended solids, total copper, and dissolved copper pollutant loads resulting from the LPA. Runoff concentrations of total zinc and dissolved zinc have not been shown to differ whether treated in basic or enhanced facilities. This analysis also does not include estimates for fecal coliform and lead, it is not clear whether these pollutants, for which there are TMDLs, would be reduced through the construction of the LPA. However, with the addition of stormwater treatment and evidence that shows reduction of several pollutants, it is not likely that there would be a substantial increase in these pollutants and the LPA may actually result in a decrease of these pollutants.

4.3.2 Columbia River and North Portland Harbor

No TMDL has been established for any pollutant associated with highway runoff. However, the Columbia River in the project area is 303(d) listed for temperature. The project would remove approximately 250 feet of vegetation along the north and south shorelines of the river in the vicinity of the new bridge structure and along the north and south shorelines of Hayden Island. Yet, this would not have a significant on the Columbia River water temperatures due to the large size of the river and the very minor role riparian vegetation plays on cooling water temperatures along the river currently. Furthermore, increased highway runoff is not anticipated to increase water temperatures significantly since it generally rains during cooler months when Columbia River water temperatures are not as much a concern.

For the Columbia River pollutant-loading analysis, as in the stormwater analysis, the Oregon and Washington sides of the river were split into separate drainages to simplify the analysis of compliance with local stormwater regulations. The loading rates for all pollutants considered in the analysis presented in Exhibit 4-6 and Exhibit 4-7 would decrease substantially with the proposed action compared to the No-Build Alternative. This reduction is expected due to the proposed reduction of untreated stormwater drainage and increase in stormwater treatment within the Columbia River Basin on both the Oregon and Washington sides.

Exhibit 4-6. Pollutant-Loading Estimate for the Columbia River South (Oregon) Basin

	No-Build Alternative	LPA Option A	LPA Option B
Treated PGIS (ac)	0	55.0	55.4
Infiltrated PGIS	0.0	0.0	0.0
Untreated PGIS	59.4	0.0	0.0
Total PGIS	59.4	55.0	55.4
TSS (lbs/year)	45,679	4,840	4,875
% Change		-89.40%	-89.33%
Total Cu (lbs/year)	9.50	2.20	2.22
% Change		-76.85%	-76.68%
Dissolved Cu (lbs/year)	2.38	1.65	1.66

	No-Build Alternative	LPA Option A	LPA Option B
% Change		-30.56%	-30.05%
Total Zn (lbs/year)	58.21	11.55	11.63
% Change		-80.16%	-80.01%
Dissolved Zn (lbs/year)	18.41	7.70	7.76
% Change		-58.18%	-57.88%

Exhibit 4-7. Pollutant-Loading Estimate for the Columbia River North (Washington) Basin

	No-Build Alternative	LPA Option A	LPA Option B
Treated PGIS (ac)	0	50.3	50.3
Infiltrated PGIS	3.0	84.4	84.4
Untreated PGIS	117.7	1.0	1.0
Total PGIS	120.7	135.7	135.7
TSS (lbs/year)	90,511	5,195	5,195
% Change		-94.26%	-94.26%
Total Cu (lbs/year)	18.83	2.17	2.17
% Change		-88.47%	-88.47%
Dissolved Cu (lbs/year)	4.71	1.55	1.55
% Change		-67.10%	-67.10%
Total Zn (lbs/year)	115.35	11.54	11.54
% Change		-89.99%	-89.99%
Dissolved Zn (lbs/year)	36.49	7.35	7.35
% Change		-79.85%	-79.85%

The project is anticipated to have an overall beneficial long-term effect to the Columbia River and North Portland Harbor’s water quality due to stormwater treatment.

4.3.3 Burnt Bridge Creek

Burnt Bridge Creek is on the 303(d) list for fecal coliform bacteria. Highway runoff is not identified in the listing as a source for this pollutant. An existing infiltration pond at the Main Street interchange would not be modified by the project, but the project would reduce the total impervious surface draining to this facility by about 2.2 acres. Currently, overflows from this infiltration pond are discharged to Burnt Bridge Creek during extreme runoff events without receiving adequate treatment. The reduction of stormwater flows to this facility as well as the addition of two bioretention ponds would reduce pollutant-loading. The loading rates for all pollutants considered in the analysis presented in Exhibit 4-8 would be eliminated as shown below for the LPA compared to the No-Build Alternative since infiltration is assumed to remove pollutants entirely according to this analysis.

Exhibit 4-8. Pollutant-Loading Estimate for the Burnt Bridge Creek Basin

	No-Build Alternative	LPA Option A	LPA Option B
Treated PGIS (ac)	0	0	0
Infiltrated PGIS	14.5	22.4	22.4
Untreated PGIS	1.7	0.0	0.0
Total PGIS	16.2	22.4	22.4

	No-Build Alternative	LPA Option A	LPA Option B
TSS (lbs/year)	1,307	0	0
% Change		-100.00%	-100.00%
Total Cu (lbs/year)	0.27	0	0
% Change		-100.00%	-100.00%
Dissolved Cu (lbs/year)	0.07	0	0
% Change		-100.00%	-100.00%
Total Zn (lbs/year)	1.67	0	0
% Change		-100.00%	-100.00%
Dissolved Zn (lbs/year)	0.53	0.78	0.78
% Change		-100.00%	-100.00%

4.3.4 Fairview Creek

DEQ has placed Fairview Creek on its 303(d) list for E. coli (year-round) and fecal coliform (fall/winter/spring); it also has approved TMDLs for bacteria and spring/summer temperature (City of Portland 2008; DEQ 2009b). The source of E. coli bacteria is not thought to be specifically from roadway runoff (DEQ 2006). Fairview Creek is also included in the TMDLs for the Columbia Slough since it is a tributary. These TMDLs include lead and fecal coliform bacteria that are associated with highway runoff. Since the majority of the existing impervious area and the entire impervious area of the expansion are infiltrated, a pollutant loading estimate is not provided. The total impervious area would decrease by 0.5 acres compared to the No-Build Alternative. The project would not have a long-term adverse effect on Fairview Creek's water quality since runoff from the expansion area would be infiltrated and not discharged to Fairview Creek.

4.4 Long-term Effects to Stormwater

Stormwater runoff from highways has elevated levels of contaminants. The project would be replacing and creating new impervious surface. However, improvements to stormwater treatment on new and improved impervious surfaces, including the I-5 and North Portland Harbor bridges, are anticipated to reduce stormwater pollutant loads discharged to Columbia Slough, Columbia River, North Portland Harbor, and Burnt Bridge Creek from the proposed project corridor. Any discharges to Fairview Creek would likely remain the same.

Besides the infiltration pond near Burnt Bridge Creek, the other existing water quality facilities would be replaced with enhanced stormwater treatment that would meet the project's stormwater management requirements.

Much of the current stormwater runoff generated by the existing highway corridor is not treated in accordance with current stormwater treatment standards for new construction. All new impervious surfaces, as well as existing impervious surfaces that would be replaced by the project, would be treated in accordance with current stormwater treatment standards before being discharged to project area receiving waters.

Exhibit 4-9 below presents an overall summary of the anticipated impact of the project on PGIS and non-PGIS from which runoff would be treated or infiltrated. The stormwater drainage areas used in these calculations do not include staging areas outside the project footprint, casting yards that might be required for fabricating bridge elements, nor does it include the area associated with the TriMet Ruby Junction facility. Exhibit 4-9 and subsequent exhibits in this section present acreages in terms of LPA Option A. Where the acreages of Option B differ from those of Option A, differences have been noted.

As previously mentioned, exclusive light rail guideway is considered non-pollutant-generating because the LRVs are electric and other potential sources of pollution such as bearings and gears are sealed to prevent the loss of lubricants. Light rail vehicle braking is almost exclusively accomplished via regenerative (power) braking, which avoids any friction or wear on the vehicle brake pads and, therefore, generates very few pollutants. Sand, however, may be applied to the tracks to aid traction on steeper grades and this is taken into consideration when assessing water quality facility requirements. While bus shelter roofs might be pollutant-generating (e.g., constructed from galvanized metal), such areas would be very small in relation to the overall area and were not included in the areas of PGIS or non-PGIS. In addition, these types of facility are not highly-defined at this early stage of project development.

Exhibit 4-9. Summary of Changes to Impervious Area and Stormwater Treatment Across the Entire Project CIA[a]

	Area (acres)			
	Infiltrated	**Treated**	**Untreated**	**Total**
Existing PGIS	20.5	0.0	218.6	239.1
Existing Non-PGIS	0.0	0.0	17.1	17.1
Existing CIA	**20.5**	**0.0**	**235.7**	**256.2**
Post-project PGIS				
Existing PGIS retained as-is	15.0	14.1	0.0	29.1
New, rebuilt, or resurfaced PGIS	91.8	137.8[b]	8.1	237.7[b]
Post-project Non-PGIS	4.7	26.2	0.0	30.9
Post-project CIA	**111.5**	**178.1**[b]	**8.1**	**297.7**[b]
Net change in CIA	**91.0**	**178.1**[b]	**-227.6**	**41.5**[b]

a These numbers do not include the impervious surface numbers for the TriMet Ruby Junction facility.

b Each of these figures would be increased by 0.7 acres for LPA Option B.

Traffic models projected to the year 2030 indicate that the project would substantially improve traffic congestion within the project corridor. Decreasing traffic congestion on the I-5 and North Portland Harbor bridges and associated roadways, would decrease idling and brake pad wear and may consequently reduce the amount of copper and other traffic-related pollutants currently carried by corridor runoff. However, quantifying the effect of reduced traffic congestion on pollutant loads is not feasible.

The proposed project would increase impervious areas by 41.5 acres for Option A and 42.2 acres for Option B, which may 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. However, untreated impervious surface would be reduced by 227.6 acres by the construction of the LPA.

Therefore, in comparison to the No-Build Alternative, the project would have an overall beneficial effect on stormwater generation and treatment in the long-term due to increased stormwater treatment and decreased traffic congestion.

4.4.1 Columbia Slough

Conditions in the Columbia Slough, such as slow moving water and existing water quality problems, make this waterbody more sensitive to TSS and other contaminants related to stormwater than other waterbodies within the project area. This is due to the fact that stream sediments are exposed longer to dissolved pollutants due to the slow water velocity.

The impervious area in the Columbia Slough watershed would increase by approximately 14 acres as shown in Exhibit 4-10. However, untreated impervious surface would be reduced by approximately 34.3 acres. Most of the increase in total impervious surface can be attributed to the project capturing runoff from the bridges across North Portland Harbor. Stormwater runoff from the existing bridge currently drains directly to the water surface below. The CRC project would create approximately 43.3 acres of new and rebuilt PGIS for the LPA Option A and 43.6 acres for Option B (Appendix A) in the Columbia Slough watershed. While I-5 would generally follow its current alignment and grade, the Marine Drive interchange would be completely rebuilt and would differ significantly from its existing layout. In addition, about 8.3 acres of existing PGIS (primarily I-5 north of Victory Boulevard) would be resurfaced rather than rebuilt. The existing stormwater conveyance system would not be modified where highway resurfacing is proposed and there does not appear to be adequate space between I-5 and Walker Slough to retrofit the existing stormwater conveyance system to treat runoff from approximately 3.7 acres of resurfaced and 3.4 acres of new and rebuilt I-5 PGIS.

Exhibit 4-10. Summary of Changes to Impervious Area and Stormwater Treatment – Columbia Slough Watershed

	Area (acres)			
	Infiltrated	**Treated**	**Untreated**	**Total**
Existing PGIS	3.0	0.0	39.8	42.8
Existing Non-PGIS	0.0	0.0	1.6	1.6
Existing CIA	**3.0**	**0.0**	**41.4**	**44.4**
Post-project PGIS				
Existing PGIS retained as-is	0.0	2.1	0.0	2.1
New, rebuilt, or resurfaced PGIS	0.0	44.5 [a]	7.1	51.6 [a]
Post-project Non-PGIS	0.0	4.3	0.0	4.3
Post-project CIA	**0.0**	**50.9** [a]	**7.1**	**58.0** [a]
Net change in CIA	**-3.0**	**50.9** [a]	**-34.3**	**13.6** [a]

a This value would increase by 0.3 acres for LPA Option B.

4.4.2 Columbia River and North Portland Harbor

On the Oregon side, the project would rebuild the Hayden Island interchange, retrofit the existing North Portland Harbor bridge with a stormwater collection and conveyance system, and demolish the existing the existing Columbia River bridges. The last two actions would result in eliminating runoff from approximately 8 acres of bridge deck that is presently discharged directly to the water surface below. The project would create approximately 52.8 acres of new and rebuilt PGIS for LPA Option A and 53.2 acres for Option B. Runoff from 2.2 acres of the existing North Portland Harbor Bridge and 7.6 acres of non-PGIS would be treated prior to being released to North Portland Harbor or the Columbia River. Currently, there are no water quality facilities for runoff from the project footprint in this watershed. Exhibit 4-11 summarizes the impact of the project on the impervious area from which runoff would be treated.

	Area (acres)

Stormwater Treatment – Columbia River South (Oregon) Basin	Infiltrated	Treated	Untreated	Total
Existing PGIS	0.0	0.0	59.4	59.4
Existing Non-PGIS	0.0	0.0	3.0	3.0
Existing CIA	**0.0**	**0.0**	**62.4**	**62.4**
Post-project PGIS				
Existing PGIS retained as-is	0.0	2.2	0.0	2.2
New, rebuilt, or resurfaced PGIS	0.0	52.8 [a]	0.0	52.8 [a]
Post-project Non-PGIS	0.0	7.6	0.0	7.6
Post-project CIA	**0.0**	**62.6** [a]	**0.0**	**62.6** [a]
Net change in CIA	**0.0**	**62.6** [a]	**-62.4**	**0.2** [a]

a Each of these values would increase by 0.4 acres for LPA Option B.

This watershed includes existing surface parking that may or may not remain after the project has been completed. It is uncertain at this time how land use in the vicinity of the Hayden Island interchange might change after completion of the CRC project. However, it has been assumed that the land on the west side of the proposed interchange and transit guideway would be used for staging during construction and converted into transit-oriented development following construction. This land comprises an area of about 10.0 acres west of the project and is bounded by the transit guideway, Center Avenue, Hayden Island Drive, and Jantzen Drive. Any redevelopment of these areas would need to comply with the stormwater development and discharge requirements of either ODOT or the City of Portland and is assumed, in the numbers presented in the table above, to receive stormwater treatment.

Constructed treatment wetlands are proposed for the main water quality facilities on Hayden Island, rather than biofiltration ponds, even though the soils belong to the Pilchuck-Urban land complex and are classified as Hydrologic Group A. At locations where such facilities are being considered, the depth to groundwater is only about 15 feet, and may be less depending on the influence of river levels on the phreatic surface. Considering the likely depth of the pond, there may not be adequate separation between the invert and groundwater table for treating runoff. The EPA recommends a “significant separation distance (2 to 5 feet) between the bottom of an infiltration basin and seasonal high groundwater table.” Again, no flow control facilities are required or proposed.

On the Washington side, the CIA in this basin would be increased by approximately 21.1 acres, most of which may be attributed to the reconfigured interchanges and increased number and length of merge lanes for I-5. The project would create approximately 97.8 acres of new and rebuilt PGIS and 13.3 acres of new and rebuilt non-PGIS. In addition, 15.0 acres of existing PGIS, mostly on I-5, would be resurfaced. Water quality facilities are proposed for approximately 134.7 acres of PGIS and 18.3 acres of non-PGIS. In contrast, runoff from only 3.0 acres of PGIS is currently treated. Exhibit 4-12 summarizes the impact of the project on the impervious area from which runoff would be treated. There is no difference in proposed impervious area between LPA Options A and B for the Columbia River basin on the Washington side.

Exhibit 4-12. Summary of Changes to Impervious Area and Stormwater Treatment – Columbia River North (Washington) Basin

	Area (acres)			
	Infiltrated	**Treated**	**Untreated**	**Total**
Existing PGIS	3.0	0.0	117.7	120.7
Existing Non-PGIS	0.0	0.0	12.2	12.2
Existing CIA	**3.0**	**0.0**	**129.9**	**132.9**
Post-project PGIS				
Existing PGIS retained as-is	13.1	9.8	0.0	22.9
New, rebuilt, or resurfaced PGIS	71.3	40.5	1.0	112.8
Post-project Non-PGIS	4.0	14.3	0.0	18.3
Post-project CIA	**88.4**	**64.6**	**1.0**	**154.0**
Net change in CIA	**85.4**	**64.6**	**-128.9**	**21.1**

Flow control is not required for this watershed and none is proposed. In addition, no new outfalls are proposed. Exhibit 4-12 demonstrates that the project proposes to treat runoff from the entire CIA with the exception of about 1.0 acre comprising the eastbound lanes of SR 14. Existing and proposed highway super-elevation at this location would result in runoff draining to catch basins located adjacent to the center median. Since this portion of SR 14 is only being resurfaced, the opportunity is limited to reconfigure the conveyance system. In addition, it is not possible to construct a biofiltration swale or media drain at the median and there is not space to provide either a cartridge vault or an end-of-pipe water quality facility.

From about 6th Street in Vancouver, I-5 will generally continue to follow its existing alignment and grade. The SR 14 and Mill Plain interchanges would be reconfigured, which would alter the current interchange footprint. In contrast, the Fourth Plain interchanges would be rebuilt and the interchange footprints would be similar to what currently exists. New streets would be constructed at the SR 14 interchange to improve local connections and the light rail guideway would be constructed primarily along existing streets. Three park and ride structures, Columbia, Mill, and Clark, would be built to serve the extended light rail system.

With the exception of the above-grade guideway between 6th Street and the new southbound Columbia River Bridge, the light rail guideway could be subject to use by buses and would therefore be considered pollutant-generating. This is a conservative determination, and could change should buses be excluded from the guideway during future project design.

4.4.3 Burnt Bridge Creek

The LPA would provide full connectivity between I-5 and SR 500 through the construction of a new ramp from southbound I-5 to eastbound SR 500 and tunnel from westbound SR 500 to northbound I-5. The project would increase the total impervious area in the watershed by about 6.6 acres and would create approximately 10.3 acres of new and rebuilt PGIS and 10.2 acres of existing PGIS would be resurfaced, as shown in Exhibit 4-13. Unlike the other watersheds, runoff to Burnt Bridge Creek must be reduced to pre-development (forested) conditions for peak discharges between 50 percent of the 2-year event and the 50-year event. There is no difference in proposed impervious area between LPA Options A and B in the Burnt Bridge Creek Drainage.

Exhibit 4-13. Summary of Changes to Impervious Area and Stormwater Treatment – Burnt Bridge Creek Drainage	Area (acres)			
	Infilt rate	**Tre ate**	**Untr eate**	**To tal**

	d	d	d	
Existing PGIS	14.5	0.0	1.7	16.2
Existing Non-PGIS	0.0	0.0	0.3	0.3
Existing CIA	**14.5**	**0.0**	**2.0**	**16.5**
Post-project PGIS				
Existing PGIS retained as-is	1.9	0.0	0.0	1.9
New, rebuilt, or resurfaced PGIS	20.5	0.0	0.0	20.5
Post-project Non-PGIS	0.7	0.0	0.0	0.7
Post-project CIA	**23.1**	**0.0**	**0.0**	**23.1**
Net change in CIA	**8.6**	**0.0**	**-2.0**	**6.6**

Soils in this area belong to Hydrologic Group B, which are considered suitable for infiltration. A soil assessment was recently obtained by the project that matches the findings of available soil data. The project design team has therefore integrated bioretention ponds as the primary BMP for this watershed. Two new bioretention ponds are proposed to treat runoff from new, rebuilt, resurfaced, and existing impervious area.

An existing infiltration pond at the Main Street interchange would not be modified by the project. Rather, the project would reduce the total impervious area draining to this facility by about 2.2 acres. Post-project, the infiltration pond will treat approximately 5.6 acres of new and rebuilt PGIS, 6.7 acres of resurfaced PGIS, and 0.5 acres of new and rebuilt non-PGIS. The infiltration pond was constructed as part of the I-5: Burnt Bridge Creek to NE 78th Street Project, which was completed in 2003. Overflows from this pond during extreme runoff events are discharged to Burnt Bridge Creek via a spillway and open channel.

4.4.4 Fairview Creek

The expansion of the Ruby Junction maintenance facility, which is included in both the LPA Option A and B, would result in a slight net decrease of impervious area (0.5 acres). Since the City of Gresham's requirements for stormwater treatment and flow control must be met for this portion of the project, runoff from all new impervious surface would be infiltrated to reduce pollutants of concern. The infiltration techniques would comply with the City of Gresham stormwater management requirements and would protect and/or improve the quality and quantity of existing groundwater flows. Therefore, the water quality of Fairview Creek would not be adversely impacted by the LPA.

4.4.5 LPA with Highway Phasing

The following describes two highway phasing options for the project and what impact these options would have on proposed impervious surface areas.

4.4.5.1 Phasing the Marine Drive Flyover and Victory Boulevard

The braided ramp between Marine Drive and southbound I-5 would be replaced by a shorter ramp merging onto southbound I-5 north of Victory Boulevard. In the full-build scenario, the braided ramp would join I-5 south of Victory Boulevard. In addition, construction of the ramp from eastbound Marine Drive to northbound I-5 would be deferred. This action would result in a net reduction in impervious area within the Columbia Slough watershed of approximately 5.5 acres in relation to the LPA, all of which would be PGIS. As a result, the need for a biofiltration swale would be eliminated and runoff draining to three constructed wetlands would be reduced.

4.4.5.2 Phasing the SR 500 Interchange

Under this option, the ramps from southbound I-5 to eastbound SR 500 and from westbound SR 500 to northbound I-5 would be deferred. Phasing this construction would result in a reduction in impervious area of approximately 5 acres, all of which is in the Burnt Bridge Creek watershed. This deferment would eliminate the need for one of the proposed bioretention ponds. The impervious area draining to the other bioretention pond would be reduced by 0.9 acres, all of which is resurfaced pavement on I-5, and the CIA draining to the existing infiltration pond would be reduced by 1.3 rather than 2.2 acres, which is what is proposed under the LPA Full Build.

5. Temporary Effects

5.1 Introduction

For purposes of this discussion, temporary effects are only those likely to occur during construction and would eventually cease once construction is completed. In some cases, such as the construction of a bridge crossing, temporary effects may last several years. Temporary effects discussed in this section are likely to be avoided or minimized with the proper implementation of measures discussed in Section 6 of this document. The temporary effects of the proposed project would result from construction activities such as soil-mixing, pile driving, demolition of the existing bridge structure, installation of cofferdams and other temporary construction activities. The temporary effects of the project would be the same for both LPA Option A and B.

Temporary effects to hydrology include placing obstructions in the water column and altering groundwater flows by pumping during depressed roadway construction. Temporary water quality impacts include turbidity due to sediment disturbance associated with in-water work, toxic contamination due to disturbance of hazardous sediments during in-water work, and toxic contamination due to equipment leaks or spills in the vicinity of project waterways. Temporary effects to stormwater include turbid overland flows due to soil disturbance and toxic contamination from leaking equipment.

5.2 Temporary Effects to Hydrology

Temporary effects to hydrology due to project construction pertain to the placement of obstructions in the water column at the Columbia River during superstructure construction and groundwater impact during depressed roadway construction across the project corridor.

Groundwater may be temporarily impacted by the construction below-grade and close to or beneath the water table. A detailed analysis of the depth to water table within the project area has not yet been conducted. However, a regional groundwater study indicates that the elevation of the water table is relatively constant over time and follows topographical features (McFarland and Morgan 1996). For instance, the water table within the SR 500 area of the corridor would be further from the surface compared to the water table on Hayden Island. Without a detailed analysis, below-grade construction is conservatively assumed to potentially require groundwater pumping. This pumping may affect the contribution of the surficial aquifer to project waterway flows as well as the groundwater quality of the surficial aquifer and stormwater quantity. Temporary effects to stormwater are discussed in Section 5.4. Since pumping would likely occur when the water table is high (e.g., during winter flows), this is not likely to affect the hydrologic regimes of project waterways significantly.

5.2.1 Columbia Slough

Temporary effects to the hydrology of the Columbia Slough due to construction are not anticipated beyond the potential for groundwater pumping during depressed roadway construction along the I-5 corridor.

5.2.2 Columbia River and North Portland Harbor

There is potential for groundwater pumping during depressed roadway construction within the Columbia River and North Portland Harbor drainage. This would be temporary and is not anticipated to have a significant effect on the hydrologic regime since this waterway is such a high-flow system.

Another temporary hydrologic effect to the Columbia River and North Portland Harbor include placing large temporary structures in the water column. These structures may be in place for several years. The project would use cofferdams at some pier complexes to isolate the work area from active flow in the Columbia River. The purpose of the cofferdams would be to avoid contaminating the Columbia River with work or waste material, contain resuspended sediments, and minimize disturbance of fish. In the Columbia River, up to 11 cofferdams may be installed, 2 for construction of the in-water piers and 9 for the demolition of existing in-water piers. In the Columbia River, cofferdams for construction could cover an anticipated combined area of approximately 15,750 square feet, and cofferdams for demolition could cover an anticipated combined area of approximately 67,500 square feet. (Exhibit 5-1). In North Portland Harbor, cofferdams for construction of the in-water piers are not anticipated and the existing in-water piers would not be demolished. Exhibit 5-1 shows in-water impacts for piles and cofferdams at the Columbia River and North Portland Harbor.

Exhibit 5-1. Summary of Temporary In-water Structural Impacts

	Columbia River			North Portland Harbor		
	Number	Area (sq.ft.)	Duration (days)	Number	Area (sq.ft.)	Duration (days)
In-water Impacts[a]						
Piles required for construction	920	4,247	260-315 each	400	<2,940	10-42 each
Piles required for demolition	304	995	30 each	None	0	0
Cofferdams required for construction	2	15,750	330-469 each	None	0	0
Cofferdams required for demolition	9	67,500	40 each	None	0	0
Total	**1,235**	**88,492**	**30-469**	**400**	**<2,940**	**10-42 each**

Notes: sq.ft = square feet

a Values represent total structures and areas over the entire construction period. Due to the temporary nature of these impacts fewer structures would be in place at any one time.

In addition to cofferdams, a total of approximately 1,500 temporary steel piles would be installed and removed during the multi-year construction of the mainstem Columbia River and North Portland Harbor bridge structures. Due to the heavy equipment and stresses placed on the support structures, many of these temporary piles would need to be load-bearing. The need for piles would be staged over the scheduled three-year construction period so that only 100 to 400 piles would likely be in the water at any given time. At least 300 temporary piles would also be installed to assist in the demolition of the existing bridge structure across the Columbia River.

The hydrologic effect of placing these temporary structures in the Columbia River and North Portland Harbor water column is expected to be minor due to the width of the Columbia River. In addition to the large size of the watershed, there are twelve major dams located in the Columbia Basin that regulate the flow in the project area that would minimize the probability of temporary hydrologic effects. Consequently, the Columbia River, near the project area, is a highly managed stream that no longer resembles its original free-flowing state, though in the immediate vicinity of the project area the river is free-flowing. The Columbia River is also tidally influenced by the Pacific Ocean, which affects flow and stage up to the Bonneville Dam, which includes the project area. The project would require a floodplain permit from local jurisdictions and further hydraulic analysis would be performed to ensure that there are no adverse effects of the project to the Columbia River's hydrologic regime.

5.2.3 Burnt Bridge Creek

Temporary effects to the hydrology of Burnt Bridge Creek due to construction are not anticipated beyond the potential for groundwater pumping during depressed roadway construction.

5.2.4 Fairview Creek

No temporary effects to the hydrologic regime of Fairview Creek are anticipated for the expansion of the facility since the approach to stormwater treatment on-site would entail infiltration for the entire expansion area.

5.3 Temporary Effects to Water Quality

Temporary effects to the water quality of project area waterways include turbidity due to ground disturbance around waterways associated with construction or staging, toxic contamination due to equipment leaks or spills in the vicinity of project waterways, sediment and contaminant migration into ground or surface water from equipment pressure or steam cleaning operations following construction periods, contamination of groundwater due to direct infiltration of toxic contaminants during groundwater pumping, infiltration of contaminated surface water, turbidity due to riverbed disturbance during in-water work, contamination due to disturbance of hazardous riverbed sediments during in-water work, and construction material or other objects falling into the Columbia River and North Portland Harbor during the construction of the new bridges and demolition of the old bridges. Following construction, the use of fertilizers, pesticides, or herbicides during restoration and revegetation activities may affect the water quality of project waterways as well. Temporary effects that are a result of in-water work are applicable only to the Columbia River and North Portland Harbor for this project since in-water work would not be performed at other waterways in the project area.

Throughout the project area, bridge, highway, transit and other related construction and improvements would create ground disturbance activities. These activities may expose soil to erosion from wind, rain, and runoff. Waterbodies receiving sediment-laden runoff by way of stormwater inlets, ditches, or other forms of conveyance may then experience increased turbidity and may be subjected to excessive sediment deposits. This may affect any of the receiving waters occurring in the project area: Columbia Slough, Columbia River, North Portland Harbor, Burnt Bridge Creek, and Fairview Creek.

The NPDES stormwater permitting program is administered by the DEQ in Oregon and Ecology in Washington. Generally for projects disturbing one or more acres, 1200-C or CA permits apply to construction activities including clearing, grubbing, grading, excavation, and stockpiling activities conducted by project owners or operators. The major provisions of these NPDES permits include: no discharge of significant amounts of sediment to surface waters; implementation of an ESCP; maintenance of BMPs; proper material and waste handling; compliance with water quality standards and any TMDLs for drainage basins; and visual inspection of BMPs.

Upland construction could cause turbidity in the project area waterways, though this would be prevented if the upland sites are managed appropriately. During construction, the project would adhere to a TESCP that specifies type and placement of BMPs, mandates frequent inspection, and outlines contingency plans in the event of failure. Additionally, there would likely be numerous other barriers between the source and the waterway. Therefore, to the greatest extent practicable, turbid discharges due to land-based BMP failure would be avoided.

Construction equipment operating on land may release contaminants (such as petroleum-based fuel or other fluids) or potentially toxic construction materials may be released, which may enter waterbodies by way of stormwater inlets, ditches, or other forms of conveyance. Also, pressure or steam cleaning of construction equipment prior to or following construction periods could release sediment and contaminants into ground or surface water. These activities could affect any of the water bodies occurring in the project area: Columbia River, North Portland Harbor, Columbia Slough, Burnt Bridge Creek, and Fairview Creek. Although there are numerous sources of chemical contaminants, there is a low risk that chemicals would actually enter the receiving waters. The project would employ numerous containment methods that would greatly minimize the potential for contamination and would ensure that accidental releases are confined to a limited area and cleaned up quickly. In addition to a TESCP, a SPCCP would be developed and implemented for the project to minimize the probability of waterway contamination.

The pumping of groundwater to facilitate construction may create a cone of depression and the potential for the movement of contaminated groundwater from nearby hazardous materials sites. A review of high ranking potential hazardous materials sites indicates that there are potential sources of contamination near proposed depressed road sections, except north of SR 500. The Hazardous Materials Technical Report discusses this in more detail.

The potential sites for staging and bridge assembly/casting areas have been specified and are listed in Section 1.3.3. These sites include Alcoa/Evergreen West, Port of Vancouver, Red Lion, Thunderbird, and Sundial. Each of these sites are adjacent to the Columbia River. The existing conditions on the assembly/casting yard range from a developed and paved port terminal to a currently undeveloped site. The staging and casting/assembly site activities may increase stormwater runoff over existing conditions and may increase pollutant loading. Each staging and casting site would meet all applicable stormwater requirements during and following utilization of the sites. A thorough, site-specific environmental impact analysis would be conducted at each of the sites to ensure that water quality impacts are minimized through the site selection process before the site is utilized during construction. All necessary permits would be secured prior to site development and operations.

Following construction, the use of fertilizers, pesticides, or herbicides during restoration and revegetation activities may affect the water quality of receiving waters. The use of these would be minimized especially near receiving waters. The project would adhere to requirements described in ODOT Standard Specifications 01040.00 to 01040.90 and/or WSDOT Standard Specification 8-02 “Roadside Restoration.”

5.3.1 Columbia Slough

Temporary effects to the water quality of the Columbia Slough includes turbidity due to ground disturbance associated with construction or staging, toxic contamination due to equipment leaks, spills, or cleaning activities in the vicinity of the waterway, toxic contamination of groundwater due to groundwater pumping during depressed roadway construction and infiltration of contaminated surface water, and contamination associated with chemicals utilized during revegetation activities. All temporary effects are described above. These effects would be minimized through the implementation of a TESCP and a SPCCP for the project area.

5.3.2 Columbia River and North Portland Harbor

Temporary effects to the water quality of the Columbia River and North Portland Harbor include turbidity due to ground disturbance associated with construction or staging, toxic contamination due to equipment leaks, spills, or cleaning activities in the vicinity of the river, contamination associated with chemicals utilized during revegetation activities, construction material and other objects falling into the Columbia River and North Portland Harbor during the construction of the new bridge and demolition of the old bridge, toxic contamination of groundwater due to groundwater pumping during depressed roadway construction and infiltration of contaminated surface water, turbidity due to riverbed disturbance during in-water work. Temporary effects of upland construction activities are described above.

There are numerous potential sources chemical contamination associated with in-water work in the Columbia River and North Portland Harbor. Some of these potential sources are listed below:

- Equipment located in or over water (such as barges or equipment operating on barges temporary work platforms, the existing structure, or the new structure) are potential sources of contamination, including petroleum fuel and other fluids.
- Concrete would be placed in numerous locations both in and over water for the construction of the pier footings and columns for the new bridge.
- Construction of the superstructure would involve the use of numerous other potential contaminants such as various petroleum products, adhesives, metal solder, concrete and metal dust, and asphalt.
- Bridge demolition would occur both in and over water and may release contaminants such as concrete debris, concrete dust created by saw cutting, and lead paint.

Dropped construction materials or demolition debris may alter water quality by stirring up sediments. Portions of the existing I-5 bridge contain lead-based paints. Significant modification to the existing bridge without proper implementation of BMPs may contaminate surface waters. Accidental chemical spills from construction machinery may be directly toxic to aquatic life.

The construction of bridge piers requires pouring concrete pier cap elements. Concrete may be poured on land or overwater during the course of construction. This fresh concrete may accidentally come into contact with the Columbia River and North Portland Harbor either by dropping into the water while it is being poured or by mixing with stormwater runoff during on land construction and being discharged into a waterbody. Fresh concrete is known to raise water pH when it comes into contact with water.

The project is likely to generate turbidity during the course of in-water work in the Columbia River and North Portland Harbor. The riverbed would be disturbed during in-water construction and cause sand and fine sediments to be re-suspended in the water column. The following activities are likely to generate turbidity:

- installation and removal of temporary piles;
- installation and removal of cofferdams;
- drilling shafts;

- removal of old piers and riprap in the channel where new piers would be placed;
- operating and anchoring the barge in shallow water; and
- demolishing the various elements of the existing bridge.

Sediment plumes, as a result of these activities, are expected to be localized and brief because of the implementation of containment measures. Containment measures are outlined in more detail in Section 6.3. In addition, the riverbed within the action area consists primarily of sand, which is anticipated to settle quickly once disturbed. A turbidity monitoring plan would be implemented during in-water work to ensure compliance with water quality permits.

The project would employ numerous BMPs to minimize turbidity during the course of in-water work. Nevertheless, due to the large size and strong currents of the Columbia River and North Portland Harbor, there are no devices that would completely contain turbidity. In addition, it is possible that BMPs may fail as a result of an accident or poor management and cause turbidity above ambient levels in these waterbodies.

There are no known records of contaminated sediments in the Columbia River mainstem portion of the project area. Therefore there is very little risk that in-water work in the Columbia River would resuspend contaminated sediments. In the North Portland Harbor, contaminated sediments have been identified, but they are thought to be outside of the project footprint. If there is potential that in-water work could disturb these sediments, they would be analyzed in accordance with regulatory criteria and removed and disposed of properly. Removed sediments may be disposed of in a permitted upland disposal site if required.

5.3.3 Burnt Bridge Creek

Temporary effects to the water quality of Burnt Bridge Creek would include turbidity due to ground disturbance associated with construction or staging, contamination due to equipment leaks, spills, or cleaning activities in the vicinity of project waterways, and contamination associated with chemicals utilized during revegetation activities. These effects would be minimized through the implementation of a TESCP and a SPCCP for the project area.

5.3.4 Fairview Creek

No temporary effects to the water quality of Fairview Creek are anticipated since runoff is almost completely infiltrated and runoff from the entire facility would be infiltrated as a result of the project. If runoff was conveyed off-site, though this is not anticipated, temporary effects may include turbidity due to ground disturbance around waterways associated with construction or staging, toxic contamination due to equipment leaks, spills, or cleaning activities in the vicinity of project waterways as described above, and contamination associated with chemicals utilized during revegetation activities. These effects would be minimized through the implementation of a TESCP and a SPCCP for the project area regardless of whether construction runoff is treated on-site through infiltration or conveyed off-site for any reason.

5.4 Temporary Effects to Stormwater

Temporary effects to stormwater across the project corridor are directly related to effects discussed in regards to hydrology and water quality, and in many cases the effects overlap. Temporary effects to stormwater include increased turbid runoff across the project corridor related to ground disturbance activities, toxic contamination of stormwater due to equipment or construction components, the potential for increased stormwater volumes due to groundwater pumping during depressed roadway construction, and at Columbia River and North Portland Harbor, an increased exposure of stormwater to contaminants due to surface areas of staging areas, barges, temporary work-bridges, and other structures related to over-water construction.

Ground disturbance activities would occur along the project corridor and in the vicinity of project receiving waters. Turbid runoff is anticipated to occur during rain events around ground disturbing activities such as clearing, grubbing, excavation, grading, stockpiling fill materials, ground improvement activities, and more. A TESCP would be designed and implemented for the project that would prevent turbid runoff from entering receiving waters. This is intended to reduce the probability of turbid runoff entering receiving waters. The site would be monitored by an environmental compliance monitor during construction to ensure turbid runoff is contained onsite. In the event of an accidental turbid discharge into surface waters, the TESCP would provide a framework for reporting and corrective action per project permits.

At active construction sites as well as staging and equipment storage areas, stormwater may be contaminated by equipment or construction components. Potential contaminant sources include equipment fuel/oil leaks or spills, “green” concrete (concrete that has not fully cured), buried waste unearthed during excavation, and more. An SPCCP would be designed and implemented for the project to provide a framework for containment, prevention, monitoring, reporting, and disposal of anything that may contaminant stormwater during construction.

During depressed roadway construction groundwater may be pumped to lower water elevations below construction activities. At this time it is unclear where the groundwater would be discharged to or what treatment would receive before being discharged or returned to groundwater flows. If the groundwater that is pumped is discharged overland, stormwater volumes would increase. In this case, stormwater treatment provided by the TESCP would need to be sized with these volumes accounted for.

5.4.1 Columbia Slough

Temporary effects to stormwater in the vicinity of the Columbia Slough include increased sedimentation in stormwater facilities due to turbid discharges related to ground disturbance activities, toxic contamination of stormwater due to equipment or construction components, and the potential for increased stormwater volumes due to groundwater pumping during depressed roadway construction. These effects and minimization measures are described above.

5.4.2 Columbia River and North Portland Harbor

In addition to the temporary effects discussed above that pertain to the whole project, the Columbia River and North Portland Harbor would experience an increase in stormwater volumes due to the impervious surfaces of staging areas, barges, temporary work-bridges, and other structures related to over-water construction. Stormwater from these structures would be conveyed and treated before being discharged to the river. The TESCP and SPCCP would address these temporary over-water construction components and prescribe methods for stormwater conveyance, treatment, monitoring, reporting, and emergency response.

5.4.3 Burnt Bridge Creek

Temporary effects to stormwater in the vicinity of the Burnt Bridge Creek include increased sedimentation in stormwater facilities due to turbid discharges related to ground disturbance activities, toxic contamination of stormwater due to equipment or construction components, and the potential for increased stormwater volumes due to groundwater pumping during depressed roadway construction. These effects and minimization measures are described above.

5.4.4 Fairview Creek

Temporary effects to stormwater in the vicinity of the Fairview Creek at the Ruby Junction Maintenance Facility include increased sedimentation in stormwater facilities due to turbid discharges related to ground disturbance activities and toxic contamination of stormwater due to equipment or construction components. Both of these temporary construction effects are not anticipated to affect Fairview Creek because stormwater is currently treated or infiltrated onsite and would continue to be during construction and after the completion of construction activities. Stormwater conveyed off-site for any reason would require prescribed treatment to ensure that runoff was not turbid or contaminated. Stormwater conveyance, treatment, monitoring, and emergency response for the Ruby Junction Maintenance Facility expansion site would be included in the project's TESCP and SPCCP for each construction phase.

6. Proposed Mitigation

6.1 Introduction

Mitigation measures to avoid or reduce the impact to water resources have been considered during the development of the LPA. There are many mitigation measures contained in state and local regulations that are designed to avoid and minimize the long-term impacts associated with construction. Regulations are in place to control the runoff generated from land development projects. Both ODOT and WSDOT have guidance measures for providing stormwater management for highways, and Portland, Vancouver, and Gresham have stormwater management requirements. A summary of the CRC project's approach to stormwater management is included in Section 1.3. Further detail is included in Appendix A. Therefore, most of the mitigation measures identified in the following sections are measures required by law and the project would not be constructed until all pertinent jurisdictions and regulations are satisfied with the measures enumerated in required plans. In addition to measures required by law, the project would implement mitigation measures that would exceed those required. For example, the project would add stormwater treatment along existing and resurfaced impervious areas within the project corridor, which is not required by current stormwater regulations.

6.2 Proposed Mitigation for Long-term Adverse Effects

6.2.1 Hydrology Mitigation Measures

The LPA would involve new bridge piers within the Columbia River. The potential long-term impact of a rise in the flood elevation would be addressed in a later design phase by conducting a flood-rise analysis. Such an analysis is a regulatory requirement. If flood-rise exceeds that allowed, the rise would be mitigated through floodplain excavation (cut/fill balance) activities.

The LPA would increase impervious surface area, which would reduce natural infiltration and increase stormwater runoff volumes. Although there are no regulations that address this potential impact, the effects of this increase would be minimized through the infiltration of stormwater runoff so that groundwater recharge continues to occur and so that stormwater flows are controlled.

6.2.2 Water Quality Mitigation Measures

Additional impervious surface area would induce additional project-generated runoff. Pollutants carried in the runoff could adversely affect receiving waters. One requirement of stormwater regulations is that total dissolved sediments must be reduced by treating stormwater prior to its discharge to receiving waters. In addition, stormwater must be treated to the maximum extent practicable and must comply with applicable water quality standards. The CRC project team has prepared a conceptual design to demonstrate the feasibility of proposed mitigation measures and water quality effects associated with the build alternatives. The conceptual design was prepared to meet the requirements of the ODOT and WSDOT for those portions of the project along I-5 and with cities of Portland and Vancouver regulations for those portions of the project along city-managed roads. In addition, the conceptual design demonstrates treatment and infiltration of the CIA to the maximum extent possible, in response to the requirements of NMFS and DEQ. Water quality BMPs for the design were chosen based on their effectiveness in reducing suspended solids, particulates, and dissolved metals.

The conceptual design prepared for FEIS analysis entails gravity pipe drainage systems that would collect and convey runoff from the new bridges, transit guideway, and road improvements. Stormwater treatment facilities would reduce TSS, particulates, and dissolved metals to the maximum extent practicable before runoff reaches surface waters (Appendix A).

Re-vegetation of construction easements and other areas would occur after the project is completed. All disturbed riparian vegetation would be replanted with species native to geographic region. A 5-year monitoring plan of re-vegetated areas would be implemented to ensure 100 percent survival of vegetation by stem count at the end of one year and 80 percent survival by stem count at the end of the 5-year monitoring period. For additional detail, consult ODOT Standard Specifications 01040.00 to 01040.90 and/or WSDOT Standard Specification 8-02 “Roadside Restoration.”

Specific stormwater management concepts are described in the following subsections.

6.2.2.1 Potential Stormwater Mitigation in Columbia Slough Watershed

Overall, the project would increase the total PGIS in this watershed by approximately 14 acres. This increase may be attributed to new streets connecting areas on either side of the Marine Drive interchange and the addition of runoff from the North Portland Harbor Bridge. The following paragraphs describe individual proposed water quality facilities and the areas they serve.

A biofiltration swale would be located south of Victory Boulevard and west of I-5 and would be sized to handle runoff from the south end of the ramp from Marine Drive to southbound I-5. Outflows would be discharged to Schmeer Slough via an existing or new stormwater pipe located on Victory Boulevard.

A constructed treatment wetland would be located within the existing loop ramp from Martin Luther King Jr. Boulevard to Union Court. The ramp would be removed as part of the project. This facility would serve a portion of the realigned Martin Luther King Jr. Boulevard east of I-5 and south of the end of the ramp from westbound Martin Luther King Jr. to northbound I-5. Outflows would be released via an existing City of Portland stormwater pipe to Walker Slough.

A biofiltration swale is proposed to treat runoff from 1.2 acres of the ramp from northbound I-5 to westbound Marine Drive. Outflows would be released to Walker Slough via an outfall.

A constructed treatment wetland is proposed to treat runoff from about 3.1 acres comprising the majority of the ramp from Martin Luther King Jr. Boulevard to northbound I-5. Outflows would be discharged to the upstream end of Walker Slough.

The largest water quality facility proposed in the Columbia Slough watershed is a constructed treatment wetland that takes advantage of the relatively open area in the southwest quadrant of the Marine Drive interchange. It would be sized to treat runoff from approximately 18.4 acres of impervious surface. This area comprises I-5, including approximately 2.1 acres of the existing North Portland Harbor bridge and ramps on the west side of the highway. Outflows from this facility would be released to the drainage channel located immediately south of the Expo Center. The channel and associated pump station may need to be enlarged to handle the additional flows. Alternatively, the wetland could be enlarged to provide detention storage and reduce peak outflows provided that the long-term survival of the wetland plants would not be affected.

The project would construct new connections between Martin Luther King Jr. Boulevard and Vancouver Way. Runoff from about 1.6 acres of new and resurfaced pavement would be treated at a biofiltration swale adjacent to the connection between Martin Luther King Jr. and Vancouver Way. Outflows would drain to the existing City of Portland stormwater conveyance system under Vancouver Way. Additional water quality improvements are expected as runoff in this system flows through over 7,000 feet of open channel before being pumped to Columbia Slough via the Pen 2–NE 13th Pump Station.

Runoff from 2.0 acres of impervious surface, comprising Martin Luther King Jr. and the new connection to Union Court and associated sidewalks, would be discharged to a constructed wetland, located between the two roadways. Outflows from this wetland would be released to an existing City of Vancouver conveyance system on Union Court and would be ultimately be pumped to Columbia Slough via the Schmeer Road Pump Station. Alternatively, the project may elect to shed a portion of the runoff across the each shoulder, where it would infiltrate or evaporate.

Runoff from about 0.5 acres of the new merge lane south of Victory Boulevard for the ramp from Marine Drive to southbound I-5 would be conveyed to a water quality swale constructed as part of the I-5 Delta Park project. This swale has adequate capacity to handle the additional runoff.

Runoff from approximately 16.9 acres of proposed new, rebuilt, and existing local streets and contiguous sidewalks within the CIA would be treated using a mix of semi-continuous biofiltration swales and proprietary systems, such as catch basins with built-in cartridge filters.

Runoff from about 1.1 acres of the bike-pedestrian pathway that is physically separated from the street network would likely be shed to adjacent landscaped areas where it would infiltrate or evaporate.

6.2.2.2 Potential Stormwater Mitigation in Columbia River South Watershed (Oregon)

The project would rebuild the Hayden Island interchange, retrofit the existing North Portland Harbor bridge with a stormwater collection and conveyance system, and demolish the existing the existing Columbia River bridges. The last two actions would result in eliminating runoff from approximately 8 acres of bridge deck that is presently discharged directly to the water surface below. The project would increase the CIA within this part of the Columbia River watershed by 0.2 acres and create approximately 52.8 acres of new, rebuilt, and resurfaced PGIS. Runoff from these areas, 7.6 acres of non-PGIS, and 2.2 acres of the existing North Portland Harbor Bridge would be treated prior to being released to North Portland Harbor or the Columbia River. Currently, there are no water quality facilities for runoff from the project footprint in this watershed. Below, is a summary of the proposed stormwater facilities for this watershed.

Grades are such that it would be difficult to convey runoff from Marine Drive west of the light rail transit track to the constructed treatment wetland in the Columbia Slough drainage. Instead, runoff from this area (approximately 2.6 of new impervious surface) would be conveyed to a biofiltration swale located immediately north of Marine Drive. Flows from the swale would be discharged to an existing outfall on North Portland Harbor via an existing City of Portland stormwater system.

A constructed treatment wetland is proposed at the south end of the proposed light rail arterial bridge across North Portland Harbor. It would be sized to handle runoff from 2.7 acres of impervious surface on the bridge, which includes 1.2 acres of light rail guideway, sidewalk, and bike path, and about 1.5 acres of PGIS acres immediately west of the south end of the bridge. Outflows from the wetland would be conveyed to North Portland Harbor via an existing City of Portland stormwater pipe under Marine Drive.

Runoff from 17.5 acres of new I-5 mainline between the Tomahawk Island Drive extension and the high point across the Columbia River and a portion of Hayden Island Drive east of I-5 would be conveyed to a constructed treatment wetland located along the east side of the interchange. It will also treat 0.1 acres of non-PGIS. Outflows from the facility would be released to the Columbia River via one of the two existing ODOT both of which are located under the south end of the existing bridges over the Columbia River.

Another constructed wetland is proposed to be located east of I-5 and south of the Tomahawk Island Drive extension. It would be sized to handle about 13.9 acres of new ramps and I-5 pavement between North Portland Harbor and Tomahawk Island Drive extension under I-5, the Tomahawk Island Drive extension, and a portion of the realigned North Jantzen Drive under I-5. It would also handle runoff from the north half of the existing I-5 bridge over North Portland Harbor. Proposed grades are such that drainage from Tomahawk Island Drive and Jantzen Drive would need to be pumped to the wetland. Outflows from the facility would be released to the Columbia River.

Runoff from approximately 4.9 acres of impervious pavement, including 2.4 acres of transit-only structure and bike-pedestrian path, would be conveyed to a constructed wetland located west of I-5 and immediately south of Hayden Island Drive. Outflows from the facility would likely be released to the Columbia River.

Runoff from approximately 10.5 acres of proposed new, rebuilt, and existing local streets and contiguous sidewalks within the CIA would be treated using a mix of semi-continuous biofiltration swales and proprietary systems such as catch basins with built-in cartridge filters.

As previously stated, approximately 10.0 acres of future transit-oriented development has been assumed on the west side of I-5 in this watershed. Runoff would be treated according to either ODOT or City of Portland standards.

Runoff from about 0.4 acres of the bike-pedestrian pathway west of the south end of the light rail/multi-use path bridge over North Portland Harbor will likely be shed to adjacent landscaped areas where it will infiltrate and evaporate. This path is physically separated from the street network.

6.2.2.3 Potential Stormwater Mitigation in Columbia River North Watershed (Washington)

In the project-related part of the Columbia River watershed in Washington State, the CIA would be increased by 21.1 acres, most of which may be attributed to the reconfigured interchanges and increased number and length of merge lanes for I-5. The project would create 112.8 acres of new, rebuilt, and resurfaced PGIS and 13.3 new and rebuilt non-PGIS, while reducing existing untreated impervious area by about 128.9 acres. Water quality facilities are proposed for 134.7 acres of new, rebuilt, and resurfaced PGIS and 18.3 acres of non-PGIS. Runoff from about 3 acres of PGIS is currently treated. Flow control is not required for the Washington side of the watershed and none is proposed. In addition, no new outfalls are proposed.

The following paragraphs describe individual proposed water quality facilities and the areas they serve. Since this watershed represents approximately 50percent of the total project footprint, the water quality facilities proposed for the highway elements are grouped by interchange.

SR 14 Interchange

Runoff from about 17.9 acres of southbound I-5, ramps on the west side of the interchange, and the west side of the Evergreen Boulevard bridge over I-5 would be conveyed to a bioretention pond. The pond is located on the west side of the SR 14 interchange, east of the Main Street extension. Any overflow from this bioretention pond would be released to the Columbia River at an outfall through the existing stormwater conveyance system.

Another bioretention pond would be located within the loop ramps on the east side of the SR 14 interchange. It would be sized to handle runoff from approximately 18.7 acres of northbound I-5, ramps on the east side of the interchange, and the east side of the Evergreen Boulevard bridge over I-5. Again, any overflow from the bioretention pond would be released to the Columbia River at an outfall via the existing stormwater conveyance system.

Runoff from about 3.2 acres of new impervious area on SR 14 and Main Street would be directed to one or two biofiltration swales located adjacent to the intersection of Main Street and SR 14. Outflows would be released to the Columbia River at an outfall through the existing stormwater conveyance system.

Runoff from approximate 3.9 acres comprising the new, rebuilt, and resurfaced westbound lanes of SR 14 east of the SR 14 interchange would be conveyed to a biofiltration swale located on the north side of the highway. Alternatively, runoff from the resurfaced westbound lanes may be shed to the highway shoulder where it would be infiltrated, which is similar to existing conditions. Outflows from the swale would be conveyed to an outfall along the Columbia River through an existing 6-foot by 6-foot culvert. CRC project staff have not yet identified any options for treating runoff from the eastbound lanes.

Mill Plain Interchange

Two biofiltration ponds are proposed in the northeast and southeast quadrants of the reconfigured Mill Plain interchanges. They would be sized to handle runoff from approximately 25.4 acres of new ramps, new, rebuilt, and resurfaced highway, a new collector-distributor road to the north, and Mill Plain Boulevard to the east. Any overflow from the ponds would be conveyed to an outfall through the existing stormwater conveyance system under I-5.

Runoff from approximately 0.8 acres of the ramp from southbound I-5 to Mill Plain Boulevard would be directed to a biofiltration swale west of the ramp. Discharge from the swale would be discharged to an outfall through the existing stormwater trunk main under I-5.

The proposed street grade for Mill Plain Boulevard under I-5 is too low to permit runoff from about 6.2 acres to be conveyed to either of the bioretention ponds mentioned above. Instead, runoff would be conveyed to proprietary cartridge filter vault and, if necessary, an oil-water separator pre-treatment facility. Based on available data, there appears to be adequate vertical distance between the low point on Mill Plain Boulevard and the invert of the existing stormwater conveyance system under I-5 to install this type of facility. Discharge from the vault would be discharged to an outfall through the existing stormwater trunk main under I-5.

Fourth Plain Interchange

The Fourth Plain interchange would be replaced, access would be provided from Fourth Plain Boulevard to the proposed Clark Park and Ride structure, and existing pavement would be resurfaced between the Fourth Plain and SR 500 interchanges. The existing stormwater conveyance systems north of Fourth Plain would likely be retained by the project. Available data indicate that the main stormwater pipe under I-5 is shallow enough to permit flows to be redirected to water quality facilities located in the interchange.

Drainage from the top surface of the Clark Park and Ride and associated paths, which entails 3.9 acres, would be conveyed to a biofiltration swale located on the east side of the structure. An oil-water separator would pretreat runoff from the park and ride.

Runoff from 11.2 acres of I-5 and the access road to the Clark Park and Ride, which includes 5.6 acres of resurfaced highway, would be conveyed to a bioretention pond located in the southeast quadrant of the interchange.

Another bioretention pond is proposed to be located in the northwest quadrant of the Fourth Plain interchange would be sized to handle runoff from an impervious area of approximately 14.3 acres. This area includes approximately 4.0 acres of new and rebuilt pavement and sidewalks as well as about 10.3 acres of existing streets and sidewalks in the Shumway neighborhood northwest of the interchange.

Runoff from approximately 1.8 acres of new and rebuilt pavement and sidewalks on Fourth Plain Boulevard, east of I-5, as well as about 0.8 acres of existing impervious area further east of the project area would be conveyed to a proposed biofiltration swale south of Fourth Plain Boulevard and east of the collector-distributor road.

Outflow from the biofiltration swales and any overflow from the bioretention ponds would be released to the Columbia River via the existing stormwater conveyance system under I-5.

Other Water Quality Facilities

The proposed approach to constructing the light rail guideway along Vancouver city streets is to excavate a slot within the existing pavement to facilitate single-track guideway construction. For single-track guideways, it was assumed that the remaining pavement would be resurfaced within each block. For double-track guideways, it is assumed that the entire street would need to be replaced. The pavement at intersections would likely need to be completely rebuilt, whether it is a single- or double-track guideway.

Runoff from approximately 41.9 acres of proposed light rail transit guideway, new, rebuilt, and existing local streets, and contiguous sidewalks within this watershed’s CIA, would be treated using a mix of semi-continuous biofiltration swales and proprietary systems such as catch basins with built-in cartridge filters.

Runoff from about 2.1 acres comprising the top floors of the Columbia Street and Mill District park and ride structures would be conveyed to the existing City of Vancouver stormwater conveyance systems via proprietary cartridge filter vaults. Pretreatment would be provided using oil-water separators.

Runoff from about 0.9 acres of the bike-pedestrian pathway that is physically separated from the street network would likely be shed to adjacent landscaped areas where it would infiltrate and evaporate.

6.2.2.4 Potential Stormwater Mitigation in Burnt Bridge Creek Watershed

The project would increase the impervious area by approximately 6.6 acres. The total project CIA would be about 23.1 acres of which approximately 20.5 acres would be new, rebuilt, and resurfaced PGIS and about 0.7 acres would be new sidewalks and bike-pedestrian paths. The remaining 1.9 acres consists of an existing portion of SR 500.

Flow control is required for stormwater runoff discharged to Burnt Bridge Creek. No new outfalls are proposed. Soils in this area belong to Hydrologic Group B and are considered suitable for infiltration. Therefore, the primary proposed water quality facilities in this watershed are bioretention ponds.

Runoff from approximately 3.4 acres of new, rebuilt, and resurfaced eastbound lanes of SR 500 and 39th Street and 1.9 acres of existing westbound lanes that would not be affected by the project would be conveyed to a bioretention pond south of SR 500. Runoff from 0.2 acres of non-PGIS would also be treated by this facility. Overflows from the pond would be conveyed to an existing outfall to Burnt Bridge Creek.

Runoff from about 2.5 acres of new and rebuilt pavement and 2.3 acres of resurfaced pavement would be conveyed to another proposed bioretention pond, which would be located immediately east of I-5 and south of 39th Street. The majority of the impervious area comprises a section of I-5 that currently drains to an existing infiltration pond at the Main Street interchange, which is described in the next paragraph. Overflows from this new bioretention pond would be conveyed to Burnt Bridge Creek through an existing outfall.

There is an existing infiltration pond at the Main Street interchange, which would not be modified by the project since this type of facility is considered to provide adequate runoff treatment. Although approximately 12.3 acres of new, rebuilt, and resurfaced project pavement and 0.5 acres of non-PGIS would be conveyed to this pond, the total impervious area served by it would be decreased by about 2.2 acres in relation to existing conditions. Overflows from the pond are currently and would continue to be released to Burnt Bridge Creek through an existing outfall.

6.2.2.5 Potential Stormwater Mitigation in Fairview Creek

The expansion of the Ruby Junction facility would result in a net decrease in impervious area (0.5 acres). The City of Gresham’s requirements for stormwater treatment and flow control would be met by infiltrating stormwater runoff from impervious surfaces within the expansion area to reduce pollutants of concern and control stormwater flows to Fairview Creek.

6.3 Proposed Mitigation for Temporary Adverse Effects

6.3.1 Introduction

State and local regulations require conservation and mitigation measures so that hydrology, water quality, and stormwater impacts associated with road, bridge, or transit construction are largely avoided or minimized. Construction impacts include potential sedimentation and erosion hazards, contaminated or sediment-laden stormwater discharges, and accidental spills generally associated with land disturbance activities. State, federal, and local permits require the development and implementation of an ESCP.

6.3.2 Hydrology

Temporary effects to hydrology due to project construction pertain to the placement of obstructions in the water column at the Columbia River during superstructure construction and groundwater impact during depressed roadway construction across the project corridor.

The project would require a floodplain permit from local jurisdictions and further hydraulic analysis would be performed to ensure that effects of the project to the Columbia River’s hydrologic regime are minimized. If adverse effects are realized through the analysis, project design would be modified to minimize effects to the greatest extent possible.

Impacts to groundwater hydrology would be minimized by limiting areas where groundwater would be pumped to areas where pumping cannot be avoided in order to complete construction.

6.3.3 Water Quality

Temporary effects to the water quality of project area waterways include:

- Turbidity resulting from erosion of ground disturbed by construction or staging.
- Toxic contamination due to equipment leaks or spills in the vicinity of project waterways.
- Toxic contamination of groundwater due to groundwater pumping during depressed roadway construction and infiltration of contaminated surface water.
- Turbidity due to riverbed disturbance during in-water work.
- Toxic contamination due to disturbance of hazardous riverbed sediments during in-water work.
- Foreign objects falling into the Columbia River and North Portland Harbor during the construction of the new bridge and demolition of the old bridge.
- Toxic contamination due to concrete curing or discharge of process water.

All work would be performed according to the requirements and conditions of the regulatory permits issued by federal, state and local governments (Section 7). State DOT policy and construction administration practice in Oregon and Washington is to have a DOT inspector on site during construction. The role of the inspector would be to ensure contract and permit requirements are met. ODOT and WSDOT environmental staff would provide guidance and instructions to the onsite inspector to ensure the inspector is aware of permit requirements.

6.3.3.1 Erosion and Sediment Control

The contractor would prepare a TESCP and a Source Control Plan would be implemented for all projects requiring clearing, vegetation removal, grading, ditching, filling, embankment compaction, or excavation. Erosion and sediment control plans are generally developed as follows: plan design/preparation; implementation before ground-breaking; inspection of BMPs; repair and maintenance of BMPs as needed; and modification of plan as needed with approval of the project engineer.

The BMPs in the plans would be used to control sediments from all vegetation removal or ground disturbing activities. The engineer may require additional temporary erosion and sediment control measures beyond the approved TESCP if it appears pollution or erosion may result from weather, nature of the materials or progress on the work. For additional detail, consult ODOT Standard Specifications Section 00280.00 to 00280.90 and/or WSDOT Standard Specification 8-01. For transit construction, consult TriMet Standard Specification 02276.

As part of the TESCP, the contractor would delineate clearing limits with orange barrier fencing wherever clearing is proposed in or adjacent to a stream/wetland or its buffer, and install perimeter protection/silt fence as needed to protect surface waters and other critical areas. Location would be specified in the field, based upon site conditions and the TESCP. For additional silt fence detail, consult ODOT Standard Specifications Section 00280.16(c) and/or WSDOT Standard Specification 8-01.3(9)A.

The contractor would identify at least one employee as the erosion and spill control lead at pre-construction discussions and the TESCP. The contractor would meet the requirements of and follow the process described in ODOT Standard Specifications Section 00280.30 and/or WSDOT Standard Specification 8-01.3(1)B. The ESC lead would be listed on the Emergency Contact List as part of ODOT Standard Specifications Section 00290.20(g) and/or WSDOT Standard Specification 1-05.13(1). The erosion and spill control lead would also be responsible for ensuring compliance with all local, state, and federal erosion and sediment control requirements.

All TESCP measures would be inspected on a weekly basis. Contractor would follow maintenance and repair as described in ODOT Standard Specifications Section 00280.60 to 00280.70 and/or WSDOT Standard Specification 8-01.3(15). Inspection of erosion control measures would immediately occur after each rainfall, and at least daily, during for precipitation events of more than 0.5 inches in a 24-hour period.

For landward construction and demolition, project staging and material storage areas would be located a minimum of 150 feet from surface waters, in currently developed areas such as parking lots or managed fields. Excavation activities (dredging not included) would be accomplished in the dry. All surface water flowing towards the excavation would be diverted through utilization of cofferdams and/or berms. Cofferdams and berms must be constructed of sandbags, clean rock, steel sheeting, or other non-erodible material.

Bank shaping would be limited to the extent as shown on the approved grading plans. Minor adjustments made in the field would occur only after engineer's review and approval. Bio-degradable erosion control blankets would be installed on areas of ground-disturbing activities on steep slopes (1V:3H or steeper) that are susceptible to erosion and within 150 feet of surface waters. Areas of ground-disturbing activities that do not fit the above criteria would implement erosion control measures as identified in the approved TESCP. For additional erosion control blanket detail, consult ODOT Standard Specifications 00280.14(e) and/or WSDOT Standard Specification 9-14.5(2) and 8-01.3(3).

Erodible materials (material capable of being displaced and transported by rain, wind, or surface water runoff) that are temporarily stored or stockpiled for use in project activities would be covered to prevent sediments from being washed from the storage area to surface waters. Temporary storage or stockpiles must follow measures as described in ODOT Standard Specifications Section 00280.42 and/or WSDOT Standard Specification 8-01.3(1).

All exposed soils would be stabilized as directed in measures prescribed in the TESCP. For additional detail consult ODOT Standard Specifications 01030.00 to 01030.90 and 00280.42 and/or WSDOT Standard Specification 8-01.3(1).

Where site conditions support vegetative growth, native vegetation indigenous to the location would be planted in areas disturbed by construction activities. Re-vegetation of construction easements and other areas would occur after the project is completed. All disturbed riparian vegetation would be replanted. Trees would be planted when consistent with highway safety standards. Riparian vegetation would be replanted with species native to geographic region. Planted vegetation would be maintained and monitored to meet regulatory permit requirements. For additional detail, consult ODOT Standard Specifications 01040.00 to 01040.90 and/or WSDOT Standard Specification 8-01.3(2)F.

6.3.3.2 Spill Pollution/Prevention Control

The contractor would prepare an SPCCP prior to beginning construction. The SPCCP would identify the appropriate spill containment materials; as well as the method of implementation. All elements of the SPCCP would be available at the project site at all times. For additional detail, consult ODOT Standard Specifications Section 00290.00 to 00290.90 and/or WSDOT Standard Specification 1-07.15(1). For transit construction in Oregon, consult TriMet Standard Specification 01450{1.04}).

The contractor would designate at least one employee as the ESC lead. The ESC lead would be responsible for the implementation of the SPCCP. The contractor would meet the requirements of; and follow the process described in ODOT Standard Specifications Section 00290.00 through 00290.30 and/or WSDOT Standard Specification 8-01.3(1)B. The ESC lead would be listed on the Emergency Contact List as part of ODOT Standard Specifications Section 00290.20(g) and/or WSDOT Standard Specification 1-07.15(1).

All equipment to be used for construction activities would be cleaned and inspected prior to arriving at the project site, to ensure no potentially hazardous materials are exposed, no leaks are present, and the equipment is functioning properly. Identify equipment that would be used below the ordinary high water (OHW) line. Outline daily inspection and cleanup procedures that would insure that identified equipment is free of all external petroleum based products. Should a leak be detected on heavy equipment used for the project, the equipment would be immediately removed from the area and not used again until adequately repaired. Where off-site repair is not practicable, the implemented SPCCP would prevent and/or contain accidental spills in the work/repair area to insure no contaminants escape containment to surface waters and cause a violation of applicable water quality standards.

Operation of construction equipment used for project activities shall occur from on top of floating barge or work decks, existing roads or the streambank (above OHW). Any equipment operating in the water shall use only vegetable based oils in hydraulic lines.

All stationary power equipment or storage facilities would have suitable containment measures outlined in the SPCCP to prevent and/or contain accidental spills to insure no contaminants escape containment to surface waters and cause a violation of applicable water quality standards. These facilities would also have spill containment materials kept on hand.

Process water generated on site from construction, demolition or washing activities would be contained and treated to meet applicable water quality standards before entering or re-entering surface waters.

No paving, chip sealing, or stripe painting would occur during periods of rain or wet weather.

For projects involving concrete, the implemented SPCCP would establish a concrete truck chute cleanout area to properly contain wet concrete as part of ODOT Standard Specifications Section 00290.30(a)1 and/or WSDOT Standard Specification 1-07.15(1). The SPCCP may include requirements for pH monitoring during concrete work with specific obligations of the contractor enumerated if the pH level changes within receiving waters by more than 0.2 pH units.

6.3.3.3 Groundwater Quality

Short-term groundwater pumping may create a cone of depression that increases the risks of contamination from nearby contaminated sites either through direct infiltration of these contaminants or through infiltration of contaminated surface water. Sites with existing soil or groundwater contamination near construction areas would be further studied and tested before any groundwater pumping occurs. From that analysis, further action, to avoid causing such contamination to spread, would be determined and implemented during the design and construction phase. These actions may include the following: remediation of contaminated areas;

removal of contaminants; or design changes that avoid ground disturbance in the vicinity of contaminated areas.

6.3.3.4 In-water Work

The project would use best management practices to minimize turbidity and release of pollutants during in-water construction in the Columbia River and North Portland Harbor. The project team would prepare applications for dredging and fill activities under Section 404 of the Clean Water Act, administered by the U.S. Army Corps of Engineers (USACE), and would seek water quality certification under Section 401 of the CWA, administered by the DEQ and Ecology.

In-water work would be conducted only during in-water work periods for the Columbia River as approved by WDFW, ODFW, NMFS, and USFWS. Because bed disturbance would result in temporary increases in turbidity, limiting the duration of dredging activities may be required by project permits. A mandatory "rest" period between dredging periods may be required as well.

If in-water dredging is required outside of a cofferdam, a clamshell bucket would be used. Dredged material would be disposed of in accordance with relevant permits and approvals.

The contractor would prepare a Water Quality Sampling Plan for conducting water quality monitoring for all projects occurring in-water. The Plan would identify a sampling methodology as well as method of implementation to be reviewed and approved by the engineer. If, in the future, a standard water quality monitoring plan is adopted by ODOT and/or WSDOT, this plan, with the agreement of NMFS and USFWS, may replace the contractor plan.

Operation of construction equipment used for in-water work activities would occur from a floating barge, work bridge deck, existing roads, or the streambank (above OHW). Only the operational portion of construction equipment would enter the active stream channel (below OHW). Process water generated on site from construction, demolition, or washing activities would be contained and treated to meet applicable water quality standards before entering or re-entering surface waters.

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7. Permits and Approvals

7.1 Federal Permits

7.1.1 NPDES

A Section 402 NPDES permit may be needed if a new outfall is developed on Hayden Island that discharges to North Portland Harbor.

Existing NPDES permits addressing stormwater outfalls may need to be amended to address additional stormwater flows generated by the project.

Existing construction NPDES permits held by ODOT and WSDOT may also require modification to address project construction.

In Oregon, NPDES permits are administered through DEQ. In Washington these permits are administered through Ecology. Specific state requirements are discussed below.

7.1.2 Section 404/10

A Section 404 and Section 10 permit would be required for in-water work within the Columbia River and North Portland Harbor. The Section 404 permit would also cover the loss of wetlands.

7.1.3 Flood Control Facilities Disturbance

Federal regulations state that “no improvement shall be passed over, under, or through the walls, levees, improved channels or floodways, nor shall any excavation or construction be permitted within the limits of the project right-of-way, nor shall any change be made in any feature of the works without prior determination by the District Engineer of the Department of the Army or his authorized representative that such improvement, excavation, construction, or alteration would not adversely affect the functioning of the protective facilities. Such improvements or alterations as may be found to be desirable and permissible under the above determination shall be constructed in accordance with standard engineering practice.”

Further, in the USACE Flood Control Operations and Maintenance Policies, Regulation 1130-2-530 states, “Projects that protect urban areas or ones where failure would be catastrophic and result in loss of life should be inspected annually.” It also instructs USACE personnel to report non-federal sponsors who are not complying with the regulations.

7.2 State Permits

7.2.1 Water Quality Certification

Section 401 state water quality certification approval would be required in association with the Section 404/10 permit application process. Section 401 requires an applicant for a federal license or Section 404 permit who plans to conduct an activity that may result in a discharge to waters of the state or U.S. to obtain certification that the activity complies with state water quality requirements and standards. Applicants must submit a Section 404 application form to the

USACE, who then forwards the application to the certifying state agency. The state agency certifies whether the project meets state water quality standards and does not endanger waters of the state/U.S. or wetlands. These certifications are issued by DEQ in Oregon and by Ecology in Washington. DEQ and Ecology would also review and approve the project's stormwater management plan as well as the project's overall effect on water quality.

7.2.2 Safe Drinking Water Act Permits

Both Washington and Oregon implement the federal Safe Drinking Water Act (SDWA) within their jurisdictions. For the CRC project, this law would only apply if infiltration basins or underground injection control (UIC) measures were incorporated into the preferred stormwater management design.

7.2.3 Wetland/Waters Removal-Fill Permit

In Washington, a Joint Aquatic Resource Permits Application (JARPA) is submitted to both the USACE and Ecology for removal/fill within wetlands or waters. Ecology reviews the permit application for 401 water quality certification.

In Oregon, removal or fill in jurisdictional wetlands or other waters of the state (including some ditches) requires a Removal-Fill permit from the Department of State Lands (DSL). DSL requires a wetland delineation and compensatory mitigation plan as part of the permit application. A Joint Permit Application is submitted to the DSL and the USACE (Portland Regional Office). DEQ reviews the permit application for 401 water quality certification.

7.2.4 Waste Discharge General Permit

In Washington, a state general permit program is administered through Ecology and is applicable to the discharge of pollutants, wastes, and other materials to waters of the state. Permits issued are designed to satisfy the requirements for discharge permits under the CWA.

7.2.5 NPDES

WSDOT has an NPDES Construction General Stormwater Permit to cover all WSDOT construction activities disturbing more than 1 acre. Under the conditions of this permit, WSDOT must submit to Ecology a Notice of Intent (NOI) to discharge stormwater associated with construction activities and to meet stormwater pollution prevention requirements.

In Oregon the DEQ issues and enforces NPDES and Water Pollution Control Facility (WPCF) permits. However, a WPCF permit is not generally required for stormwater treatment facilities and therefore not anticipated to be necessary for this project. For the CRC project, compliance with the 1200-CA and MS4 permit would be required for: (1) the construction, installation, or operation of any activity that would cause an increase in the discharge of wastes into the waters of the state or would otherwise unlawfully alter the physical, chemical, or biological properties of any waters of the state; (2) an increase in volume or strength of any wastes in excess of the discharges authorized under an existing permit; and (3) the construction or use of any new outlet for the discharge of any wastes into the waters of the state. ODOT has an NPDES General Construction 1200-CA Stormwater Permit to cover ODOT construction activities on sites covering more than 1 acre. This permit requires a TESCP.

7.3 Local Permits

7.3.1 Vancouver Municipal Code (VMC). 2005. "Stormwater Management." VMC 14.09

The City of Vancouver implements its own NPDES permit, as issued by Ecology. The City defers to Ecology's Stormwater Management Manual for Western Washington for guidance, but requires stormwater mitigation for any development that increases the impervious area by more than 2,500 square feet.

7.3.2 Vancouver Municipal Code. 2005. "Erosion Control." VMC 14.24

This code establishes regulations to minimize erosion from land development and land-disturbing activities.

7.3.3 Vancouver Municipal Code. 2005. "Water Resources Protection." VMC 14.26

This code establishes allowable and prohibited discharges and BMPs for protecting stormwater, surface water, and groundwater quality.

7.3.4 City of Portland Administrative Rule ENB-4.01, Stormwater Management Manual. September 2004

The City of Portland requires stormwater mitigation for any development that increases impervious surface area by more than 500 square feet.

7.3.5 City of Portland Code (CPC). 2004. "Stormwater Management." CPC 33.653. Portland, OR

The City of Portland code provides for placement of stormwater facilities, and standards and criteria for on-site facilities. The code lists approval criteria to ensure the development of a feasible stormwater system with adequate capacity.

7.3.6 City of Portland Code (CPC). 2010. "Drainage and Water Quality." CPC 17.38. Portland, OR

This portion of the City of Portland code provides guidelines for the effective management of stormwater, groundwater, and drainage, and to maintain and improve water quality in the watercourses and water bodies within the City of Portland.

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