Interstate 5 Columbia River Crossing

Hazardous Materials Technical Report for the Final Environmental Impact Statement

May 2011

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LIST OF EXHIBITS

APPENDICES

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ACRONYMS

Acronym	Description
µg	micrograms
AAI	all appropriate inquiry
AASHTO	American Association of State Highway and Transportation Officials
ACM	asbestos-containing material
AIRS	EPA Aerometric Information Retrieval System
AST	above ground storage tank
ASTM	American Society of Testing and Materials
AVS	acid-volatile sulfide
bgs	below ground surface
BMP	best management practice
BNSF	Burlington Northern Santa Fe Railroad
BTEX	Benzene, toluene, ethylbenzene, and xylene
C-TRAN	Clark County Public Transportation Benefit Authority
CD	collector-distributor
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Act Information System
CFR	Code of Federal Regulations
CMMP	Contaminated Media Management Plan
CORRACTS	RCRA Corrective Action Sites
CPC	City of Portland Code
CPU	Clark Public Utilities
CRBG	Columbia River Basalt Group
CRC	Columbia River Crossing
CSCS	Confirmed and Suspected Contaminated Sites
CTR	Commute Trip Reduction (Washington)
CU1	Confining Unit 1
CU2	Confining Unit 2
CVOC	Chlorinated volatile organic compound
CWA	Clean Water Act
DDT	Trichlorodiphenyldichloroethane
DEIS	Draft Environmental Impact Statement
DEQ	Oregon Department of Environmental Quality
DMEF	Dredge Material Evaluation Framework
DOT	U.S. Department of Transportation

ECO	Employee Commute Options (Oregon)
Ecology	Washington Department of Ecology
EDR	Environmental Data Resources
EIM	Environmental Information Management System
EMAP	Environmental Management and Assessment Program
EPA	United States Environmental Protection Agency
ERNS	Emergency Response Notification System
ERTS	Environmental Report Tracking System
ESA	Environmental Site Assessment
ESCI	Environmental Site Cleanup Information
FEIS	Final Environmental Impact Statement
FHWA	Federal Highway Administration
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act of 1972
FINDS	Facility Index System/Facility Identification Initiative Program Summary Report
FTA	Federal Transit Administration
FTTS	FIFRA/TSCA Tracking System
g	gram
gpd/ft	gallons per day per foot
HASP	Health and Safety Plan
HAZMAT	Hazardous Materials/Incidents
HMIRS	Hazardous Materials Information Reporting System
HRM	Highway Runoff Manual
HSIS	Hazardous Substance Information Survey
HSWA	Hazardous and Solid Waste Amendments
I-5	Interstate 5
ICIS	Integrated Compliance Information System
kg	kilogram
LPA	Locally Preferred Alternative
LQG	large quantity generator
LRV	light rail vehicle
LUST	leaking underground storage tank
MCL	Maximum contaminant limit
MDR	Methods and Data Report
mg/kg	milligrams per kilograms
Mi	mile
mm	millimeter
MSL	Mean sea level

MTCA	Model Toxics Control Act
NAVD88	North American vertical datum 1988
NEPA	National Environmental Policy Act
NFA	no further action
NFRA	no further remedial action
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
OAR	Oregon Administrative Rule
ODOT	Oregon Department of Transportation
OHW	ordinary high water
ORS	Oregon Revised Statute
OTC	Oregon Transportation Commission
PADS	PCB Activity Database
PAHs	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PGIS	pollutant-generating impervious surface
POV	Port of Vancouver
PRP	potentially responsible party
PS&E	Plans, Specifications, and Estimates
Qfc	coarse-grained facies
Qff	fine-grained facies
RAATS	RCRA Administration Action Tracking System
RCRA-NLR	Resource Conservation and Recovery Act - No Longer Regulated
RCRIS	Resource Conservation and Recovery Information System
RCW	Revised Code of Washington
REC	recognized environmental condition
RGS	reporter gene system
RM	river mile
ROD	Record of Decision
RTC	Regional Transportation Council
SARA Title III	Superfund Reauthorization Act
SDWA	Safe Drinking Water Act
SEF	sediment evaluation framework
SGA	sand and gravel aquifer
SHWS	State Hazardous Waste Sites
SMCL	Secondary maximum contaminant limit

SPCC	Spill Prevention, Control & Countermeasure plan
SPILLS	spill data
SPUI	single-point urban interchange
SQG	small quantity generator
SR	state route
STHB	stacked transit highway bridge
SVOC	Semi-volatile organic compound
SWF-LF	Solid Waste Facilities List
SWPPP	Stormwater Pollution Prevention Plan
TBT	Tributyltin
TCE	Temporary Construction Easement
TDA	Threshold drainage area
TDM	transportation demand management
TGA	Troutdale gravel aquifer
TriMet	Tri-County Metropolitan Transportation District
TRIS	Toxic Chemical Release Inventory System
TSA	Troutdale Sandstone Aquifer
TSCA	Toxic Substances Control Act of 1976
TSM	transportation system management
TSSA	Troutdale Sole Source Aquifer
TVS	total volatile solids
USA	unconsolidated sedimentary aquifer
USACE	United States Army Corps of Engineers
USC	United States Code
USGS	United States Geological Survey
UST	underground storage tank
VCP	Voluntary Cleanup Program
VOC	Volatile organic compound
VMC	Vancouver Municipal Code
VNHR	Vancouver National Historic Reserve
WAC	Washington Administrative Code
WSDOT	Washington State Department of Transportation
WTC	Washington Transportation Commission

1. Summary

1.1 Introduction

Without proper precautions, hazardous materials can adversely affect project construction worker and public safety, agency and public relations, and the quality of natural resources, as well as delay project schedules and increase project costs. Conversely, identifying and remediating hazardous materials can have long-term benefits to human health and the environment. This report identifies, describes and evaluates potential short-term and long-term effects related to hazardous materials resulting from the construction and operation of the Interstate 5 (I-5) Columbia River Crossing (CRC) project, and describes measures to help avoid or mitigate these potential effects.

The purpose of this report is to satisfy applicable portions of the National Environmental Policy Act (NEPA) Section 42 United States Code (USC) § 4321 “to promote efforts which will prevent or eliminate damage to the environment.” Information and potential environmental consequences described in this technical report will be used to support the Final Environmental Impact Statement (FEIS) for the CRC Project pursuant to 42 USC 4332.

The objectives of this report are to:

- Define the project study area (Section 1).
- Describe project elements and proposed construction and operation activities (Section 1).
- Describe methods of data collection and analysis (Section 2).
- Describe existing conditions and the environmental setting (Section 3).
- Identify hazardous materials sites within the study area (Section 3).
- Screen and evaluate identified hazardous materials sites (Section 4).
- Summarize potential significant short-term effects (Section 5).
- Summarize potential significant long-term effects (Section 6).
- Describe avoidance and mitigation measures to help prevent, eliminate or minimize environmental consequences (Section 7).
- Describe applicable permits and approvals (Section 8).

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. Exhibits 1-1a through 1-1c present the location of some LPA elements.

1.2.2.1 Multimodal River Crossing

<u>Columbia River Bridges</u>

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.

Exhibit 1-1a: Fourth Plain to SR 500
McLoughlin Transit Option
Project Element Locations

Columbia River CROSSING

Analysis by Marshall; Analysis Date: December 2010; File Name: P:\GIS\CRC\GIS\MXD_PDF\TECH_REPORTS\HAZMAT\Ex_1-1a_ProjectElements.mxd

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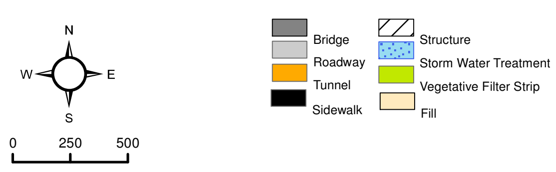

Exhibit 1-1b: SR 14 to McLoughlin Boulevard
McLoughlin Boulevard Transit Option
Project Element Locations

Columbia River CROSSING

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Exhibit 1-1c: Marine Drive and Hayden Island Project Element Locations

Analysis by Marshall; Analysis Date: December 2010; File Name: P:\GIS\CRC\GIS\MXD_PDF\TECH_REPORTS\HAZMAT\Ex_1-1c_ProjectElements.mxd

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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 1-2) shows anticipated future changes to C-TRAN bus routes.

Exhibit 1-2. 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 1-3) 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 1-3. 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.
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.

Element	Estimated Duration	Details
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.

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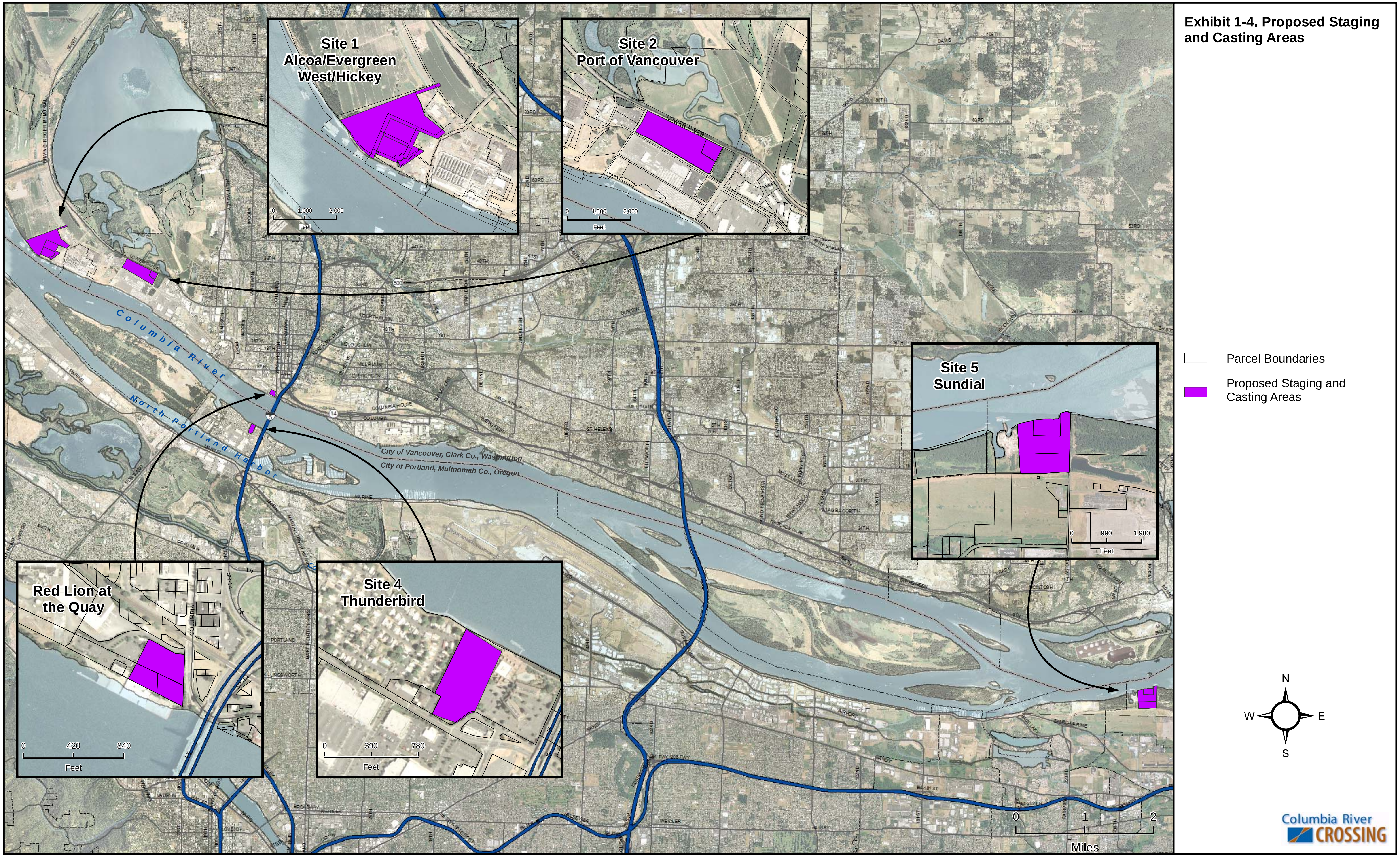
Exhibit 1-4. Proposed Staging and Casting Areas



Analysis by J. Koloszar; Analysis Date: Monday, May 09, 2011; File Name: Stage_Cast_DC212.mxd

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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 Proposed Construction Activities

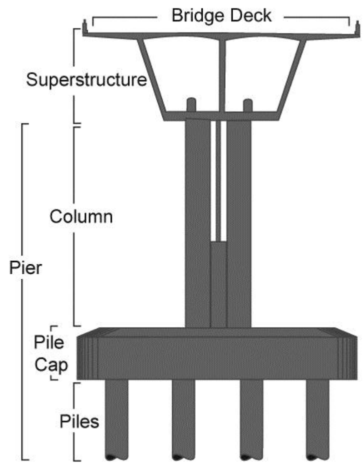
This section describes proposed construction techniques that would likely be used during the CRC project. The type, methods and specifications of these construction activities would be determined in preliminary engineering (PE) design reports and by the selected contractors.

1.3.1 Columbia River Crossing (Main Line) Construction

Bridge construction would include the following components: piles or shafts, pile caps, column, superstructure and bridge deck (Exhibit 1-5). The building of the new bridges over the Columbia River requires multiple phases of work. The general sequence for construction is:

- Initial preparation – mobilize construction materials, heavy equipment and crews.
- Conduct soil stabilization to approaches for bridge structures. Stabilization techniques include the use of compaction grouting, jet grouting, or the use of stone columns.
- Installation of structure foundations – driven piles, drilled shafts and/or spread footings.
- Bridge piers – construct cap on top of drilled shafts; construct columns and pier tables. In-water piers would be constructed using barge and/or temporary work bridge support. Temporary work bridges would be constructed using driven piles.
- Bridge superstructure – build or install the horizontal structure of the bridge spans between the bridge support columns.
- Bridge deck – construct the bridge deck on top of the superstructure.

Exhibit 1-5. Basic Bridge Components



1.3.1.1 Pier and Superstructure Construction

In-water foundations (shafts) would be required to support crossing piers. Columns would be constructed after the foundation (pile) caps are complete. Barges would be required for cranes, material, and work platforms. Tower cranes would likely be used to construct columns and support superstructure construction. The superstructure would be constructed of structural steel, cast-in-place concrete, or precast concrete.

1.3.1.2 Permanent Foundations

Permanent foundations would likely be anchored 30 feet or less into consolidated portions of the Troutdale Formation (up to 260 feet below ground surface [bgs] and/or elevation of -290 feet NAVD88). The quantity of permanent piles/shafts required is influenced by numerous factors, many of which are unknown at this stage of bridge design. Unknown factors include pile/shaft type, pile/shaft size, and bridge type. For the purposes of this report, foundations may be built using 120-inch-diameter drilled shafts. The Main Line Crossing is anticipated to have spans that range from 270 feet to 500 feet, resulting in 6 new in-water pier complexes. The transit bridge and northbound and southbound bridges over North Portland Harbor are anticipated to have 13 new in-water piers. No new pier complexes are anticipated for the Main Line Crossing in North Portland Harbor; however, existing pier complexes would likely have seismic upgrades. Exhibit 1-6 summarizes permanent piles needed for construction of the new bridges over the Columbia River.

Exhibit 1-6. Estimated Number of Permanent Piles/Shafts Required for the Columbia River Bridge Multimodal Crossing

Description (From East to West)	Number of Permanent Piles/Shafts	Estimated Depth Below ground surface
I-5 Northbound Bridge	95/75	110 to 260 feet
I-5 Southbound Bridge with light rail	95/75	110 to 260 feet
Total Permanent Piles for the Columbia River Bridges	**190/150**	

1.3.1.3 Temporary Foundations

Temporary foundations would likely be required to support contractor operations. These operations include work and equipment barge moorings, and construction of temporary work bridges. Temporary piles are expected to range between 12 and 48 inches in diameter, with the majority of piles consisting of 24- to 48-inch-diameter piles. It is not known at this stage of engineering design how deep temporary piles would need to be driven. In general, temporary piles would extend only into the shallow soil. The quantity of temporary piles required is influenced by numerous factors, many of which are unknown at this stage of bridge design. Unknown factors include pile type, pile/shaft size, and bridge type, among others. Several extraction methods are being considered for temporary piles, including direct pull, vibratory extraction, and cutting the piles below the mud line.

1.3.1.4 Cofferdams

Cofferdams may be used throughout the project to support installation of piers. Cofferdams would likely consist of sheet pile sections vibrated into place. Piles or drilled shafts would then be installed while water is still in the cofferdam. After pile or drilled shaft installation is complete, a concrete seal (false work) would be placed and the cofferdam would be dewatered. Cofferdams are not watertight and would need to be continuously pumped after dewatering, although the concrete seal would limit the need for this action.

1.3.2 Foundation and Structural Support for Interchanges, Bridge Overpasses, Transit, and Roadways

Interchanges, bridge overpasses, and portions of transit and roadways would be structurally supported by foundations and abutments. These structures would be in turn constructed using shallow footings, piles and shafts, and retaining walls. Subsurface conditions may also be modified by soil stabilization techniques such as jet grouting, compaction grouting, and/or stone columns.

1.3.2.1 Geotechnical Borings

Geotechnical boreholes would be used to characterize subsurface soil and water table conditions in areas where potential shafts, piles, footings, and/or retaining walls are needed to support project construction. Geotechnical information is typically used to evaluate material strength and compressibility to help determine the type and specifications for structural support. Further information on geotechnical boring is provided in the technical reports provided by Shannon and Wilson (2008) and Parsons Brinckerhoff (2009).

1.3.2.2 Shallow Footings

Shallow footings would be installed when appropriate for project elements such as bridge overpasses and light rail stations that do not require a high degree of structural support. Depending on location and structure type, shallow footings may extend up to 15 feet below grade and may be composed of precast concrete forms. Where possible, shallow footings are preferred to be used instead of piles to reduce cost. Shallow footings would likely be used for all park and ride structures and light rail stations.

1.3.2.3 Drilled Shaft and Driven Pile

Driven piles and drilled shafts would generally be used as foundation elements to anchor supporting bridge abutments, retaining walls, and bridge piers.[1] Drilled shafts would be used for in-water piers, with driven piles used to support construction equipment and activities for the Columbia River and North Portland Harbor bridges. A summary of estimated number and depths of piles and shafts for the interchanges and bridges is presented in Exhibit 1-7.

Some of the foundation options proposed for this project involve the driving of small- or large-diameter piles using an impact pile hammer. After the pile is driven, steel reinforcement and concrete may be placed inside the pile's annulus. The reinforcement is used to tie the pile to the structure it is supporting.

Some of the foundation options proposed for this project involve the drilling of small- or large-diameter shafts using an auger. Drilled shafts would require installation using either temporary or permanent casings to prevent sloughing and caving of soils. Casings would likely be installed using an oscillator, which rotates the casing back and forth, driving it downward, until it reaches the required tip elevation. Other potential methods of casing installation, such as rotator (rotates the pile as it is driven downward) or vibratory hammer, are also possible. Drilled shafts would likely be proofed using an impact hammer prior to final construction. Reinforcing steel is installed in the annulus of the shaft and the shaft is concreted into place. It is likely that steel casing would be left in place at in-water and deep shaft locations.

Foundation construction for the interchanges would require the transfer of vertical loads from weak near-surface soils to stronger material at depth. Exhibit 1-7 contains estimated pile and shaft depths using preliminary geotechnical recommendations for the bridge and interchange locations. All depths and elevations shown are subject to change.

Based on geotechnical boreholes completed within the study area, the deep foundations would likely extend into the Troutdale Formation. The Troutdale Formation is located between approximately 110 and 260 feet bgs for foundations over the Columbia River.[2] Foundations would likely be constructed to these depths for the Columbia River Crossing and the SR 14 and Mill Plain interchanges. Shallower foundation depths would likely be used for the Marine Drive and SR 500 interchanges and would not encounter the Troutdale Formation.

Exhibit 1-7. Estimated Number and Depths of Piles/Shafts Required for Interchanges and Associated Bridge Overpasses

	Foundation Type[b]		Area of Structure	Estimated Pile Tip Depth Below Existing Ground/ Mudline[c]	Estimated Number of Piles	Approximate Depth to Groundwater[d]	Occurrence of Excavations
Bridges	Shafts	Piles	(square feet x 1,000)	(feet bgs)		(feet bgs)	
Victory to Marine Drive Bridges [a]	X	X	430	125 to 160	140 to 240 shafts 1,000 to 2,000 piles	25	High

[1] Spread footings may also be used for foundation structures instead of piles or shafts, when appropriate conditions exist. The use of spread footing would reduce the amount of subsurface disturbance, and reduce project costs.

[2] Dependent on geotechnical conditions.

Bridges	Foundation Type[b]		Area of Structure	Estimated Pile Tip Depth Below Existing Ground/ Mudline[c]	Estimated Number of Piles	Approximate Depth to Groundwater[d]	Occurrence of Excavations
	Shafts	Piles	(square feet x 1,000)	(feet bgs)		(feet bgs)	
North Portland Harbor Bridge	X		460	130 to 160	90 to 130 shafts 900 to 1,500 piles	10	High
Hayden Island Bridge	X	X	310	180 to 260	220 to 310 shafts 1,900 to 2,500 piles	10	High
SR 14 Bridges [b]	X		530	120 to 130	170 to 210 shafts	10	High
Evergreen Bridge [b]	X	X	30	50 to 70	90 to 160 piles 10 to 30 shafts	90	Low
Mill Plain to 33rd Street Bridges [b]	X	X	180	80 to 90	130 to 240 shafts 440 to 740 piles	150	Moderate
SR 500 Interchange and 39th Street Bridges [b]	X	X	130	50 to 80	20 to 40 shafts 150 to 260 piles	150	Low

a Foundation data from Shannon & Wilson “Geotechnical Data Columbia River Crossing,” March 5, 2008.

b Foundation data from WSDOT Geotechnical Division, “I-5, XL-2268, MP 0.0 to 3.0 Columbia River Crossing project Washington Landside Structures and Retaining Walls Conceptual Geotechnical Recommendations for Biological Assessment” Memorandum, November 5, 2008.

c Columbia River pile depths assume 30 feet embedment into the Troutdale Formation.

d Clark County water level contour map (Clark County 2005). Contours were created by computer model of data originating from various sources in the 1990s.

1.3.2.4 Retaining Walls

Retaining walls would be constructed to provide support for soil where vertical or near vertical grade changes are necessary for bridge approach abutments and underpasses. Proposed retaining walls would be constructed partially below the ground surface. Trenching and excavation activities are anticipated in the immediate vicinity of proposed wall locations.

1.3.2.5 Ground Stabilization

Subsurface soils would need to be stabilized or strengthened to support ground improvements such as bridge abutments at Hayden Island, Marine Drive and Victory Boulevard, Tomahawk Island, and along river embankment areas of Hayden Island and North Portland Harbor, and in upland areas such as Burnt Bridge Creek. Ground stabilization is necessary based on geotechnical information suggesting soil liquefaction and lateral displacement potential under a design earthquake (Shannon and Wilson 2008; Parsons Brinkerhoff 2009; FEIS 2010). Estimated areas for stabilization are up to 600 feet from the shore line and 50 feet from the structure dripline or abutment. The depth of soil stabilization is estimated to occur at or above the ordinary high water (OHW) line (approximately 21.2 feet NAVD88) to a depth of up to 90 feet below ground surface. Soil stabilization and strengthening may be conducted using a variety of methods, including but not limited to compaction grouting, jet grouting, and/or stone columns.

In addition, the levee system along the southern embankment of the North Portland Harbor may be modified for construction of transit and roadway. Modification may require a portion of the levee to be removed and rebuilt as part of this effort.

1.3.2.6 Excavation and Fill, and Dewatering

Cut and fill soil moving techniques would be used to support construction of transit and roadways. In general, cut would be used to lower the grade of roadway and transit, where fill would be used to elevate roadway or track bed and/or increase the feature's load-bearing capacity. Exhibit 1-1a through Exhibit 1-1c displays the locations of proposed cut and fill.

Dewatering of excavations may occur for structures that extend below the water table. These structures include but are not limited to tunnels and retaining walls (Exhibit 1-1a through Exhibit 1-1c). Dewatering techniques may employ the use of sheet piles to limit groundwater flow into the excavation.

1.3.2.7 Limited Debris Removal

Some disturbance to in-water river sediments will occur from limited debris removal of riprap or concrete within North Portland Harbor. Removal is necessary for the installation of drilled shafts for new bridge foundations. Removal will likely occur using a clamshell bucket and barge support. The project estimates that it will take seven days to remove up to 90 cubic yards of material. Material will be characterized and disposed at an approved uplands facility.

1.3.2.8 Utility Corridors

New underground utility corridors will be placed to support the operation of light rail. Utilities include but are not limited to electrical and phone lines. Utilities will be generally installed in lined trenches approximately 3 feet bgs.

1.3.2.9 Over-water Bridge Demolition

Columbia River Bridges

The existing Columbia River bridges will require demolition of the structure and removal of the debris. Bridge components would need to be cut out and removed in pieces. These components include but are not limited to the bridge deck, the counterweights for the lift span, towers, deck, trusses, piers, and piles. The counterweights would likely be removed first, followed by the lift towers and concrete deck. The trusses could then be cut into manageable pieces and removed. Final pier removal will depend on site-specific considerations, safety, phasing constraints, and impacts to aquatic species. Bridge piers could be removed by either installing cofferdams around the piers or by using a diamond wire/wire saw to cut the piers into manageable chunks to be transported off-site. During demolition, containment of debris is necessary and will be part of contract requirements. Temporary piles would be required to support work and provide containment. Material barges may be necessary to install and remove cofferdams and move equipment during bridge demolition.

North Portland Harbor Bridges

The concrete decks of the North Portland Harbor bridges would need to be cut up and removed in pieces. Deck removal would be done using the methods described above. The deck could be cut and the pieces transported away by barge or truck; or the sections may be demolished using a breaker with a barge below to catch and contain debris. Containment of debris is necessary and will be part of contract requirements. Once the deck is removed, then girders could be cut and removed to a barge for demolition off-site. Alternately, girders could be demolished onto a barge below.

The same two methods described above could be used to remove the existing bridge piers for the North Portland Harbor bridge. Extraction methods could include use of a vibratory extractor, direct pull, or a clam shell dredge. To minimize turbidity, cofferdams may be installed around the existing piers once the superstructure is removed. With either method, the pieces of the piers would likely be removed via barge.

1.3.2.10 Demolition of Acquired Structures

A number of land-based structures will be acquired and demolished to accommodate the project. These properties are identified in the Acquisitions Technical Report. Demolition materials from these structures will need to be managed, recycled and/or disposed of accordingly. Acquired structures may include asbestos-containing material (ACM), lead-based paint, equipment containing polychlorinated biphenyls (PCBs) and/or mercury, or other hazardous materials.

1.3.2.11 Stormwater Management and Treatment Facilities

Federal, state, and local agencies with direct jurisdiction over aspects of stormwater management in the study area include National Oceanic & Atmospheric Administration (NOAA) Fisheries, U.S. Environmental Protection Agency (EPA), Washington State Department of Ecology (Ecology), Oregon State Department of Environmental Quality (DEQ), the City of Vancouver, and the City of Portland.

Stormwater generated during construction activities must comply with WSDOT's Stormwater National Pollutant Discharge Elimination Systems (NPDES) General Permit and ODOT's 1200-CA permit, and must be consistent with WSDOT's Highway Runoff Manual (HRM, WSDOT 2008).

Stormwater from newly constructed permanent impervious surfaces is required to be managed and treated under applicable city, state and federal regulations. These include the Federal Clean Water Act (CWA), the Washington State Pollution Control Act, Vancouver Municipal Code (VMC) Chapter 14, and City of Portland Code (CPC) Title 17.

Objectives for permanent stormwater management include:

- Provide source control to prevent pollutants entering into stormwater.
- Provide water quality treatment facilities for new or existing pollution-generating impervious surfaces[3] (PGIS) in accordance with the agency requirements. PGIS include:
  - Highways and ramps, including non-vegetated shoulders.
  - Light rail guideway subject to vehicular traffic. Guideway is referred to as a *semi-exclusive* if the tracks are subject to cross-traffic, or *non-exclusive* if vehicles such as buses can travel along the guideway.
  - Streets, alleys and driveways.
  - Bus layover facilities, surface parking lots, and the top floor of parking structures.
- Provide flow control for new and replaced impervious areas in accordance with state and local requirements.

[3] A pollution-generating impervious surface (PGIS) is defined as a surface that is considered a significant source of pollutants in stormwater runoff.

- Conduct maintenance on water quality treatment facilities and flow controls to ensure they are performing as intended.

Exhibits 1-8a through 1-8c displays the locations of proposed stormwater conveyance system and treatment facilities. The stormwater system will manage and treat water within the Columbia River and Burnt Bridge Creek watersheds.

In the Columbia River watershed the proposed project will create 89 acres of PGIS and 26 acres of resurfaced PGIS. The project would increase PGIS approximately 28 acres from the No-Build Alternative. The project proposes to treat stormwater from all 115 acres of PGIS. The project would also manage and treat a portion of non-PGIS from light rail guideways and station platforms. Additional information on the proposed stormwater conveyance system and treatment facilities is provided in the Water Quality and Hydrology Technical Report.

Exhibit 1-8a. Fourth Plain to SR 500 Stormwater Systems

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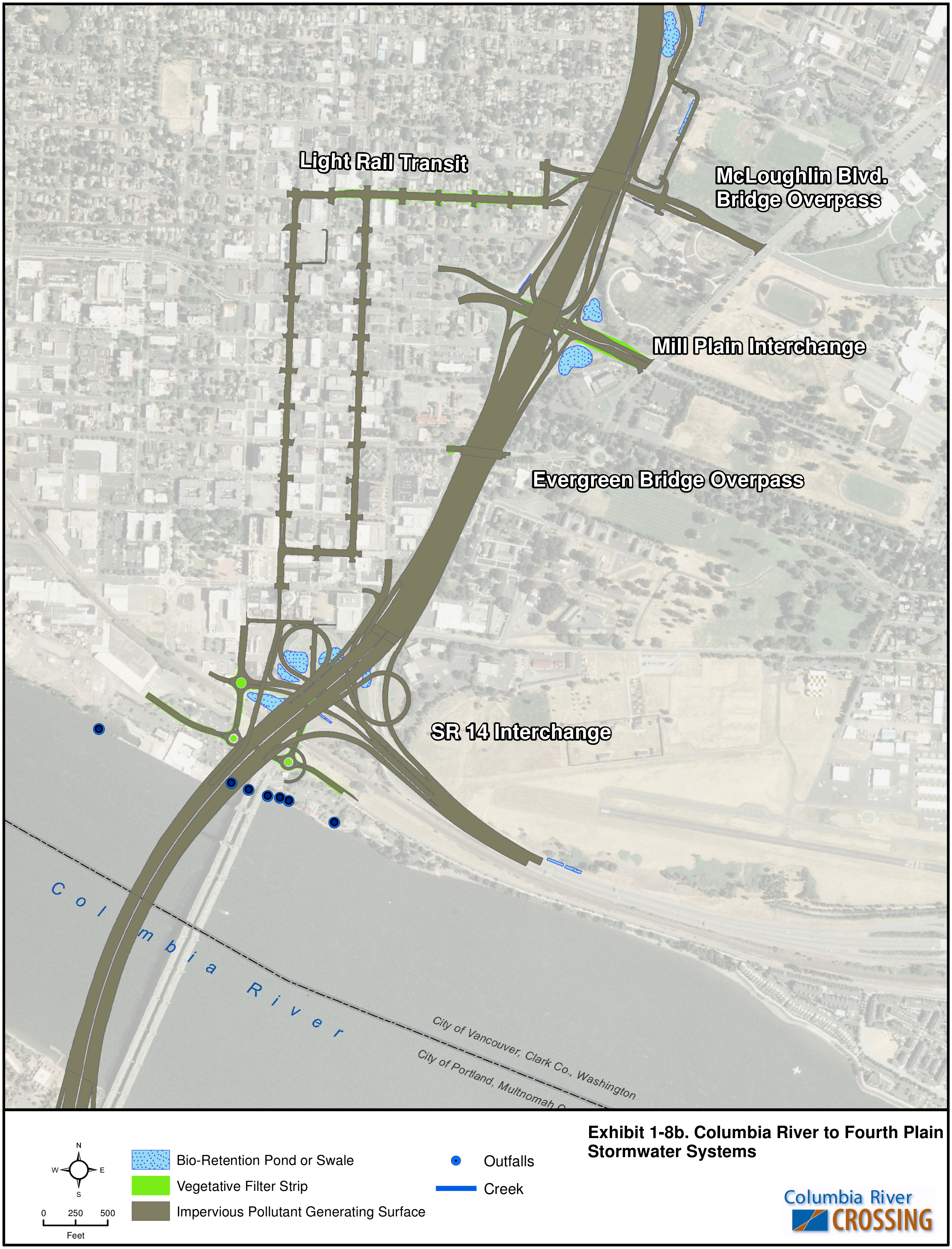

Exhibit 1-8b. Columbia River to Fourth Plain Stormwater Systems

Analysis by Marshall; Analysis Date: February 2010; File Name: P:\GIS\CRC\GIS\MXD_PDF\TECH_REPORTS\HAZ\Ex_1-8b_Stormwater.mxd

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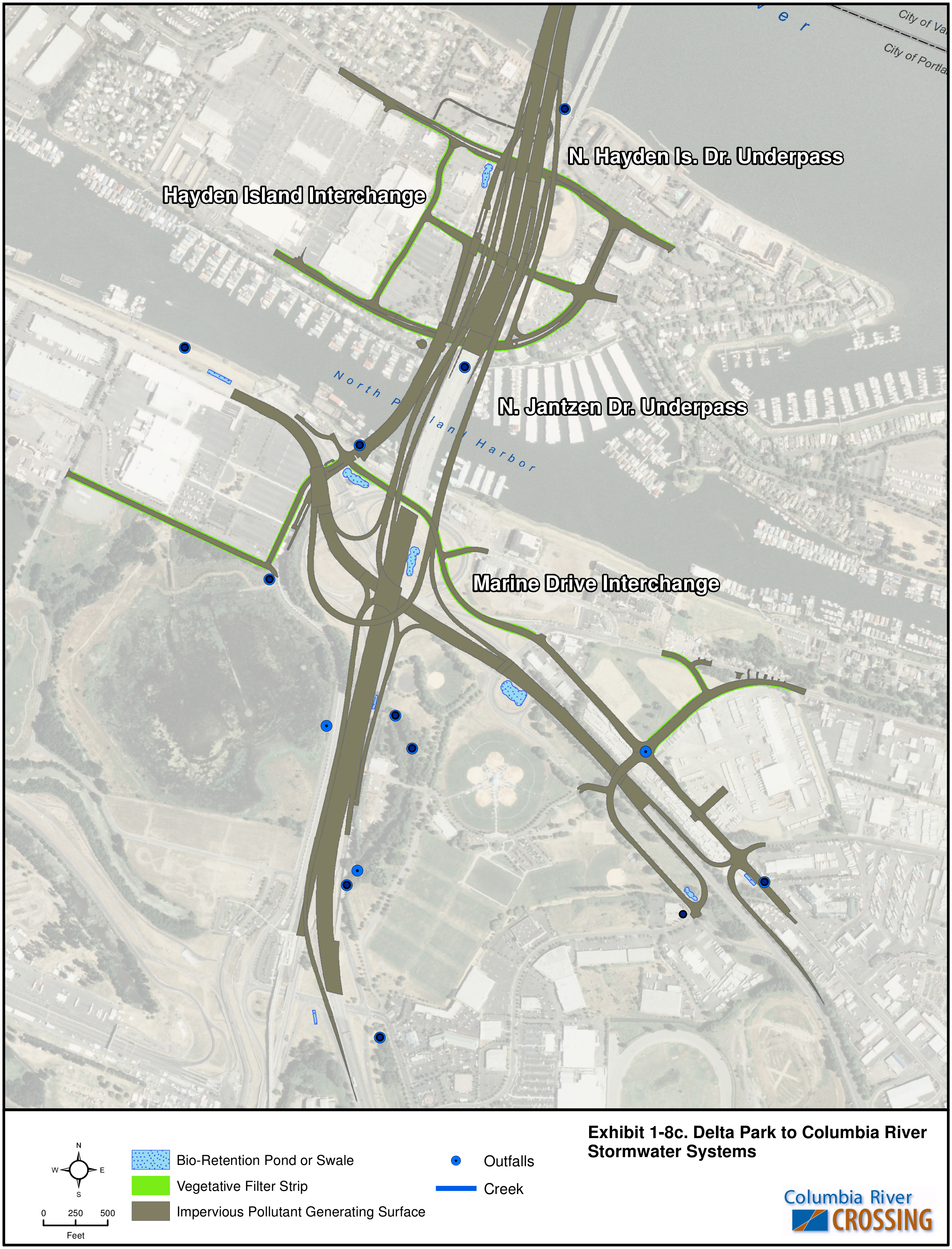

Exhibit 1-8c. Delta Park to Columbia River Stormwater Systems

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1.4 Temporary Effects

Temporary effects are potential short-term effects to the locally preferred alternative (LPA) and/or effects to the physical environment from hazardous materials. Such effects are thought to occur in three general categories: 1) Liability to the purchaser in acquiring property with recognized environmental conditions (RECs)[4]; 2) effects on the environment and resources from construction in areas where hazardous materials exist; and 3) effects on construction from presence of hazardous materials.

These potential effects are assessed qualitatively based on the project team's current understanding of the natural and built environments. The significance of the effect to occur without mitigation measures is also stated.[5] For the purposes of this report, no or limited construction activities will be conducted for the No-Build Alternative; therefore, temporary effects for the No-Build Alternative are not discussed.

1.4.1 Property Acquisition Liability

Tax lots have been listed for acquisition in fee for the project. Acquisition of property where RECs have been identified can result in potential liability for the purchaser (i.e., ODOT, WSDOT, or TriMet). Liability issues for acquired property in fee are addressed in different ways under Oregon and Washington State laws.

In Oregon, the standard for liability for remedial actions (cleanup) of a property is pursuant to Oregon Revised Statute (ORS) 465.255. This statute states that "the owner/operator is strictly liable for those remedial action costs incurred by the state or any other person that are attributable to or associated with a facility and for damages for injury to or destruction of any natural resources caused by a release." This statute extends to limit the State's legal liability of an acquired facility or property through condemnation.

In Washington, the standard of liability is pursuant to the Revised Code of Washington (RCW) 70 105D. The code states that "the owner/operator of the facility is liable for remedial cost." Provisions in the code thus allow for the State to inherit legal liability when acquiring the property/facility.

Liability issues can include: 1) restriction in current or future property use; 2) incurring costs for cleanup; 3) schedule delays; 4) work and public safety; and/or 5) increased resource agency oversight. Conducting all appropriate inquiry (AAI) into the previous ownership and uses of the property prior to property transaction is a means of safeguarding and managing potential liability issues. In this way RECs are disclosed prior to the sale of the property and potential issues can be mitigated prior to construction activities. Inquiry may result in responsibility for cleanup by the

[4] The term "recognized environmental condition" is defined by ASTM E-1527 as: "...the presence or likely presence of any hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater or surface water of the property."

[5] A significant effect can represent a substantial increase in project costs, a substantial delay in project schedule, long-term liability, and/or a substantial change to an environmental resource. As stated in 40 CFR 1502.2, "Effects shall be discussed in proportion to their significance," and "in a finding of no significant effect, there should be only enough discussion to show why more study is not warranted."

owner/operator and/or reduction in the property's value. Further discussion of mitigation measures for property acquisition is provided in Section 7.

Findings

The LPA has a potential for adverse effects from property acquisition liability if not correctly mitigated. Of the sites listed for acquisition in fee, 55 have been identified as hazardous material sites for LPA Option A and 52 for LPA Option B (Exhibit 5-1).

1.4.2 Permanent and Temporary Easements

Permanent and temporary easements will be used to support the project. Types of easements include, but are not limited to, subsurface easement, airspace easements, and property easements. Permanent easements are necessary to construct subsurface utility lines (storm drain, telephone, electrical), roadways, sidewalks, or access. In acquiring permanent easements, the State owns a limited interest in a property. Temporary easements allow the State the right to the property for short-term ground improvements or staging purposes. After fulfilling its intended purpose, the easement is typically returned back to the landowner.

Easements where RECs have been identified can result in potential liability for the operator. Liability issues can come in the form of: 1) incurring cleanup costs; 2) schedule delays; and 3) worker and public safety.

Findings

The LPA has a potential for adverse effects from gaining permanent and temporary easements. Twenty (20) easements have been identified as being priority hazardous material sites. Of the 20 easements, 17 are temporary construction easements, and 3 are permanent easements (Exhibit 5-1).

1.4.3 Adverse Effects on the Environment from Construction

Environmental media – soils, sediments, surface water, stormwater, and groundwater – can be adversely affected by the exacerbation of existing contamination or the release of hazardous substances during construction activities. This may cause a risk to human health or the environment, raise liability issues, increase project costs, and/or cause schedule delays.

The degree to which existing contamination can migrate into the environment depends on the type, intensity and duration of construction activities and on the nature and extent of contamination. Types of construction activities include, but are not limited to: excavation, grading, dewatering, drilling, dredging, utility line trenching, construction stormwater management, and installation of piles and shafts for bridge and interchange foundations; soil stabilization; and demolition. The type, intensity, and duration of these activities will be further defined during the design phase and contractor procurement.

Documented contaminants at identified hazardous materials sites include chlorinated solvents, petroleum hydrocarbons, pollutant metals, pesticides, and PCBs. However, unidentified contamination from historical land use likely also exists within the main project area. Impacts are most likely associated with commercial and industrial properties that may have generated or improperly disposed of hazardous materials (Section 4). The nature and extent of contamination in areas where below-grade construction will be conducted will be evaluated on a site-by-site basis prior to preparing Plans, Specifications, and Estimates (PS&E). Site-by-site evaluation may take the form of physical investigation, sampling, and analysis.

Contaminants that are encountered during construction can migrate into the environment along a variety of pathways (Section 6). Shallow soil contamination can migrate downward into subsurface soils and/or groundwater through drag down from excavation, utility work and drilling, and/or infiltration of stormwater. Groundwater impacts can be exacerbated by dewatering activities. Impacted stormwater can migrate to surface water and sediments. Impacted sediments can be re-suspended into the water column and/or re-deposited from scour or dredging activities.

Alternatively, hazardous substances or petroleum products have the potential to be released into the environment during construction activities. Construction equipment can release petroleum products into the environment from improper transfers of fuels or spills. Other pollutants such as paints, acids for cleaning masonry, solvents, and concrete-curing compounds are present at construction sites and may enter the environment if not managed correctly.

Adverse effects to the environment from contamination is most critical in areas sensitive to human and ecological health, such as surface water bodies, wetlands, floodplains, residential areas, and/or in wellhead protection zones. Within the study area these areas include, but are not limited to, Columbia Slough, North Portland Harbor, Hayden Island, Columbia River, City of Vancouver, and Burnt Bridge Creek drainage.

1.4.3.1 Surface and Subsurface Soils

Surface and subsurface soils often are the most likely media to be affected by an initial contaminant release. Common contaminant release mechanisms include spills, below-ground disposal, leaking underground storage tanks (LUSTs), and soil leaching. Contamination in soil can migrate to other environmental media such as sediments, surface water and groundwater from secondary release mechanisms during construction activities (e.g., excavation, grading, and drilling). Secondary release mechanisms include, but are not limited to drag down, smearing, groundwater leaching, stormwater runoff, and erosion.

Findings

The LPA has a potential for adverse effects from the exacerbation or migration of existing soil contamination during construction activities. A portion of the construction activities occur within the Columbia River floodplain, which is considered a sensitive area for aquatic organisms and fish. Of particular concern is the migration of existing soil contamination from priority hazardous materials sites along the North Portland Harbor and Hayden Island from the construction of Marine Drive, Hayden Island, and SR 14 interchanges and overpasses. Adverse effects from soil contamination on construction activities may be significant if not correctly mitigated.

However, it is recognized that beneficial effects to the environment can be realized by the cleanup of residual soil contamination during construction. This potential cleanup of contaminated soil would not otherwise be realized within the timeline of the LPA.

1.4.3.2 Stormwater

Precipitation events can generate stormwater runoff at construction sites. Without adequate stormwater management and treatment, water quality can be diminished and soil erosion can occur. Stormwater quality can also be affected by a direct release/spill of a hazardous substance to stormwater lines during construction. Adverse effects to stormwater quality can further impact surface water, groundwater, and sediment quality.

In addition, priority hazardous material sites have been identified in the proximity of stormwater treatment facilities located at the Mill Plain interchange, the SR 14 interchange, and Marine Drive interchange (Exhibits 4-2a through 4-2c). Adverse effects to groundwater could occur in these areas if stormwater is infiltrated into contaminated subsurface soils to the water table.

Findings

The LPA has a potential for adverse effects to stormwater quality during construction activities. This may result from erosion of exposed contaminated soil surfaces during precipitation events where stormwater is not controlled or adequately treated, and/or release to stormwater during construction. Adverse effects from diminished stormwater quality are expected to be significant if not correctly mitigated.

1.4.3.3 Surface Water

Surface water quality can be adversely affected by near-water or in-water construction activities. Near-water activities such as embankment modifications have the potential to allow contaminated soils to migrate to surface water. In-water activities such as barge support, pier installation, temporary pile installation and removal, dredging, and scour have the potential to re-suspend contaminated sediments into the water column. Lead-paint abatement and over-water activities such as bridge demolition and construction could also adversely affect surface water quality.

Findings

The LPA has a potential for adverse effects to surface water quality from construction. Adverse effects to surface water quality are expected to be significant if not mitigated correctly. These effects are of most concern in the areas of Marine Drive, North Portland Harbor, and Hayden Island where modifications to the embankments and pile installation and removal are proposed. These construction activities are in proximity to priority hazardous materials sites Nos. 138 (Diversified Marine) and 142 (Pier 99), where known or suspected releases of contamination occurred in soil, sediment and/or groundwater. Unidentified contamination may also be present in these areas due to historical land use.

Installation of pier structures within the Main Channel of the Columbia River is not expected to have adverse effects on surface water quality outside of potential turbidity issues associated with the placement of coffer dams (see the Ecosystems and Water Quality Technical Reports). Laboratory analysis of sediments collected downstream of the I-5 bridges did not detect chemicals of concern and/or were below Sediment Evaluation Framework (SEF) screening levels. However, a supplemental sediment evaluation will occur within the footprint of the pier structures to confirm that sediment quality is acceptable. This is particularly the case near City of Vancouver outfalls where stormwater discharge from PGIS may have locally impacted sediments near proposed near-shore bents.

Potential adverse surface water quality effects to the Columbia Slough and Burnt Bridge Creek from the construction of the LPA would not be significant. Construction activities in the area of the Columbia Slough and Burnt Bridge Creek are minimal in extent and intensity.

1.4.3.4 Sediment

Sediment quality can be adversely affected by exacerbating existing sediment contamination through in-water construction activities. These activities include pier installation, pile installation and removal, dredging, and barge support. Scour from cofferdams and/or piers could also exacerbate contaminated sediments. Exacerbation can occur from re-depositing contaminated sediments or exposing residual contaminated surfaces. Exacerbation of sediment contamination can also lead to impacts on surface water quality through re-suspension into the water column.

Sediment quality within the North Portland Harbor and vicinity of Hayden Island is suspected of being impacted from historical industrial, commercial and residential activities. These activities include boat moorage, boat maintenance and fueling, freight hauling, and miscellaneous activities associated with floating homes. Contaminants including PCBs, tributyltin (TBT), and pollutant metals are suspected in sediments at hazardous materials sites Nos. 138 (Diversified Marine) and 142 (Pier 99). In addition, stormwater from non-point upland sources, including the I-5 bridges and associated roadways, may be contributing to sediment contamination.

Shallow water environment (less than 20 feet deep) occurs in the North Portland Harbor and in proximity to Hayden Island. This environment has a higher likelihood of retaining contaminants due to the prevalence of fine-grained materials (sands and silts) and its low-energy fluvial setting. Shallow water environments of North Portland Harbor and Hayden Island have been identified as a sensitive environment for fish.

Sediments within the main channel of the Columbia River are not thought to be impacted by contaminants. This is based on sediment samples collected downgradient of the I-5 bridges. However, localized impacts to near-shore sediment may have potentially occurred from stormwater discharge associated with the City of Vancouver outfalls (Exhibit 3-3). No in-water construction activities will occur within the Columbia Slough, Vanport wetlands, and/or Burnt Bridge Creek.

Findings

The LPA has a potential for adverse effects to sediment from construction activities. These effects will be significant if not mitigated correctly. Exacerbation of existing sediment contamination is of most concern in near-shore environments (water column less than 20 feet) along North Portland Harbor, Hayden Island, and the Columbia River where pier installation, pile installation and removal, dredging and barge support could occur. These construction activities can re-suspend contaminants into the water column, re-deposit contaminated sediments, or expose residual sediment contamination. Construction activities are in proximity to priority hazardous materials sites Nos. 138 (Diversified Marine) and 142 (Pier 99), where known and/or suspected releases of contamination have occurred in soil, sediment and/or groundwater. Impacts to sediments may have also occurred from the discharge of impacted stormwater from point and non-point sources. Near-shore environments are typically more sensitive for aquatic organisms and fish due to their use for foraging, migration, and rearing.

Potential adverse effects associated with pier installation within the deeper water environment of the Columbia River is thought to be minimal. This is due to the likelihood that contaminated sediments within the deeper water environment are not present due to the high-energy fluvial environment and presence of coarse-grain sediments that tend not to retain contaminants.

1.4.3.5 Groundwater

The Troutdale Aquifer extends throughout the Portland Basin and is used as a municipal water source. It is designated by the EPA as a sole source aquifer in Clark County, Washington. The City of Vancouver recognized its dependence on this aquifer and the importance of protecting it as a resource by designating the area within its boundaries as a Critical Aquifer Recharge Area.

The Troutdale Aquifer can be adversely affected by the exacerbation of existing contamination during construction. Construction activities include, but are not limited to: 1) excavation to accommodate roadway grade changes, tunneling, utility lines, stormwater conveyance systems, and retaining walls; 2) installation of piles and shafts for bridge and interchange foundations; 3) earth stabilization techniques such as placement of stone columns; and 4) dewatering activities for the placement or retaining walls and tunnels.

Mechanisms that could cause existing contamination to migrate to or below the water table during project construction are: 1) drag down of surficial contamination; 2) downward or lateral migration of mobile contamination along conduits or preferential pathways; 3) leaching of exposed contamination; 4) migration of contamination from dewatering activities; 5) infiltration of impacted stormwater and/or infiltration of stormwater into impacted subsurface materials; and 6) accidental release of hazardous substance or petroleum products.

The most significant effects to groundwater quality during construction could occur in areas where: 1) abundant or gross contamination is present in saturated or unsaturated soils; 2) contaminants are soluble in water and/or are in a dense non-aqueous form; 3) the depth to water table is shallow; and/or 4) construction activities extend to or below the water table. These conditions or a combination of these conditions could allow contamination to migrate downward and adversely affect groundwater quality if contamination is not mitigated correctly.

Areas most sensitive to adverse effects to groundwater quality are those where beneficial use of groundwater occurs. Drinking water, irrigation and process water generally derive water from zones approximately 100 to 300 feet below ground surface. Therefore, proposed construction activities that extend into these zones where water is derived have a higher potential to cause adverse effects to the well head. This is particularly the case for municipal wells at water stations WS-1 and WS-3, which hydraulically influence the direction of groundwater flow within the City of Vancouver. Groundwater within these wells' zone of influence is thought to be captured within a 1- to 5-year timeframe. Municipal wells at these stations are currently tested and treated to meet state and federal primary and secondary water quality standards. For WS-1 this includes treatment of groundwater using an air stripping system to remove low-level solvent contamination.

Existing groundwater contamination from hazardous materials sites is present within the main project area. The nature and extent of these impacts are not fully understood, but likely consist of low concentrations dissolved phase solvents, metals, and/or petroleum products within the Unconsolidated Sedimentary Aquifer (USA) and Troutdale Gravel Aquifer (TGA).

Findings

The LPA has a potential to cause adverse effects to groundwater from construction. Construction activities for the LPA are intense and complex, with a higher occurrence of activities that extend to or below the water table in areas where hazardous materials sites were identified and/or unidentified contamination may exist.

Exacerbation of existing contamination in groundwater is of most concern in areas where construction activities in the vicinity of a hazardous materials site require dewatering. Areas where dewatering may occur include the SR 14 interchange, Columbia River Crossing, Hayden Island interchange, North Portland Harbor interchange, and/or Marine Drive interchange. The construction of these project elements requires a high degree of excavation work, deep installation of piles and shafts, and dewatering. Construction will occur in areas where the water table is fairly shallow, and contamination may be present from historical land use. Groundwater in this area is beneficially used for drinking water, process water, and/or irrigation.

Construction activities that encounter dissolved phase groundwater contamination at depth during deep foundation construction will not likely result in adverse effects. The drag down of dissolved phase contaminants during drilled shaft or driven pile construction is thought to be minimal, if any. The potential of downward migration due to the creation of preferential pathways would only be significant if dense non-aqueous phase liquids are encountered.

1.4.4 Adverse Effects to Construction Activities from Hazardous Materials

1.4.4.1 Worker Safety and Public Health

Adverse effects to worker safety and public health from hazardous materials during construction can occur if not correctly mitigated through proper safety precautions. Potential exposure routes include dermal contact and ingestion of contaminated soil and water, and inhalation of contaminated vapors or particulates. Exposure is thought to be the greatest during excavation work, demolition, or application of materials that contain hazardous substances. Potential receptors include construction workers, excavation workers, transients, the travelling public, and residents (adult and child). Health effects are dependent on the type of contaminants, duration, dosage, exposure route, and age of persons exposed. Contaminants such as chlorinated solvents, metals (lead), petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), pesticides/herbicides, asbestos, and PCBs are mainly associated with long-term chronic effects to human health. However, these contaminants and other, unidentified contaminants have the potential to cause acute effects to human health. EPA, DEQ, and Ecology provide generic health-based screening concentrations to establish precautions for worker safety.

Findings

The LPA has a potential for adverse effects to worker safety and public health if these effects are not mitigated correctly. Under the LPA, construction activities are relatively intensive and complex, and a number of exposure pathways could be potentially complete. Adverse effects to worker safety are expected to be significant if not mitigated correctly. The potential impacts can be mitigated by following an approved, project-specific Health and Safety Plan (HASP). In general, the plan outlines roles and responsibilities, known physical and chemical hazards, and action levels and establishes exclusion zones and personal protective procedures.

1.4.4.2 Hazardous and Non-hazardous Wastes

Waste can be generated during construction activities when contaminated materials are encountered or generated by construction and demolition. Waste can consist of contaminated soils, sediments, water, and/or building material.

Non-hazardous wastes are those categorized as not hazardous waste and are exempted from or do not apply to Resource Conservation Recovery Act (RCRA) Subtitle C regulations. They are typically called “solid waste.” Non-hazardous wastes likely to be encountered are fill, debris, soil, and wood. Non-hazardous wastes require management in accordance with applicable federal and state regulations. Characterizing, managing, storing, and disposing of hazardous waste will likely be a common component of project construction.

A solid waste that is dangerous and/or potentially harmful to human health is considered a hazardous waste. Hazardous waste can have characteristics of toxicity, corrosivity, reactivity, and/or ignitability that are governed by RCRA Subtitle C regulations. Universal wastes include batteries, pesticides, and mercury-containing light bulbs. In addition, wastes that contain PCBs are managed under the Toxic Substance Control Act (TSCA) and under 40 CFR Part 761.

Hazardous wastes and universal wastes require management in accordance with applicable federal and state regulations. Characterizing, managing, storing, and disposing of hazardous waste will likely be a small component of project construction. However, if not mitigated correctly, hazardous wastes can increase project costs and cause schedule delays, and are a source of liability to the project.

Findings

Under the LPA, construction activities will be relatively intensive and complex, and will generate significant quantities of materials that will need to be managed, stored, and characterized for the presence of contamination. The LPA has a high potential to manage, characterize and dispose of non-hazardous wastes. Adverse effects from non-hazardous waste are thought to be significant if not correctly mitigated.

If any material is determined to be a hazardous waste, the material will need to be properly disposed of at a registered facility according to state and federal guidelines. The LPA has a low potential of managing, characterizing and disposing of hazardous waste. However, adverse effects from the hazardous waste are expected to be significant for the LPA if not mitigated correctly.

1.4.4.3 Lead and Asbestos-Containing Materials

Wastes that contain lead and ACMs are managed and disposed of as non-hazardous wastes under 40 CRF Part 261. Lead has the potential to be a hazardous waste if it fails toxic characteristic leaching procedures. Asbestos is treated as an industrial waste and requires special packaging and handling pursuant to OAR 340-248, WAC 269-65, and 40 CFR Part 61 Subpart M.

The existing I-5 bridges, buildings, and other structures that contain lead and/or ACMs will need to have proper abatement conducted prior to any demolition, renovation, or repair activities. Abatement must follow state guidelines and be conducted by licensed abatement firms. Abatement materials must be properly disposed at authorized solid waste facilities. In general, building and structures that were built prior to 1980 have a higher likelihood of containing asbestos. EPA issued a ban and phase out of asbestos in 1989.

Findings

The LPA has a potential for adverse effects to the project from the disturbance of lead and asbestos-containing materials during construction. These effects are expected to be significant if not mitigated correctly. However, it is recognized that the proper removal of lead and ACMs is beneficial to human health and the environment.

Forty-five of the properties being acquired include structures that were built before 1980 and are proposed to be demolished. Structures on these properties have a higher likelihood of containing RECs such as lead and ACM (however, it should be noted that any structures, regardless of age, may have lead or ACM in its construction materials and are suspect until otherwise determined). The number of building displacements is the same for Option A and Option B.

1.4.5 Other Consideration for the LPA

1.4.5.1 Ruby Junction Maintenance Facility

The LPA includes expansion of light rail maintenance infrastructure at the TriMet Ruby Junction Maintenance Facility. Expansion would require 15 properties to be acquired, as well as modifications to the existing building structure. Review of the DEQ facility profiler indicates a number of potential issues of environmental concern at or near the facility. Expansion may result in significant adverse effects if not correctly mitigated. These potential effects include liability issues in property acquisition, and site investigation and cleanup to accommodate modifications to building structures. These effects will be more fully realized as further details on facility expansion come available.

1.4.5.2 Staging Areas

The LPA will consider three staging areas to support construction. These sites are the Port of Vancouver, Red Lion, and the former Thunderbird Hotel. Staging areas will be used for material lay down yards, equipment storage, and fabrication. The areas may require regrading and roadway access, demolition, and utility trenching.

Preliminary review of the staging areas indicates that only the former Thunderbird Hotel has an existing environmental issue likely to affect its immediate use as a staging area. The hotel location was a former landfill site (Site ID 103) and service station (Site ID 107), which may have resulted in impacts to subsurface soils and groundwater.

Adverse effects to the project from acquisition of the former Thunderbird Hotel are expected to be significant if not mitigated correctly. The eastern portion of this property will be permanently acquired for the bridge and the western half is planned for staging. Prior to the use of the site for staging and bridge construction, the structures currently on-site will require demolition and soil stability techniques may be employed. Removal of the debris and fill material may be necessary for the use of the site for bridge construction and work area. These impacts are thought to be significant if not correctly mitigated.

1.4.5.3 Casting Areas

The LPA will consider two areas to pre-cast concrete forms used in bridge and interchange construction. These areas are the Sundial Site and the Alcoa/Evergreen Site.

Preliminary review of the two proposed casting areas indicates that both sites have existing environmental issues that will likely affect their immediate use as casting area. This is based on the understanding that staging areas will be used for barge slips, will have ground disturbances, and will require stormwater management for casting activities.

Adverse effects to the project from acquisition of the Sundial Site or Alcoa/Evergreen Site are expected to be significant if not mitigated correctly. Of the two sites, the Sundial Site appears to be more suitable for future site activities with regard to hazardous material issues. Environmental impacts to soil, sediment and groundwater appear at the Sundial Site to be relatively less significant than those associated with the Alcoa Site. This is particularly the case for in-water sediments at the Alcoa Site, which have known PCB impacts above generic risk-based levels. These impacts are upriver from the proposed staging area. Dredging of sediments for barge ramp installation at the casting area could result in significant environmental issues. An Ecology information review indicates that the Port of Vancouver has been diligent on requiring Alcoa to meet its Model Toxics Control Act (MTCA) requirements.

1.5 Long-term Effects

Long-term effects are future effects on environmental resources from the operation and maintenance of the No-Build Alternative or the LPA, or future effects to the operation and maintenance of the No-Build Alternative or LPA from hazardous materials sites. Long-term effects are thought to occur in three general categories: 1) property acquisition, 2) effects to the environment from operation, and 3) effects to operation from hazardous materials. These potential effects are assessed qualitatively based on the project team's current understanding of the natural and built environment.

1.5.1 Property Acquisition Liability

Long-term liability can result from ownership or from becoming legally and/or financially obligated to a property that is or will be undergoing investigation, cleanup, and/or requirements associated with the long-term operation of a cleanup action.[6]

Findings

Compared to the No-Build Alternative, the LPA has a higher potential for long-term effects from property acquisition. The LPA will acquire 55 properties that have been identified as a hazardous material site for LPA Option A and 52 for LPA Option B. Long-term adverse effects from property acquisitions are thought to be significant because environmental actions on the acquired properties may continue after construction is completed.

1.5.2 Adverse Effects on the Environment from Operation and Maintenance

1.5.2.1 Spills and Releases

Operation of roadway and transit may result in releases of hazardous substances or petroleum products into the environment from accidental spills. These releases can migrate to surface water or groundwater and/or affect properties outside of the right-of-way. Adverse effects include road closures and delays, cleanup costs, and regulatory fines applied to the responsible party.

Findings

Compared to the No-Build Alternative, the LPA has a lower potential for long-term adverse effects from spills and releases. The LPA will have an updated roadway, bridge and stormwater conveyance design, which will allow better response and management of spills. Adverse effects from spills and releases can have significant impacts to surface water and groundwater resources if not correctly mitigated.

1.5.2.2 Stormwater Conveyance System and Treatment Facilities

Water quality can be diminished by stormwater flowing over PGIS (i.e. roadways and bridges carrying automobiles) and by runoff and erosion of contaminated soils exposed during excavation and grading. Typical stormwater pollutants include petroleum products, metals (copper, cadmium, and lead), salts, fecal coliforms, and suspended solids. Contaminants in stormwater can further migrate to surface water, groundwater and sediments.

Long-term operation and maintenance of the stormwater conveyance system and treatment facilities is necessary to meet discharge and water quality regulatory standards. Treatment technologies rely on reduction of stormwater flow velocity to allow for the settling out of suspended solids and pollutant uptake by plants. Pollutant uptake by plants and accumulation of pollutant loading at soil horizons may have limited or diminishing capacities over time.

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[6] Under Oregon law ORS 465.255, the owner/operator is liable for remedial costs incurred by the State. The statute limits the State from being legally liable through property acquisition or condemnation.

Long-term evaluation of the effectiveness and performance of the treatment systems would be conducted to ensure that the systems are functioning as intended.

Findings

Compared to the No-Build Alternative, the LPA has a lower potential for adverse effects from impacted stormwater. The LPA is thought to have significant beneficial effects to the environment in regards to stormwater, because it will provide management and treatment of stormwater generated from PGIS (Exhibits 1-8a through c). Updates and enhancement of the stormwater conveyance system and treatment facilities are expected to result in locally improved surface water, sediment, and groundwater quality for both full build and phasing option (see Water Quality Discipline Report). This is considered significant due to the beneficial uses of the Columbia River and Troutdale Aquifer. In addition, groundwater recharge to the Troutdale Aquifer should increase due to direct infiltration of stormwater into bioswales and the management and storage of overflow volumes in retention ponds. The LPA stormwater conveyance system and treatment facilities would be monitored and maintained to ensure they are performing as intended. Stormwater that is not adequately managed or treated is expected to have significant adverse effects to the environment.

1.5.3 Adverse Effects on Operation and Maintenance from Hazardous Materials

1.5.3.1 Legacy Hazardous Material Sites

Legacy sites are hazardous materials sites that are or should be undergoing long-term cleanup actions by the owner, sites where additional investigation and cleanup may be required but where the responsible party has not yet complied, or orphan sites which are being managed by regulatory agencies. In special cases, site cleanup activities may coincide with the operation and maintenance of the No-Build Alternative or LPA. These activities could potentially interfere with the long-term operation and maintenance of the alternative and result in financial liability or access restrictions.

Findings

Compared to the No-Build Alternative, the LPA has a higher potential for long-term adverse effects from legacy sites. Of particular concern are the Diversified Marine Site (Site ID 138), the Pier 99 (Site ID 143), former Hayden Island Landfill (Thunderbird Hotel Site ID 103), Boise Cascade (Site ID 80), Harbor Oil (Site ID 141), and Plaid Pantry Site (Site ID 151). These sites have not been fully characterized, and cleanup actions have not been determined or are currently on-going. Potential legacy issues associated with Diversified Marine and Pier 99 include cleanup actions for soil and sediment along the North Portland Harbor embankment and/or for in-water sediments. Potential future remedial activities that could affect the operation and maintenance of the LPA include soil removal, sediment dredging, capping, groundwater treatment and/or long-term monitoring. In addition, potential legacy sites could be discovered during project construction activities. Adverse effects from legacy sites are expected to be significant if not correctly mitigated.

1.5.3.2 TriMet Ruby Junction Maintenance Facility

Adverse effects to the environment could result from the long-term operation and maintenance of the Ruby Junction Maintenance Facility if not correctly mitigated. Operation and maintenance of the facility requires the use of hazardous substances and the generation and disposal of hazardous waste. Poor management practices or an accidental spill could result in a release to the environment. A potential benefit of the expansion of the facility may include updates in spill prevention and containment systems through new construction.

1.6 Proposed Mitigation

The following presents mitigation measures for identified adverse effects for the LPA. Measures are described for the three general categories used to describe temporary and long-term effects: 1) property acquisition, 2) effects to the environment from construction activities, and 3) effects to construction from hazardous materials.

1.6.1 Property Acquisition and Cleanup Liability

Environmental due diligence is recommended for properties to be acquired and/or for properties that are proposed for substantial construction activities. Environmental due diligence can take many forms. However, typical environmental due diligence includes the completion of Phase I and/or Phase II Environmental Site Assessments (ESAs). These can be completed on a site-by-site basis or completed for blocks of properties, adjacent properties, or within focused areas. The focus of environmental due diligence is to determine the potential for environmental liability (existing contamination, current operational practices, construction worker health and safety, etc.) associated with a particular property.

Phase I ESA– Phase I ESAs may be necessary to help identify liability issues associated with purchasing a facility or property in fee. An adequately completed Phase I ESA through good commercial and customary practice is the first step in the due diligence process by establishing the baseline condition of the property. This allows the purchaser to be in a legally defensible position if financial and legal liabilities are incurred. Under ASTM E 1527-05, parameters are set forth as to how Phase I ESAs are to be performed. A Phase I ESA also can be used to assist in establishing the fair market value of the property. Residential properties that are acquired may only need a less detailed level of study such as a Transaction Screen ASTM E1528-06.

It is anticipated that the majority of properties to be acquired or are located in areas with substantial construction activities will be subject to minimum due diligence in the form of a Phase I ESA or Transaction Screen. The due diligence would be completed prior to acquisition or construction initiation at a site to identify potential environmental issues. These assessments can be completed on a site-by-site basis or completed for blocks of properties, adjacent properties, or within focused areas.

Phase II Environmental Site Assessments – More extensive investigation may be necessary if the Phase I ESA determines that a property has a likelihood of contamination. In this case, a Phase II ESA may be necessary for property acquisition or for construction purposes. Phase II ESAs will be conducted in a manner that is consistent with the MTCA, Oregon Administrative Rules (OAR) for Hazardous Materials, ASTM International, and the American Association of State Highway and Transportation Officials (AASHTO). The Phase II ESA is an intrusive investigation to collect samples of soil, groundwater and/or building materials. The substances most frequently tested for are petroleum hydrocarbons, metals, pesticides, solvents, asbestos, and/or lead-based paint. A Phase II ESA can be simple, such as an investigation of an underground storage tank (UST), or complex, as for a site that has a long, intensive history and multiple environmental issues. Ecology and DEQ may be notified if contamination is encountered during the assessment. Findings will be used to support avoidance strategies or help guide appropriate cleanup actions.

At this time it is not possible to ascertain all properties that may require a Phase II ESA to ensure that potential liability is identified. In general, a Phase II ESA is conducted based on the results of the Phase I ESA or other known or existing information. However, based on the evaluation work completed as part of this report, it is anticipated that at a minimum, Phase II ESAs will be completed for the acquired properties which were identified as priority hazardous material sites (Exhibit 5-1). Supplemental Phase II ESAs will likely be required as additional information is obtained during the environmental due diligence process.

1.6.2 Effects to the Environment from Construction Activities

Focused Site Assessments – Assessments would be conducted prior to construction to assess potential adverse effects to the environment or construction activities. Focused site assessments would characterize and evaluate potential existing impacts to soil, sediment and groundwater that could be exacerbated through the construction process. Areas of focused assessment include, but are not limited to, the Marine Drive Interchange, North Portland Harbor, Hayden Island, Columbia River, SR 14 interchange and the Mill Plain interchange. Findings would be used to support avoidance or mitigation strategies or to help guide appropriate cleanup actions.

Construction Stormwater Pollution Prevention Plans (SWPPPs) – Control plans will be prepared to prevent or minimize soil or sediment from being carried into surface water by stormwater runoff. Plans would be required for all permitted construction sites, are subject to approval by the regulatory agencies, and must comply with CPC Title 10 and Vancouver Municipal Code (VMC) Chapter 14.24. Plans would be prepared in a manner that is consistent with the Stormwater Manual for Western Washington and/or WSDOT Highway Runoff Manual, and would be put in place prior to clearing, grading, or construction.

NPDES Construction General Stormwater Permits – 1200-C and/or 1200-CA permits would be prepared to cover all ODOT and WSDOT construction activities disturbing more than 1 acre. Under the conditions of this permit, ODOT and WSDOT must submit to the regulatory agencies a Notice of Intent to discharge stormwater associated with construction activities and to meet stormwater pollution prevention requirements. Permits are subject to approval by the DEQ pursuant to OAR 340-045 and by Ecology pursuant to WAC 173-220.

Stormwater Conveyance System and Treatment Facilities Monitoring Plan – A stormwater monitoring plan would be prepared to evaluate the long-term performance and effectiveness of the updated stormwater conveyance and treatment systems. Based on the findings, modifications and/or enhancements to the updated system would be conducted to best meet discharge criteria.

Drinking Water Supply and Treatment – In the event that migration of contaminated material has occurred, groundwater at WS-1 and WS-3 is currently treated for microbiological constituents by chlorination, and groundwater at WS-1 is treated for volatile organic compounds (VOCs) by aeration. Groundwater at these stations is monitored to ensure that water quality meets drinking water standards.

1.6.3 Effects on Construction from Hazardous Materials

Health and Safety Plan (HASP) – Site-wide construction HASPs would be prepared to minimize exposure of construction and excavation workers to hazardous materials, and to reduce the risk to human health and the environment. Construction would be conducted under approved site-specific HASPs prepared by the contractors. The HASP would conform to Occupational Safety and Health Administration (OSHA) requirements.

Spill Prevention, Control & Countermeasures (SPCC) plans – SPCCs address three areas: 1) operating procedures the facility implements to prevent oil spills; 2) control measures installed to prevent oil from entering navigable waters or adjoining shorelines; and 3) countermeasures to contain, clean up, and mitigate the effects of an oil spill that has an impact on navigable waters or adjoining shorelines.

SPCCs would be used to limit the generation and migration of hazardous substances or petroleum products, and will outline best management practices (BMPs) to be used by contractors. Plans would be required for all permitted construction sites and would be prepared by the construction contractor. ODOT projects administer SPCCs pursuant to OAR 340.142. WSDOT projects require SPCC plans in accordance with WSDOT Standard Specification 1-07.15(1).

Contaminated Media Management Plans (CMMPs) – CMMPs would be prepared to properly characterize, manage, store, and dispose of contaminated materials encountered during construction activities. The CMMP would outline roles and responsibilities of personnel; health and safety requirements; methods and procedures for characterizing, managing, storing, and disposing of waste; and reporting requirements.

Hazardous Building Material Surveys and Abatement Program – A hazardous building material survey would be conducted, prior to acquisition of building and/or structures and depending on building age and/or suspicion of hazardous building materials. Surveys would be consistent with OAR 248 and WAC 296-65. The survey would inventory lead-based paint, ACM, mercury, and PCB containing equipment, and/or abandoned waste. Based on survey results, abatement would be conducted prior to demolition, renovation, and/or repair. Disposal of identified hazardous building materials would be conducted at suitable Subtitle C or D solid waste facilities.

Well Decommissioning – Two City of Portland process wells located on Hayden Island are within the footprint of the proposed roadway. One well (east of I-5) is abandoned. The other well is not in use and is planned for decommissioning pursuant to Oregon Water Resources Department (OWRD) regulations prior to the start of project construction. Other wells, where encountered, would be decommissioned pursuant to OAR 690-220 or WAC 173-160, as necessary. Where applicable, dry wells would be decommissioned pursuant OAR 340 Division 44 or WAC 173-218.

2. Methods

2.1 Introduction

This section describes the methods by which data is collected and the guidelines by which data is evaluated.

2.2 Study Area

A study area is used to place constraints on the active area in which the evaluation of hazardous materials and hazardous materials sites is conducted. The boundaries of the study area are displayed in Exhibit 2-1. The study area encompasses the main project area of the LPA for the CRC Project. The boundaries of the study area were set using the standard search radius established by ASTM E 1527-05 for conducting environmental site assessments. This distance is defined by a 1.0-mile radius around the main project area boundary.

2.2.1 Main Project Area

The main project area defines the area most likely to have direct impacts from construction and operation of the CRC project. The main project area is based on the designs of the LPA. This area extends 5 miles from north to south between the I-5/Main Street interchange in Vancouver and the I-5 Victory Boulevard interchange and Martin Luther King Boulevard near NE Union in North Portland. North of the river, the API extends west into downtown Vancouver and east to near Clark College, and includes potential transit alignments and park and ride locations.

2.3 Data Collection Methods

Data sources and data collection methodologies presented in this technical report are consistent with those described in the Methods and Data Report (MDR) for hazardous materials (Parametrix 2007). Procedures for this assessment were developed to comply with applicable state and federal environmental policy legislation and guidance. These include the WSDOT Guidance and Standard Methodology for Hazardous Material Discipline Reports (WSDOT 2009), Oregon Department of Transportation (ODOT) HazMat Program Procedures Guidebook (ODOT 2004), and most aspects of ASTM E 1527-05.

Project staff conducted this assessment in accordance with generally accepted industry practices and procedures within the authorized scope of work. Information in this report is based on regulatory environmental database review, literature review, observed site conditions, and the best available information known or made available by the project team and applicable agencies.

2.3.1 Database Search

Appendix B presents a description of federal and state environmental database listings used to identify potential hazardous materials sites within the study area. In general, the database listings are compiled and maintained by agencies for properties and facilities that generate, store, use, transport, or dispose of hazardous substances, and for properties that are known or suspected to have soil, sediment, or groundwater contamination.

For the purposes of this report, a hazardous materials site is a location or facility that potentially contains a recognized environmental condition (REC). The term “recognized environmental condition” is defined by ASTM E-1527 as:

> “...the presence or likely presence of any hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater or surface water of the property. The term includes hazardous substances or petroleum products even under conditions in compliance with laws. The term is not intended to include de minimus conditions that generally do not present a material risk of harm to public health or the environment and that generally would not be the subject of an enforcement action if brought to the attention of appropriate governmental agencies.”

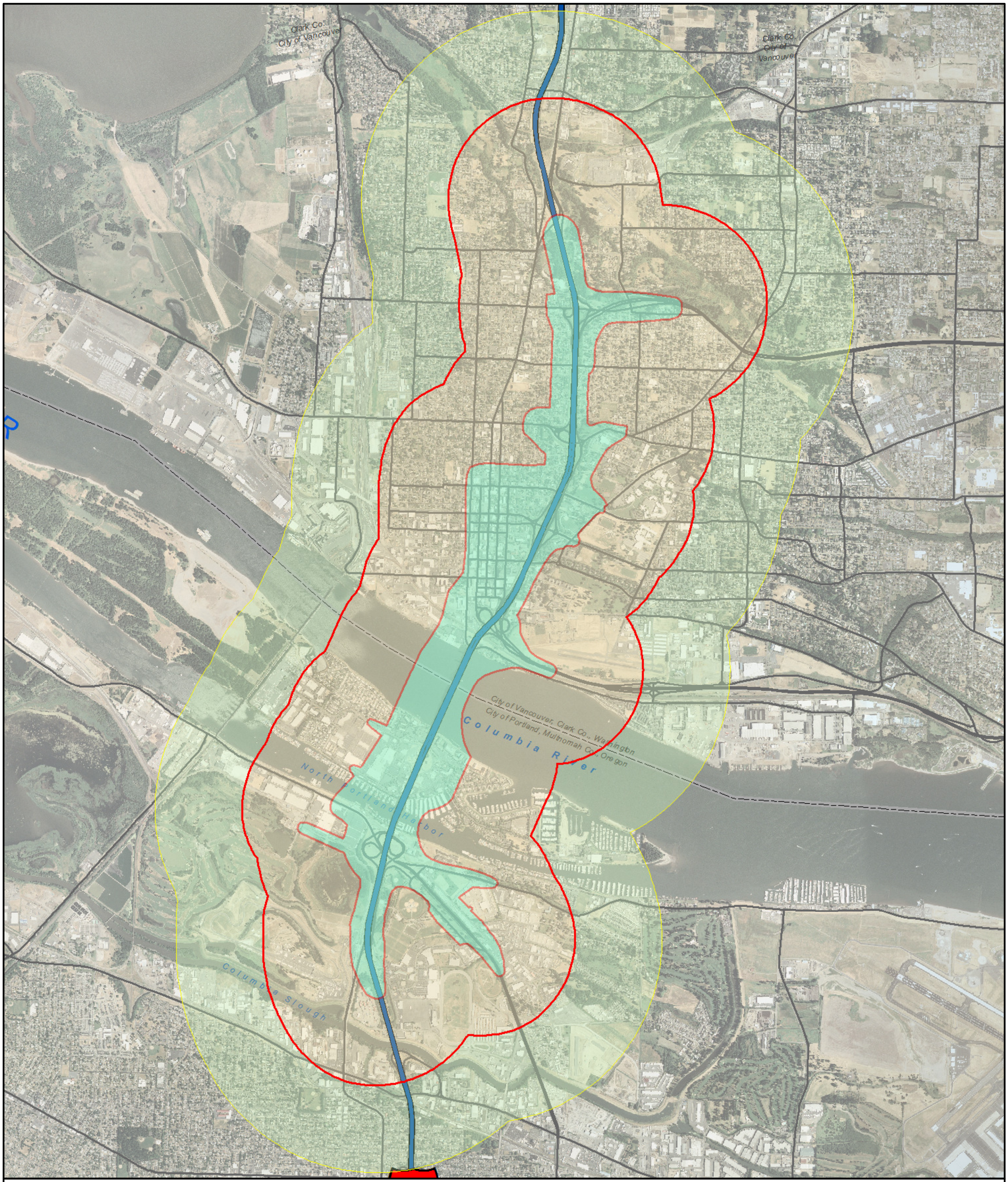
The database search was conducted in part by Parcel Insight, Inc., which compiled database records through May 2009. A copy of Parcel Insight, Inc.’s database search is provided in Appendix C, on CD-ROM. State agency databases were also searched independently by project staff to ensure completeness of the search. Identified sites were given unique project identification numbers.

2.3.2 Historical Land Use Review

Historical land use within the study area was reviewed in regards to RECs with the aid of fire insurance maps (Sanborn Maps®) and historical aerial photographs.

2.3.2.1 Sanborn Fire Insurance Maps

Sanborn fire insurance maps were originally intended to assist insurance companies in assessing fire risk associated with discrete properties. Map information typically includes site address and location, property boundaries and size, building size and construction materials, utility line types and locations, material types stored in the building, building use/function, boiler locations, fuel and oil storage locations, and/or other details about use. Identified sites were given unique ID numbers. This assessment used Sanborn maps for the years 1911 to 1969 (included in Appendix D) to aid in the identification of sites that may have used, stored, or generated hazardous substances or petroleum products. This assessment was not definitive, and sites that were identified are only suspected of using or storing hazardous substances and/or generating or disposing of hazardous substances. In addition, historical use of these sites may have not been identified due to limited information.



N
W E
S

0 0.5 1

Miles

Main Project Area

1/2 Mile

1 Mile

Exhibit. 2-1

Study Area Location Map

Columbia River CROSSING

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2.3.2.2 Historical Aerial Photographs

Plan view aerial photographs depict the land use and setting for a specific time period. This assessment used aerial photographs at approximately 10-year intervals from the mid-1930s to the present to identify agricultural, commercial, or industrial sites that may have used, stored, or generated hazardous substances or petroleum products. Historical aerial photographs from 1939, 1948, 1955/1956, 1964, 1973, 1980, 1990 and 1998 were reviewed; these photographs are included in Appendix E.

The photographs in Appendix E also include Site ID information from the historic Sanborn maps evaluation. In addition, oblique aerial photographs of downtown Vancouver for 1950 and 1963 are presented in Appendix E. The oblique photographs also depict Sanborn Site ID information.

2.3.3 Site Reconnaissance

Site reconnaissance consisted of drive-by surveys within the study area. Drive-by surveys were generally conducted at sites that were identified by the database search or historical land use review to have had a potential REC. In addition, the drive-by survey also assessed sites within the main project area that were not identified, but that appeared to have a potential REC. However, site reconnaissance information is limited because the drive-by surveys were conducted from the public right-of-way. The project team recorded the following information, if observed:

- Evidence of a UST or above-ground storage tank (AST).
- Evidence of a spill or release.
- Poor housekeeping practices, such as garbage or debris.
- Evidence of dead or distressed vegetation.
- Evidence of the use or storage of petroleum products or hazardous materials.

2.4 Guidelines for Evaluating Potential Effects

Applicable state and federal guidelines were used to collect and screen data and to evaluate potential direct effects to the project from hazardous materials. These guidelines include:

ODOT. 2004. ODOT Hazmat Program Procedures Guidebook. Prepared by the Oregon Department of Transportation. Revised November 11, 2004.

WSDOT. 2009. Guidance on Standard Methodology for WSDOT Hazardous Material Discipline Report. Prepared by the Washington Department of Transportation, Environmental Services Office, Olympia, Washington. January, 2009.

ASTM. 2005. ASTM E 1527-05, Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process.

AASHTO. 1990. Hazardous Waste Guide for Project Development. Prepared by the AASHTO Special Committee on Environment, Archaeology and Historical Preservation.

2.5 Data Screening Methods

The following methodology was used to screen hazardous materials data.

2.5.1 Methods for Ranking Identified Database Sites

Hazardous materials sites identified in one of the listed databases were ranked qualitatively for their potential to act as a contaminant source. Ranking was based on the following criteria:

- Location of the site (in or out of the study area and/or API).
- Type and number of database listings.
- Occurrence of a known release of a hazardous substance(s) or petroleum product.
- Status of cleanup – Active, Inactive,[7] or unknown.

2.5.1.1 Screening Database Information

Database types were compared to one another on their ability to signify that an adverse environmental condition exists.[8] Comparisons of database types are presented below, with those at the beginning of the list having the greatest potential for adverse effects relative to those at the end of the list. Appendix B provides a summary of databases reviewed and their description.

Sites with a Known Release to the Environment

- NPL, CERCLIS, ROD, TRIS, ECSI, and CSCSL database listings indicate that a relatively significant adverse environmental condition exists at the site. These database listings signify sites that have had one or more confirmed or suspected releases to the environment and may require or are in the process of cleanup.
- IRC, RAATS, VCP, and LUST database listings indicate that an adverse environmental condition exits. These sites have one or more confirmed releases to the environment and may require or are in the process of cleanup. LUST sites associated with fueling stations may pose a greater threat than those associated with home heating oil, due to the use of fuel additives and the quantities stored at fueling stations.
- ENG CONTROLS and INST CONTROLS database listings indicate sites at which a formal control is in place that may pose limitations or constraints to property use.
- Delisted-NPL, CERCLIS-NFRAP, CSCSL-NFA, and Inactive Drycleaners database listings indicate sites that have had or were thought to have an adverse environmental condition; however, these sites have an inactive status.
- SPILLS, HAZMAT, and ERNS database listings indicate incidents of vehicle accidents with fuel spills and transported material spills that may produce environmental consequences, depending on their nature and extent.

Sites with No Reported Release

- UST and AST database listings have limited potential for producing significant adverse environmental conditions. UST sites that are acquired would require proper decommissioning.

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[7] All sites are considered active unless identified as having no further action or inactive status.

[8] Comparisons are based on WSDOT guidance, available data, and professional judgment.

- RCRIS, RCRA-TSDF, RCRA-NLR, CORRACTS, TSCA, PADS, FTTS: HIST-FTTS, SSTS, and MANIFEST database listings indicate sites where hazardous substances that are stored, generated, transported and/or disposed. These sites have limited potential for producing significant environmental consequences.
- SWL-LF database listings are solid waste facilities.

Sites Listed on Long-term Environmental Monitoring Databases

- Sites listed in the ICIS, NPDES, and AIRs databases have limited potential for producing significant environmental consequences, depending on industry type. However, adverse environmental consequences may be associated with sites that have multiple NPDES violations.
- FINDS sites have limited potential for producing significant environmental consequences.

2.5.1.2 Description of the Ranking System

Using database information (including listings type[s], site status, and location), historical land use information, site reconnaissance information, and current land use information, identified hazardous materials sites were ranked on a scale of 0 to 5 (low to high) for being a potential source of contamination within the study area. A description of each ranking is provided below. Sites were ranked using available information on database type, site status, and site location.[9]

- #0 – Identified site is located within the study area, but is located greater than 0.5 mile from the main project area and is not known to have had a release.
- #1 – Identified site is located between the main project area and 0.5 mile of the main project area and is not known to have had a release.
- #2 – Identified site is within the main project area and is not known to have had a release.
- #3 – Identified site is outside the main project area and has had a known release.
- #4 – Identified site is within the main project area and has had a known or suspected release; however, no further action is required or pending.
- #5 – Identified site is within the main project area, has had a known or suspected release, and cleanup activities at the site are active.

Sites ranked #4 and #5 have the greatest potential to be a source of contamination within the study area.

[9] A site is considered to be active unless otherwise indicated by the database or file review. Although a site is designated inactive, it may be subject to or be open to further inquiry by state or federal regulators.

2.5.2 Methods for Identifying Hazardous Materials Sites from Historical Land Use Information

2.5.2.1 Screening Sanborn Sites with RECs

Sanborn Fire Insurance maps were used to identify historical sites within the main project area that are suspected of having RECs from the generation, storing, use, and/or disposal of hazardous substances and/or petroleum products. Sites were identified using business title, type, and/or the presence of potential features of concern. As such, the quality of this information is not conclusive, and can only be used to gain a general understanding of current site conditions.

Identified sites fall into three general categories:

1. Automotive services, including service stations, sales and repair;
2. Heavy and light industrial services, including machine shops and factories; and
3. Commercial properties, including laundry and dry cleaners services.

It is recognized that not all sites fit into these general categories, although they act as a means to separate sites by practices or chemicals that may have been used on site. For example, automotive stations and repair facilities are likely to have used and stored petroleum hydrocarbons on site; paint stores and dry cleaners are often sources of spent or stored solvents; and industrial and other small manufacturers and repair sites are often sources of multiple types of hazardous materials, both raw materials and generated waste products. To avoid repetition, sites that were positively correlated with one of the databases discussed above were removed from the Sanborn list.

Based on this information identified sites were screened into:

- Sites that have a high (H) potential of being a contaminant source within the study area.
- Sites that have a low (L) potential of being a contaminant source within the study area.

2.5.2.2 Historical Aerial Photographs

Historical aerial photos for the project area were reviewed in chronological order to establish changes in land use over time. Documented changes in land use are generally on a scale that includes large portions of the project area, although it is possible to discern the appearance of smaller sites such as mills and other industrial sites and, on occasion, smaller sites such as gas stations. Major land use observations include agricultural use of property, a change from rural or agricultural use to residential or commercial use, or any change to or from an industrial use.

2.5.3 State File Review of Priority Sites

A review of updated site information was conducted on priority hazardous materials sites having a ranking of #4 or #5. For each site, information pertaining to status, type, and quantity of contaminant released, and to affected media were reviewed. The DEQ Facility Profiler website and Ecology’s Environmental Information Management (EIM) System website were reviewed. In addition, DEQ and Ecology project managers for the identified site were contacted to document any new relevant and available information.

2.6 Methods for Evaluating Short-term and Long-term Effects

2.6.1 Short-term Effects from Project Construction Activities

Short-term effects to the project were evaluated qualitatively by comparing the location of identified priority hazardous materials sites and historical land use with the location and activities associated with:

- Construction of proposed structures, including bridges, interchanges, retaining walls, tunnels, utility corridors, and stormwater treatment facilities.
- Construction activities, including excavation, grading, soil stabilization, dredging, and the storing and use of hazardous substances.

In general, adverse impacts are thought to occur in areas where construction activities are intensive and where priority hazardous materials sites are or were located. In addition, short-term effects are discussed in regards to the liability associated with acquisition of property with RECs.

2.6.2 Long-term Effects from Project Operation and Maintenance

Long-term effects to the project were evaluated qualitatively by assessing activities associated with the long-term operation and maintenance of the project. Activities include HazMat response to roadway spills, and treatment and discharge of stormwater.

2.7 Mitigation Measures

Mitigation measures for short-term adverse effects from hazardous materials initially consist of avoidance of identified hazardous materials sites. In cases where project construction cannot avoid an identified hazardous material site, the approach for mitigation may include conducting due diligence on the property prior to acquisition; coordination and communications with the state environmental agencies and potentially responsible parties (PRPs); conducting focused site investigations; encouraging the PRP to conduct cleanup; and remediation or abatement of contaminated media. In cases where project construction encounters contamination from an unidentified source, the approach for mitigation includes conducting environmental management under an approved work plan(s) that outlines methods for identifying, characterizing, managing and disposing of hazardous materials, and implementing methods for minimizing the exacerbation of contamination.

Mitigation measures for long-term adverse effects from hazardous materials include instituting HazMat emergency responses to releases or spills on roadways and bridges; conducting maintenance and cleaning of roadways, bridges, and tracks; and conducting long-term monitoring of stormwater facilities to ensure they are functioning as intended.

2.8 Coordination

Project coordination and communication were conducted with Tanya Bird and Mike Stevens, WSDOT Hazardous Materials and Solid Waste Program, and Jennie Armstrong and Charles Schwarz, ODOT Region 1 HazMat Group during preparation, review, and finalizing of this Hazardous Materials technical report.

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3. Affected Environment

This section describes the environmental setting and identifies hazardous materials sites within the main project area.

3.1 Physical Setting

3.1.1 Current Land Use

Current land use in the vicinity of the LPA is displayed in Exhibit 3-1. An understanding of both current and historical land use is important in assessing the occurrence and types of hazardous materials. For example, agricultural land is more likely to have a higher occurrence of pesticides and herbicides then residential land and commercial or industrial land is more likely to have higher occurrence of petroleum products and other hazardous materials.

3.1.1.1 Portland

The Marine Drive Interchange area land use is a mix of commercial, industrial, and residential properties. Hayden Island east of I-5 is predominantly commercial and residential. Hayden Island west of I-5 is commercial, including the Jantzen Beach Center (a large shopping mall) and surrounding retailers. Residential uses in the area include condominiums, manufactured homes and floating homes associated with small marinas.

3.1.1.2 Vancouver

The downtown area of Vancouver is located west of I-5 and south of Mill Plain Boulevard and includes the downtown area, residential areas, and the Uptown Commercial district. The large Central Park includes the National Park Service property and the Vancouver National Historic Reserve (VNHR) east of I-5. Land uses are primarily commercial, but include retail, offices, industrial, and residential uses. Commercial uses are concentrated in the downtown area, while industrial uses are generally located in the southern portion near the Columbia River.

North of Mill Plain Boulevard, the land uses and zoning are predominately residential, with major transportation corridors, primarily Fourth Plain Boulevard and Main Street, providing commercial uses. Residential neighborhoods are located west of I-5. The east side of I-5 includes more multi-family housing and zoning, and has more of a suburban form. Clark College, Fort Vancouver, and the Veterans Administration campus occupy the majority of property adjacent to the eastern side of I-5. The current municipal boundaries of the City of Vancouver are at the railroad bridge just south of 63rd Street on Highway 99.

3.2 Environmental Setting

3.2.1 Topography and Drainage

The Columbia River dominates the topography of the study area. The project corridor lies within the Columbia River main valley, with the exception of a small area north of the SR 500 interchange located in the Burnt Bridge Creek watershed (Exhibit 3-2). Burnt Bridge Creek flows into Vancouver Lake before discharging to the Columbia River. Project area elevations vary from approximately 10 feet North American Vertical Datum 1988 (NAVD88) in the Columbia River floodplain to about 220 feet NAVD88 at the drainage divide between the Columbia River and Burnt Bridge Creek valleys. A small area of the southern portion of the main project area in Portland drains to the Columbia Slough. The Columbia Slough runs parallel to the Columbia River to the south and discharges to the Willamette River approximately 5.5 miles west of the main project area.

3.2.2 Fluvial Setting

The Columbia River drains almost 220,000 square miles in seven states and Canada, with land in forest, agricultural, residential, urban, and industrial uses. The Lower Columbia River, that section of the river most pertinent to the impact analysis, flows from Bonneville Dam at River Mile (RM) 146 to the mouth of the river, and drains an area of 18,000 square miles. Adjacent to the study area, Hayden Island divides the Columbia River into the mainstem to the north and a side channel called the North Portland Harbor to the south. The I-5 highway crosses both channels near RM 106.5.

3.2.2.1 Columbia River

Exhibit 3-3 displays Columbia River bathymetry within the main project area. The figure indicates that depth of water in the study area extends from the ordinary high water line[10] at 21.2 feet NAVD88 to approximately -50 feet NAVD88. Shallow water environments (less than 20 feet of water column) are present in North Portland Harbor and in proximity to Hayden Island.

Geotechnical borings and bathymetric surveys completed within the footprint of the proposed crossing indicate that the depth of unconsolidated sediments (alluvial and/or catastrophic flood deposits) in the study area ranges from -40 to -230 feet NAVD88 (DEA 2006; Shannon and Wilson 2008). Underlying these sediments is the top of the Troutdale Formation, which slopes downward from north to south in the project area.

The top layer of river substrate is composed of loose to very dense alluvium (primarily sand, gravel and trace fines). The alluvium is underlain by dense gravel and in turn underlain by the Troutdale Formation. Additional information regarding the characteristics of in-water sediment material in proximity to the study area has been compiled by the U.S. Army Corps of Engineers and geotechnical investigations conducted for the project (USACE 2009, Shannon and Wilson 2009).

Federal, state, and local databases were reviewed for sediment evaluations performed in proximity to the existing I-5 bridges. The EPA Environmental Management and Assessment Program (EMAP) database was searched for sediment evaluations in the study area. Ecology's EIM database was also queried for recent sediment sampling and analyses performed under the State of Washington's jurisdiction. Legacy data were retrieved using SEDQUAL, the predecessor to the EIM database. For evaluations performed under State of Oregon jurisdiction, the USACE Portland District was contacted.

[10] Normally, this is the point on a stream bank to which the presence and action of surface water is so continuous as to leave a district marked by erosion, destruction or prevention of woody terrestrial vegetation, predominance of aquatic vegetation, or other easily recognized characteristics, but may be modeled based on stream elevation gage data to be the elevation of the 2-year flow. In this area of the Columbia River, the OHW has been modeled.

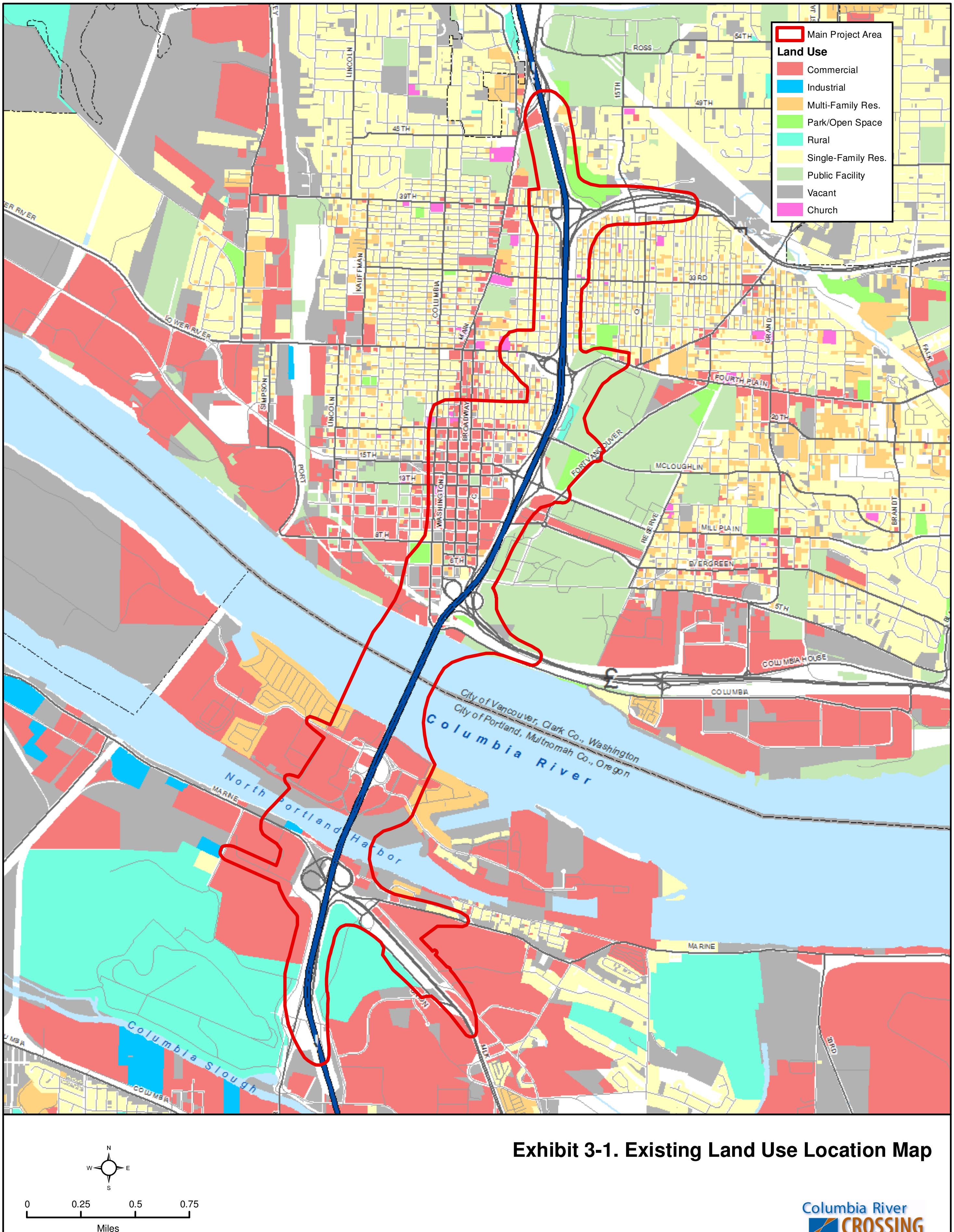

Exhibit 3-1. Existing Land Use Location Map

Columbia River CROSSING

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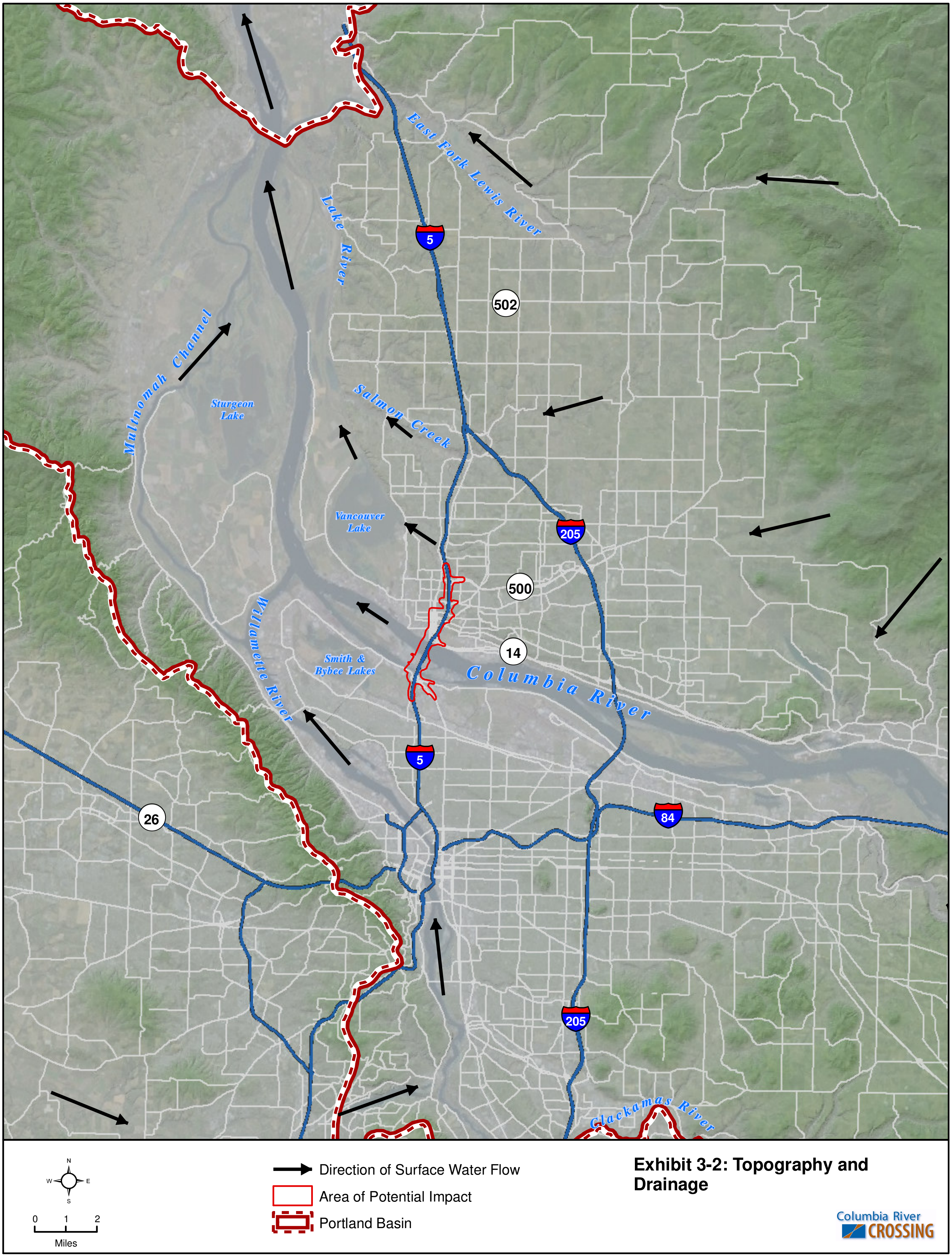

Exhibit 3-2: Topography and Drainage

Columbia River CROSSING

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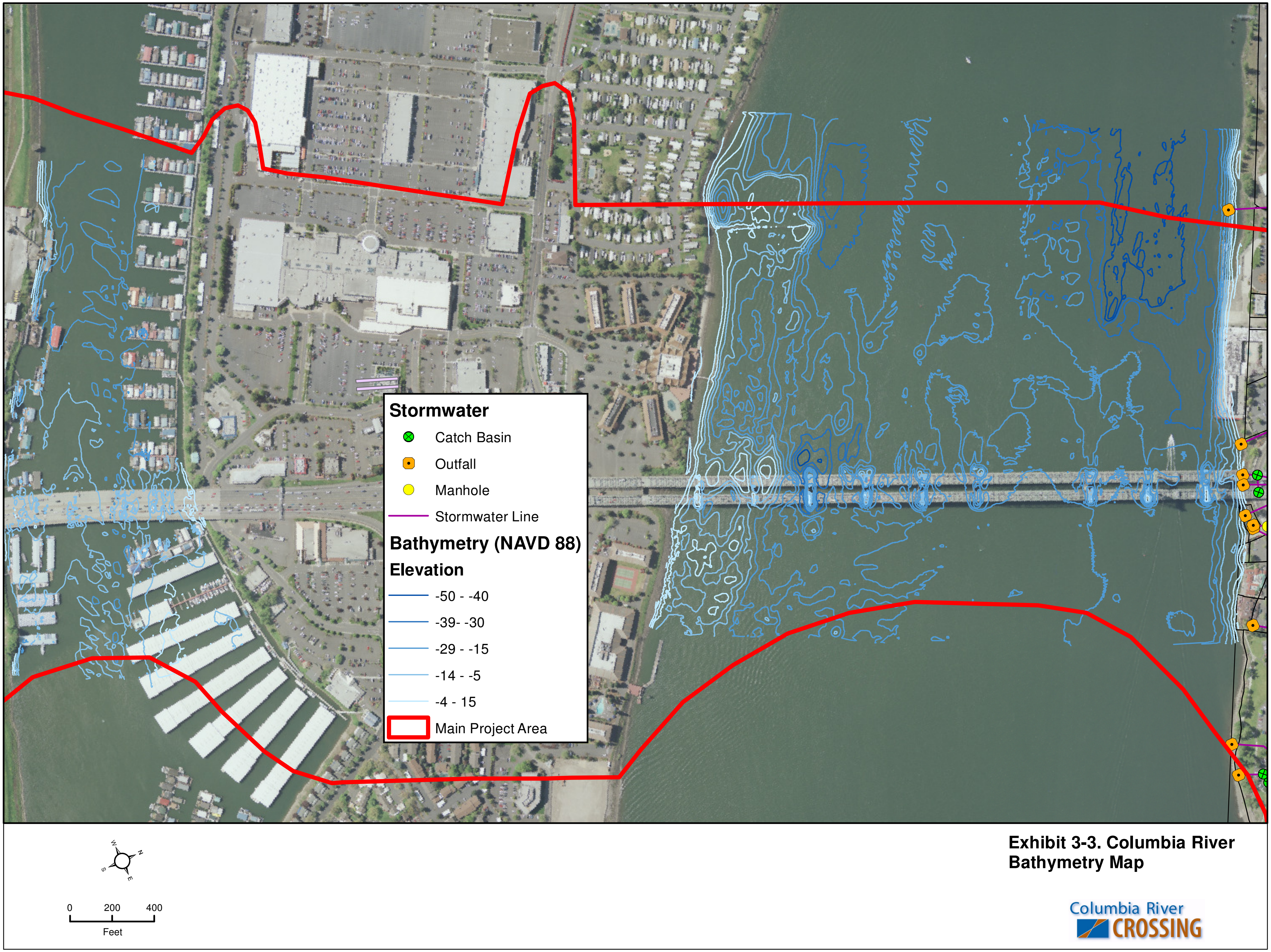

Exhibit 3-3. Columbia River Bathymetry Map

Columbia River CROSSING

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Columbia River Bi-State Program

As part of the Columbia River Bi-State Survey Program, sediment sampling and analysis were performed in 1991 and 1993 (Tetra Tech 1991-1993). Bi-State Program sample collection stations were located within the navigation channel and within 1 mile of the I-5 bridges. Based on the data collected, the concentrations of chemicals of concern in sediment samples were below screening levels established for evaluating the suitability of open water disposal.

The USACE conducted a study (USACE 2009) to characterize the river sediment for dredging as part of the Columbia River Channel Improvement Project. In June 1997, 89 stations were sampled from the Columbia River channel, between RM 6 and RM 106.2, for physical analysis. Samples from 23 of the 89 stations were further analyzed for chemical contaminants. Analyses for inorganic total metals, polycyclic aromatic hydrocarbons (PAHs), total organic carbon (TOC), acid-volatile sulfide (AVS), pesticides, polychlorinated biphenyls (PCBs), pore water TBT, and the P450 reporter gene system (RGS, a dioxin/furan screen) were performed on selected samples. Two sample collection stations (CR-BC-88 and CR-BC-89) were within 0.5 mile of the I-5 bridges (Exhibit 3-4). All sample results for these stations were below their respective screening level values.

Exhibit 3-4. Columbia River Sediment Quality Table

Analysis	Units	Sample Location		Screening Levels[a]
		CR-BC-88	CR-BC-89	
Physical Analysis				
Water Depth*	feet	39.1	34.1	-
River Mile	Miles	106.2	106.2	-
Grain Size – Mean	mm	0.89	0.59	-
Grain Size – Median	mm	0.73	0.51	-
Sand	%	1.1	2.9	-
Very Fine Sand	%	0.1	0.3	-
Silt	%	0.0	0.3	-
Clay	%	0.0	0.0	-
Volume of Solids	%	0.5	0.6	-
Solids	%	88.9	-	-
TOC	%	<0.05	-	-
Metals				
Arsenic	mg/kg	1.0	-	57
Cadmium	mg/kg	<0.8	-	5.1
Chromium	mg/kg	3.0	-	NA
Copper	mg/kg	5.0	-	390
Lead	mg/kg	2.0	-	450
Mercury	mg/kg	<0.05	-	0.41
Nickel	mg/kg	6.0	-	140
Silver	mg/kg	<0.6	-	6.1
Zinc	mg/kg	31.0	-	410
AVS	%	<0.7	-	-

Analysis	Units	Sample Location CR-BC-88	Sample Location CR-BC-89	Screening Levels[a]
Pesticides and PCBs				
Aldrin	µg/kg	<2	-	10
DDT	µg/kg	<2	-	-
DDE	µg/kg	<2	-	-
DDD	µg/kg	<2	-	-
Total DDT	µg/kg	ND	-	6.9
Aroclor 1254	µg/kg	<10	-	-
Aroclor 1260	µg/kg	<10	-	-
Total PCBs	µg/kg	ND	-	130
Low Molecular Weight PAHs (LPAHs)				
Napthalene	µg/kg	0.7	-	2,100
2-Methylnapthalene	µg/kg	0.6	-	670
Acenaphthalene	µg/kg	<5	-	560
Acenaphthene	µg/kg	<5	-	500
Fluorene	µg/kg	0.7	-	540
Phenanthrene	µg/kg	2.0	-	1,500
Anthracene	µg/kg	0.8	-	960
Total LPAHs	µg/kg	6.0	-	5,200
High Molecular Weight PAHs (HPAHs)				
Fluroanthrene	µg/kg	2.0	-	1,700
Pyrene	µg/kg	<5	-	2,600
Benzoanthracene	µg/kg	2.0	-	1,300
Chrysene	µg/kg	2.0	-	1,400
Benzo(b,k)fluoranthene	µg/kg	5.0	-	3,200
Benzo(a)pyrene	µg/kg	2.0	-	1,600
Ideno(1,2,3-cd)pyrene	µg/kg	2.0	-	600
Dibenz(a,h)anthracene	µg/kg	1.0	-	230
Benzo(g,h,i)perylene	µg/kg	5.0	-	670
Total HPAHs	µg/kg	21.0	-	12,000
P450 Reporter Gene Assay (Dioxin/Furan Screen)				
6 Hour B(a)P Eq	µg/g	0.60	-	-
6 Hour TEQ	ng/g	0.03	-	-
16 Hour B(a)P Eq	µg/g	0.10	-	-
16 Hour TEQ	ng/g	0.01	-	-
Ratio	-	7	-	-
Primary Contaminates**	-	PAHs	-	-

Notes

AVS - acid-volatile sulfide
PAH - polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyl
TEQ - toxicity equivalent
TOC - total organic carbon
DDT - dichlorodiphenyltrichloroethanes

a Table 6-1, Dredged Material Evaluation and Disposal Procedures (USACE, et al. July 2008).

*Corrected to river datum.

**Based on ratio of 6 hr/16 hr where ratio > 5 = PAHs; ration 5 to 1 = both PAHs and chlorinated compounds; and ratio < 1 = chlorinated compounds.

< - Denotes a non-detect at the numerical level listed.

Units

ft - feet
mi - miles
mg/kg - milligrams per kilogram
mm - millimeters
µg/kg - micrograms per kilogram
µg/g - micrograms per gram
ng/g - nanograms per gram

Following the June 1997 sampling event, the Columbia River mile segment nearest the I-5 bridges (RM 99 to 106) was given an “exclusionary” ranking in accordance with the Dredge Material Evaluation Framework (DMEF) for the Lower Columbia River Management Area. Exclusionary rank is given to coarse-grain material (greater than 80 percent retained on a No. 230 sieve or approximately 0.063 mm in diameter) with total volatile solids (TVS) less than 5 percent and sufficiently removed from sources of sediment contamination. Under the DMEF guidelines, this ranking authorizes dredged sediment to be suitable for unconfined aquatic disposal without further testing.

Deep-draft federal navigation maintenance dredging in the main Columbia River near the I-5 bridges was completed in 2007 using a hopper dredge. The main channel dredging was authorized from RM 3 to 106.5, but actual dredging extended to only RM 105.5. Mechanical excavation near RM 105 in front of the Port of Vancouver docks was completed in 2008.

In August 2008, a sediment sampling study was conducted in the mainstem Columbia River, similar to the June 1997 sampling effort. The final data and completed data report concluded that based on sampling results all sediment sampled was considered acceptable for open in-water placement without further characterization (Siipola 2009).

3.2.2.2 Burnt Bridge Creek

Burnt Bridge Creek defines a portion of the northern boundary of the study area. The creek originates in East Vancouver from field ditches that drain a large wetland area between NE 112th Avenue and NE 164th Avenue. The creek is approximately 12.9 miles in length and alternates between ditches and natural channels. Except for floodplains, parks, and wetlands, nearly the entire basin is urbanized. In the project area, the creek flows through a small canyon with a narrow floodplain. The creek passes under the existing highway in a culvert north of the project area.

3.2.3 Existing Stormwater Conveyance Systems

The existing stormwater drainage systems in the study area are closed conveyance systems that discharge runoff to either the Columbia River or Burnt Bridge Creek watersheds or to stormwater drywells that infiltrate into the subsurface soil. These watersheds are highly urbanized within the study area. The existing drainage systems are described below based on their receiving waterbody.

3.2.3.1 Columbia River Watershed

The total drainage area included in the analyses of stormwater draining to the Columbia River Watershed is about 486 acres. Of this area, approximately 204 acres (or about 42 percent) is comprised of impervious surfaces that include highways, streets, parking lots, and alleys. The area extends north from the Columbia River to just south of SR 500. The drainage area includes I-5, the western end of SR 14, and downtown Vancouver. With the exception of SR 14, runoff from this drainage area receives no water quality treatment prior to being released to the Columbia River. Runoff from the eastbound lanes of SR 14 (about 3 acres) sheds to the shoulder where it disperses and/or infiltrates to groundwater.

Runoff from the I-5 bridges drains directly from the bridge decks through scuppers to the Columbia River or ground below. North of the Columbia River, conveyance systems collect runoff from I-5, SR 14, and streets in downtown Vancouver. The runoff is discharged directly to the river via several outfalls located from about 0.5 mile east (upstream) of the existing bridges to about 0.5 mile west. Over 80 percent of the total drainage area is served by a single conveyance system that discharges to the Columbia River via a 60-inch diameter outfall located immediately east of the I-5 bridges. Runoff also discharges to the Columbia River via several outfalls located in the immediate vicinity of the existing I-5 bridges (Exhibit 3-3) (Clark County 2005). A small portion of stormwater runoff is captured by basins that drain into dry wells and/or dry well systems. Based on city records it is estimated that for the Columbia River Watershed, 15 dry wells are currently active with the main project area for City of Vancouver, and 16 dry wells are currently active in the main project area for City of Portland.

3.2.3.2 Burnt Bridge Creek Watershed

The total drainage area included in the analyses of stormwater draining to Burnt Bridge Creek is about 190 acres, of which approximately 86 acres (or about 45 percent) comprises highway, streets, parking lots, and alleys. The area includes SR 500, the I-5/SR 500 interchange, I-5 north of the interchange, and adjacent neighborhoods. Runoff from approximately 66 acres of impervious surface is directed to an infiltration pond located immediately south of the I-5/Main Street interchange. Runoff from the remaining area flows to a pond located east of the I-5/SR 500 interchange. A small portion of stormwater runoff is captured by catch basins that drain into dry wells. It is estimated that for the Burnt Bridge Creek Watershed, 3 drywells are currently active within the main project area for the City of Vancouver.

3.2.3.3 Stormwater Quality

Impacts to stormwater quality can occur when precipitation encounters PGIS. PGIS is defined as surfaces that are considered a significant source of pollutants in stormwater runoff and include, but are not limited to:

- highways, including non-vegetated shoulders,
- streets, including contiguous sidewalks, and driveways, and
- bus layover facilities, surface parking lots, and the top floor of parking structures.

Runoff from PGIS is typically associated with a suite of pollutants, including suspended sediments, nutrients (nitrogen and phosphorus), PAHs, oils and grease, road salt and deicing agents, antifreeze from radiator leaks, cadmium, copper, lead and zinc from tires, engine parts, and brake pad wear.[11] Fecal coliform, while not a product of roadway surfaces or activities, is known to be conveyed in road runoff.[12] 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 and duration of storms. Additional information on pollutant loading is provided in the Water Quality and Hydrology Technical Report.

3.2.4 Geologic Setting

Geologically recent deposits that fill in the Portland Basin consist of conglomerate, gravel, sand, silt, and some clay from volcanic, fluvial, and lacustrine material (Pratt et al. 2001). Late Pleistocene catastrophic flood deposits cover much of the surface within the study area. Deposits originating from an ancestral Columbia River underlie the catastrophic flood deposits. These

[11] The Columbia River is on the Oregon DEQ 303(d) list for several pollutants, including PAHs which are pollutants associated with highway runoff.

[12] Burnt Bridge Creek and the Columbia River are on the 303(d) list for fecal coliform.

sedimentary deposits overlie Miocene basalt flows of the Columbia River Basalt Group (CRBG) (Swanson et al. 1993). The CRBG overlies lava flows and volcanic breccias of Oligocene age.

Geologic units within the study area are described below by increasing age. Further discussion on the geologic setting is provided in the Geology and Groundwater Technical Report.

3.2.4.1 Artificial Fill (Qaf)

Artificial fill material was used to modify existing topographic relief and typically consists of sand, silt, and clay with some gravel and debris. Fill areas mapped with inferred contacts represent lakes and marshes that may have been drained rather than filled. Fill that is 5 to 15 feet thick is common in developed areas of the Willamette River and Columbia River floodplains (Madin 1994). However, thickness and distribution are highly variable (Beeson et al. 1991).

3.2.4.2 Alluvium (Qal)

Alluvial deposits include material derived from present day streams and rivers, their floodplains, and abandoned channels. The alluvial deposits are typically Holocene to upper Pleistocene in age. Alluvial material consists of unconsolidated gravel, medium to fine sand, silt, and organic-rich clay. Cobble-sized material may be present within existing or abandoned stream channels. Thickness is typically less than 45 feet, but may be up to 150 feet thick locally. Alluvium is exposed at the surface from just south of the Columbia Slough in Oregon to approximately 0.25 mile north of the Columbia River in Washington (Beeson et al. 1991; Phillips 1987).

3.2.4.3 Catastrophic Flood Deposits (Qff/Qfc)

The catastrophic flood deposits resulting from the Pleistocene-aged Missoula Floods are derived from the repeated failure of ice dams located on the Clark Fork River in northwestern Montana (Bretz et al. 1956). Glacial Lake Missoula was created by ice dams from the advancing front of the Cordilleran ice sheet. As flood water velocities were reduced, sediment loads were deposited in foreset bedded gravel and sand similar to delta deposition (Robinson et al. 1980).

This deposit is subdivided into two facies by Madin (1994): a fine-grained facies (Qff) and coarse-grained facies (Qfc). Both are present locally. The finer sediments consist primarily of coarse sand to silt. The fine sand and silt is composed of quartz and feldspar with white mica. The coarser sand is composed primarily of basalt. The Qfc consists of pebble to boulder gravel with a coarse sand to silt matrix.

3.2.4.4 Troutdale Formation (Tt)

The Troutdale Formation (Miocene to Pliocene in age) underlies the catastrophic flood deposits and consists of coarse- to fine-grained fluvial sedimentary rock derived from the ancestral Columbia River (Trimble 1963). The unit is a friable to moderately strong conglomerate with minor sandstone, siltstone, and mudstone. Pebbles and cobbles are composed of CRBG (described below) and exotic volcanic, metamorphic, and plutonic rocks. The matrix and interbeds are composed of feldspathic, quartzo-micaceous, and volcanic lithic and vitric sediments. The formation exhibits cementation mantling on some of the grains (Beeson et al. 1991).

3.2.4.5 Sandy River Mudstone (Tsr)

The Sandy River Mudstone (Pliocene in age) underlies the Troutdale Formation and consists of fine-grained, predominantly fluvial and minor lacustrine sediments. The unit is a friable to moderately strong sandstone, siltstone, and claystone. The mudstone is composed of primarily quartz-feldspathic and white mica sediments (Beeson et al. 1991).

3.2.4.6 Miocene and Older Rocks

The CRBG (late Miocene and early Pliocene in age) consists of numerous basaltic lava flows which cover approximately 63,000 square miles and extend to thicknesses greater than 6,000 feet. The CRBG is composed of dark gray to black, dense, crystalline basalt and minor interbedded pyroclastic material.

3.2.5 Hydrogeologic Setting

As the geologic units described above were deposited in the deforming Portland Basin, hydrogeologic units were also formed. The physical nature and depositional environment of the geologic material will create units of material that possess dissimilar hydraulic properties. Groundwater moving through the material will travel at different rates, depending on the physical properties of the hydrogeologic unit. The physical properties of units in the Troutdale Aquifer are further discussed below.

A 1993 United States Geologic Survey (USGS) report (Swanson et al. 1993) describes eight major hydrogeologic units in the Portland Basin. These units are, from youngest to oldest and increasing depth:

- Unconsolidated Sedimentary Aquifer (USA)
- Troutdale Gravel Aquifer (TGA)
- Confining Unit 1 (CU 1)
- Troutdale Sandstone Aquifer (TSA)
- Confining Unit 2 (CU 2)
- Sand and Gravel Aquifer (SGA)
- Older Rocks

The eighth unit is referred to as undifferentiated fine-grained sediments where the TSA and the SGA appear to have pinched out or there is insufficient information to characterize the aquifer units within the fine-grained Sandy River Mudstone. Where this occurs, CU 1 and CU 2 cannot be separated and have been mapped as undifferentiated fine-grained sediments. The older rocks, consisting of older volcanic and marine sedimentary rocks of generally low permeability, are present at depths estimated to range up to 1,600 feet in the central area of the basin. They are poor aquifers and too deep to be used as a primary source of water in the site region. Due to these conditions, no further discussion is presented regarding the older rock unit.

The Portland Basin aquifer system has also been grouped into three major subsystems:

- Upper sedimentary subsystem (USA and TGA)
- Lower sedimentary subsystem (CU 1, TSA, CU 2, and SGA)
- Older rocks

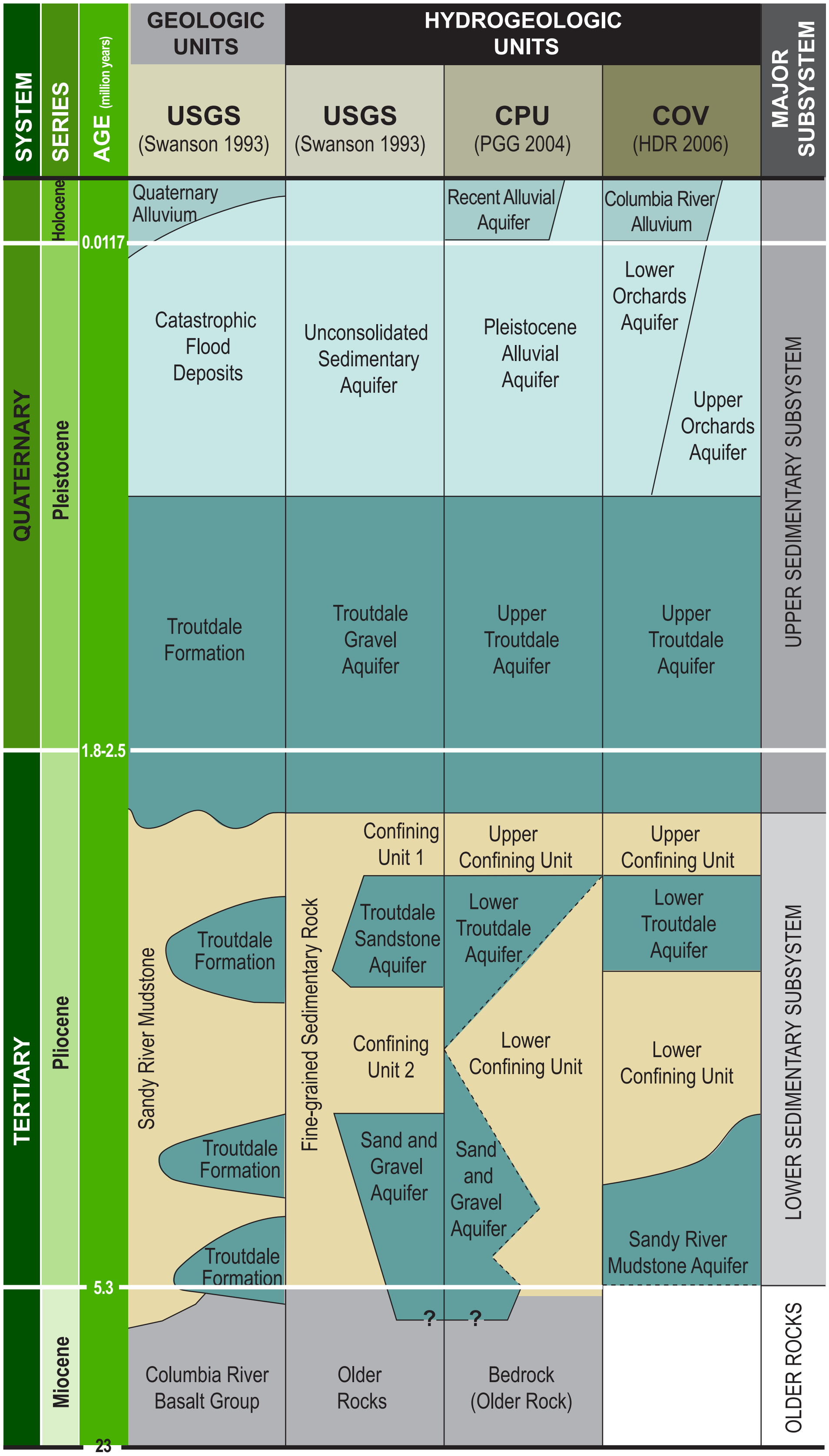

Exhibit 3-5: Geological Units and Comparison of Hydrogeologic Unit Terminology

Columbia River CROSSING

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This grouping is based on regionally continuous contacts between units of different lithologic and hydrogeologic characteristics (Swanson et al. 1993). Exhibit 3-5 presents other nomenclatures used to describe the hydrogeologic units by Clark Public Utilities (CPU) and the City of Vancouver. For the purpose of consistency with EPA's (2006) determination, terminology used by McFarland and Morgan (1996), which was derived from Swanson et al. (1993), will be presented in this report.

Exhibit 3-6 shows cross section orientation lines for selected wells and geologic units near the study area. Hydrogeologic unit cross sections are presented in Exhibits 3-7a through 3-7d.

3.2.6 Unconsolidated Sedimentary Aquifer and Troutdale Gravel Aquifer

EPA (2006) defines the Troutdale Aquifer to include both the upper and lower sedimentary subsystems. For the purposes of this report, the discussion of the Troutdale Aquifer focuses on the USA and TGA because: they are prolific and are the uppermost aquifers within the Portland Basin; they contain a majority of water supply wells in the study area; they are the primary aquifers for drinking water and will likely continue to be the source of water supply as demands increase; and they are hydrogeologically separated from the lower subsystem by a confining layer.[13] This is demonstrated in Clark County where over 90 percent of the 7,111 wells inventoried are completed in the USA or TGA and are less than 300 feet in depth (Gray and Osborne 1996). In addition, a majority of water supply wells for the City of Vancouver are completed in the USA (HDR 2006).

3.2.6.1 Hydrologic Characteristics

The upper sedimentary subsystem is composed of Pleistocene to Quaternary sediments and consolidated to semi-consolidated gravel of the upper Troutdale Formation. The Pleistocene to Quaternary deposits have similar hydrogeologic properties and are grouped as the USA. The upper Troutdale Formation deposits that form the TGA are hydrogeologically isolated from the lower Troutdale Formation by CU 1.

Unconsolidated Sedimentary Aquifer

The USA occurs in the saturated portions of the Quaternary alluvium deposits and the Pleistocene-aged catastrophic flood deposits. The Quaternary alluvium deposits, which overlie the catastrophic flood deposits, consist of very poorly consolidated silt and sand. The alluvium deposits are partially saturated and have a lower permeability than the underlying catastrophic flood deposits. The catastrophic flood deposits mapped by Phillips (1987) were further subdivided into coarse-grained and fine-grained facies. The flood deposits can be very heterogeneous due to the nature of deposition. Deposition under flood conditions allowed for silt and fine sand to fill the interstices of gravel deposits in some areas and remain open in other areas (Robinson et al. 1980).

Public supply and industrial wells completed in the USA near Camas, Washougal, and Vancouver have maximum yields between 1,000 and 6,000 gallons per minute (gpm), with less than 10 feet of drawdown (Mundorff 1964). Wells completed in the fine-grained facies are less productive than wells in the more productive coarse-grained facies of the catastrophic flood deposits.

[13] This rationale was used to limit the study area to contain only the USA and TGA. The report did not consider wells screened in the lower sedimentary aquifer.

Mundorff (1964) estimated that the transmissivity portion of the USA ranged from 1.9 million to 3.5 million gallons per day per foot (gpd/ft).[14] The calculated transmissivities for Vancouver Water Stations (WS) WS-1, WS-3 and WS-4, all producing from the USA, were 2 million gpd/ft, 878,900 gpd/ft, and 586,000 gpd/ft, respectively (Robinson et al. 1980).

TGA

The TGA underlies the catastrophic flood deposits and alluvial deposits that make up the USA in the study area. The TGA is composed of partially cemented sandy conglomerate. The transition to the Pleistocene-aged Troutdale Formation is primarily based on a drop in permeability, followed by harder drilling conditions that were encountered and/or where cementation or a silty sandy matrix was encountered.

The elevation of the top of the Troutdale Formation varies noticeably due to an erosional period prior to the deposition of the catastrophic flood deposits and erosion that occurred during the flood events. It has been observed that where the upper Troutdale Formation has been severely weathered, a thick clayey soil may have developed in some areas, thus creating a discontinuous confining unit between the two aquifers (Swanson et al. 1993; PGG 2002).

The permeability and the transmissivity of the TGA have been noted to be at least an order of magnitude lower than the USA (McFarland and Morgan 1996; PGG 2002). This difference in permeability and transmissivity is due to the presence of more fines in the Troutdale Formation, along with lithification and cementation, which ranges from consolidated to semi-consolidated. Although the TGA contains zones of significant cementation, it is sufficiently conductive to produce high-yield wells. Wells completed in the TGA commonly yield up to 1,000 gpm (Swanson et al. 1993). The TGA has historically served as the most productive aquifer in the Salmon Creek drainage.

3.2.6.2 Groundwater Recharge and Discharge Areas

Recharge to the USA and TGA occurs from precipitation, infiltration from the Columbia River and streams, infiltration from pervious surfaces, and contributions from drywells and underground sewage-disposal. Principal precipitation recharge areas for groundwater in the LPA, with the exception of Hayden Island, are the upland areas of the Boring Hills and Western Cascade Mountains (Exhibit 3-2). Groundwater recharge on Hayden Island is primarily from infiltration from the Columbia River. The combined average recharge rate is estimated to be about 22 inches/year (Snyder et al. 1994) for the Portland Basin. The highest rates (up to 49 inches/year) occur in the Cascade Range, and the lowest rates are near 0 inches/year at the Columbia and Willamette Rivers. Seasonal fluctuations in precipitation affect groundwater elevations and aquifer saturated thickness. Whereas heavy spring and winter precipitation increases groundwater elevation and aquifer saturated thickness, lower precipitation in the summer and fall months decreases groundwater elevations and aquifer saturated thickness. Changes in groundwater elevations and saturated thickness affect the rate and direction of groundwater discharge. In general, groundwater is locally discharged to the Columbia and Willamette Rivers and Burnt Bridge Creek.

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[14] Transmissivity is the rate at which water travels through an aquifer of unit width under a unit hydraulic gradient. It is a function of the liquid, porous media and its thickness.

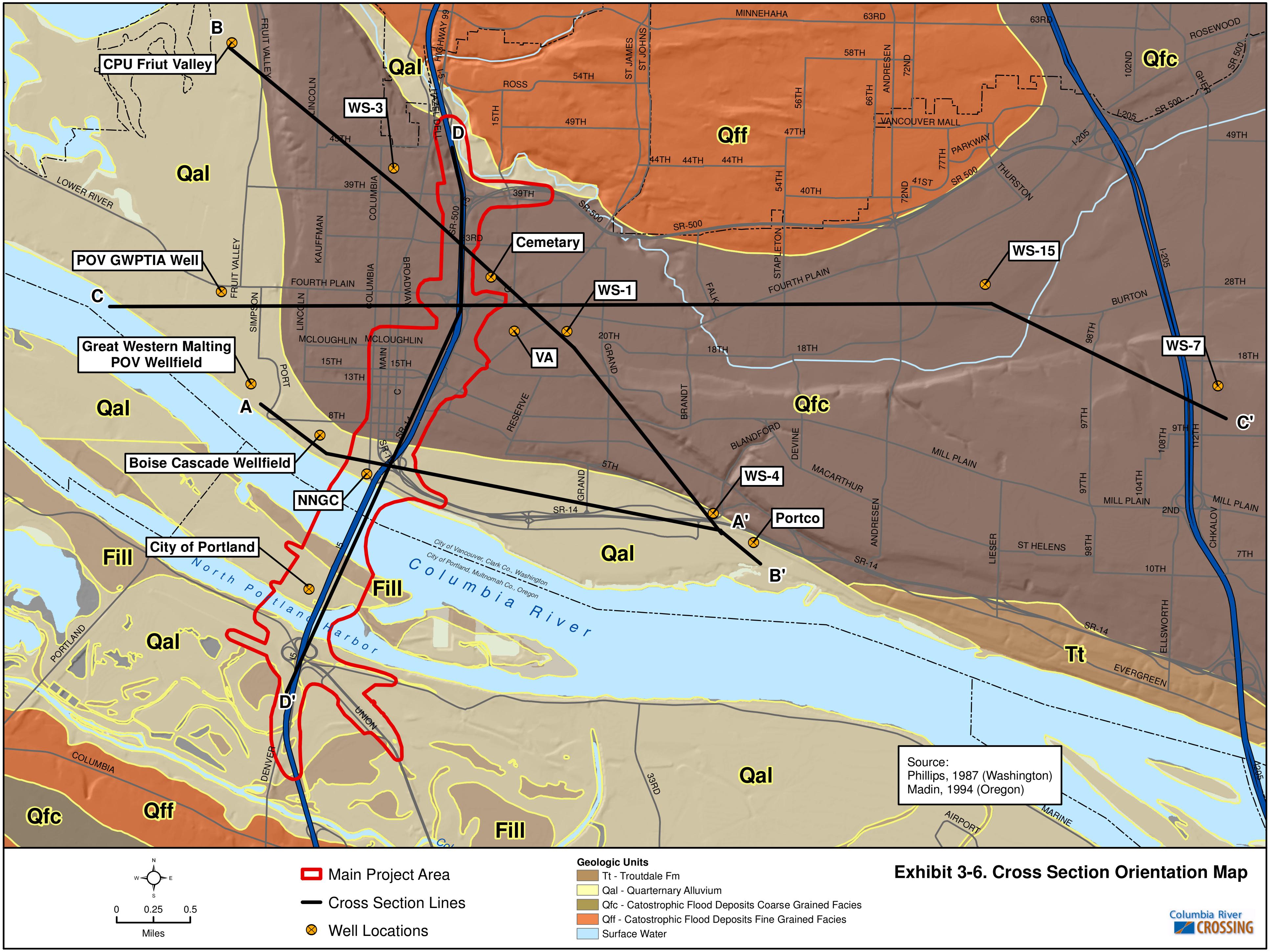

Exhibit 3-6. Cross Section Orientation Map

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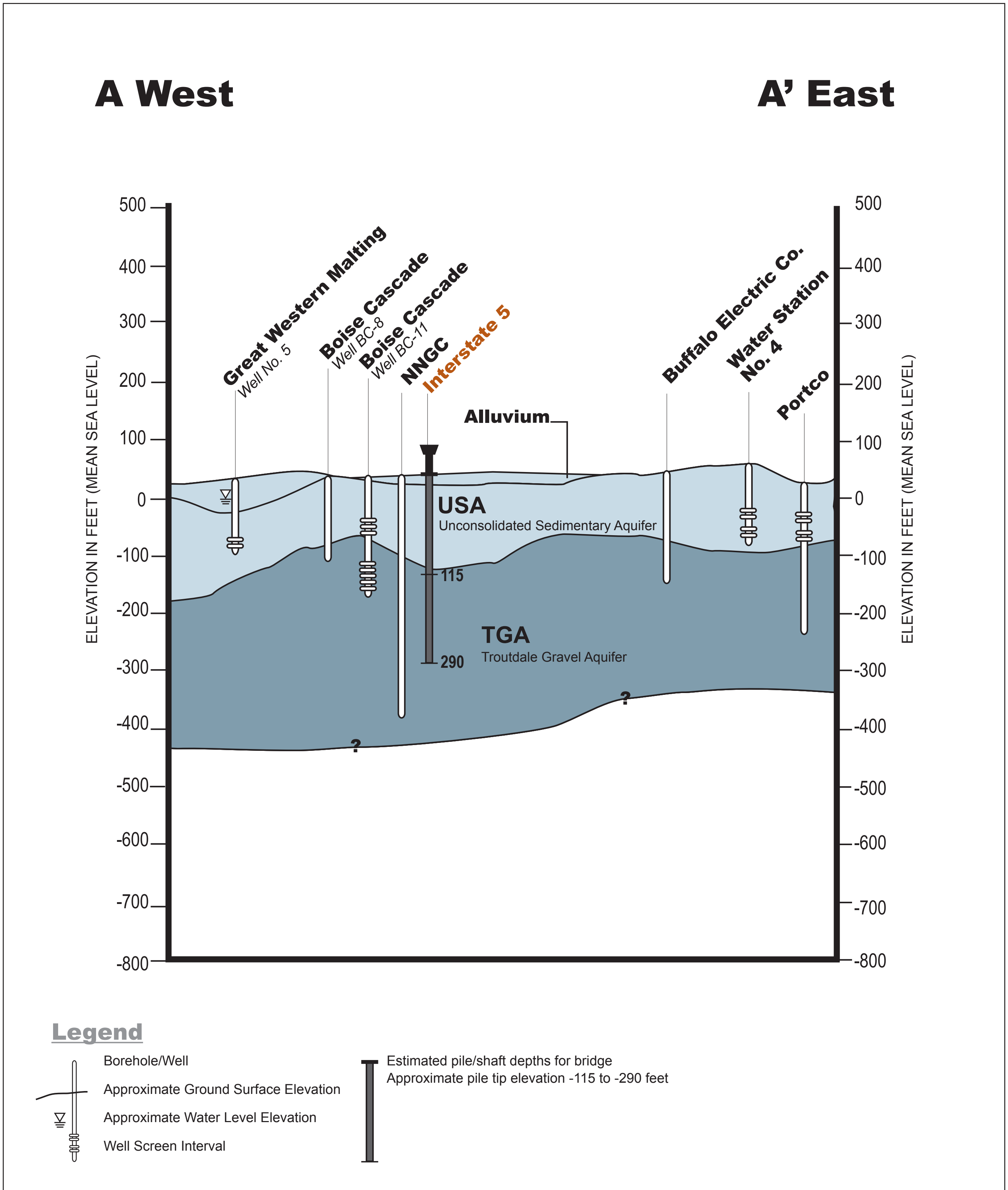

Approximate Vertical
0 100 200
0 2,000 4,000
Approximate Horizontal
SCALE IN FEET

MODIFIED FROM:
Pacific Groundwater Group, 2002.
Evaluation of Clark Public Utilities
Proposed South Lake Wellfield

Exhibit 3-7a.
Hydrogeologic
Cross Section A-A'

Columbia River CROSSING

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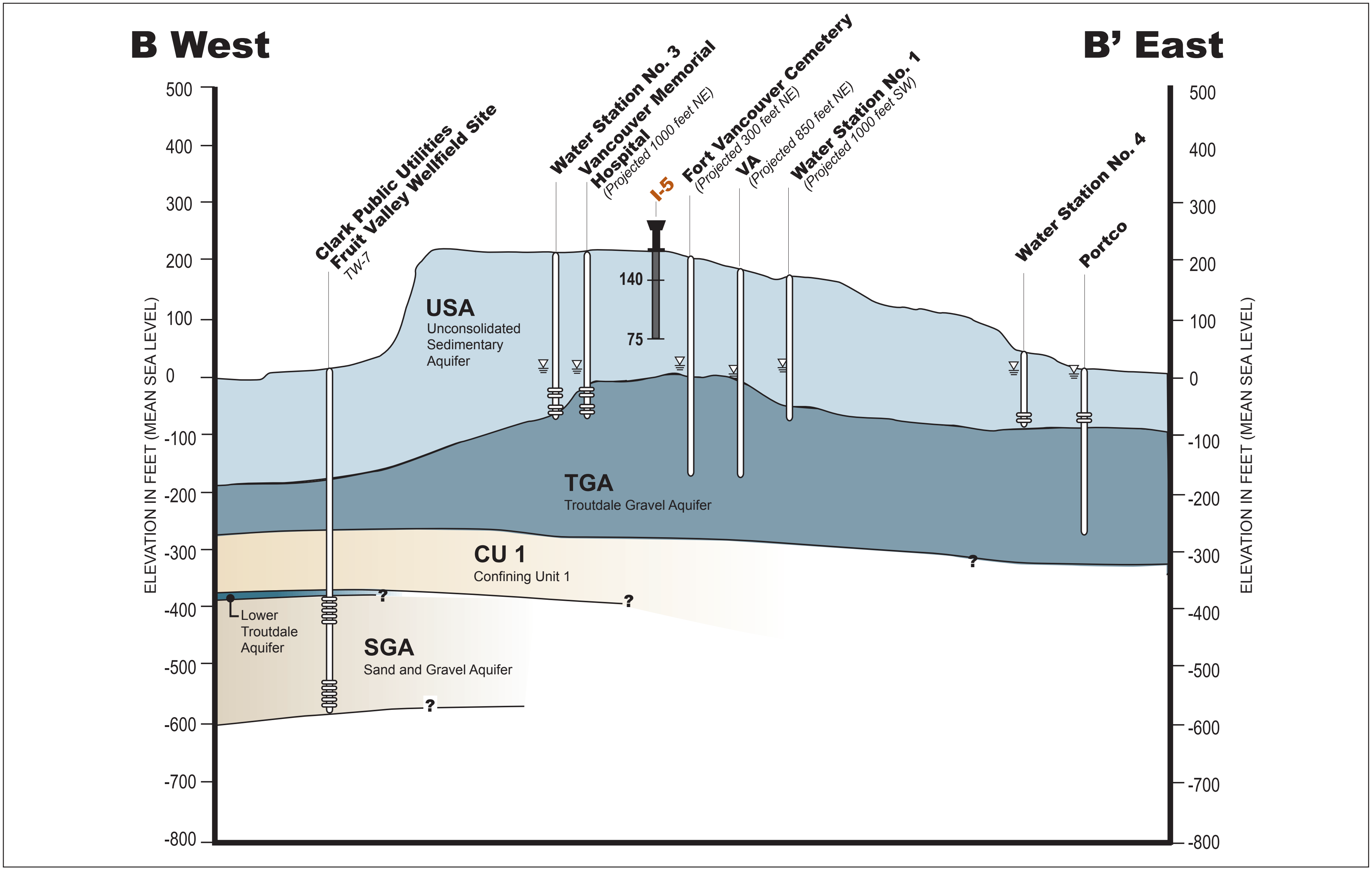

Approximate Vertical
0 100 200
0 2,000 4,000
Approximate Horizontal
SCALE IN FEET

Legend

Borehole/Well

Approximate Ground Surface Elevation

Approximate Water Level Elevation

Well Screen Interval

Estimated pile/shaft depths for SR 500 and 39th Street bridges
Approximate pile tip elevation 75 to 140 feet

MODIFIED FROM:
Pacific Groundwater Group, 2002.
Evaluation of Clark Public Utilities
Proposed South Lake Wellfield

**Exhibit 3-7b.
Hydrogeologic Cross Section B-B'**

Columbia River CROSSING

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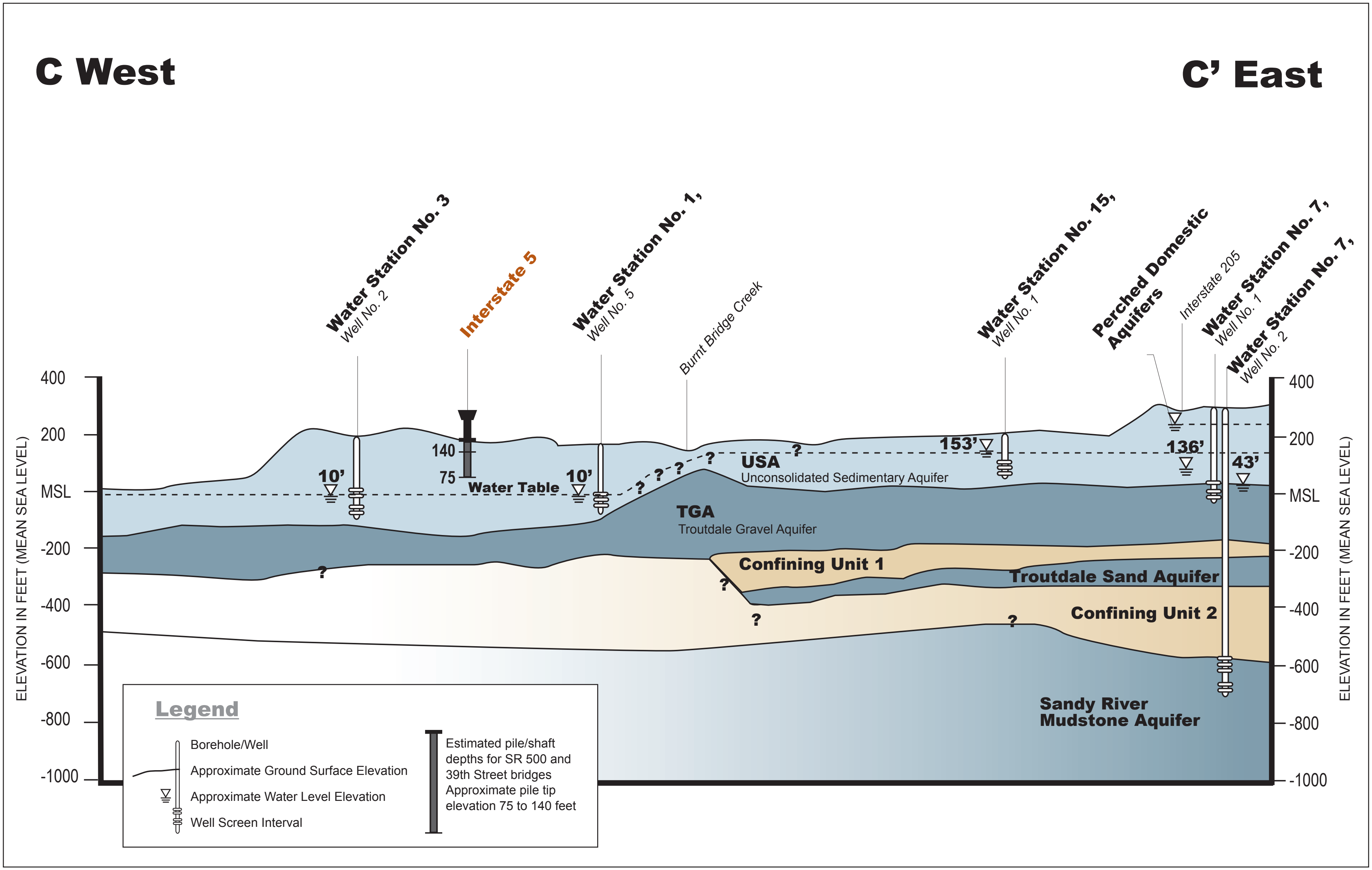

Parametrix

Approximate Vertical

0 200 400

0 2,000 4,000

Approximate Horizontal

SCALE IN FEET

MODIFIED FROM:

Clark County Water Quality Division, 1994, Method to Evaluate Aquifer Vulnerability Through Conjunctive use of a Groundwater Flow Model and Geographic Information System.

Robinson & Noble, Inc., 1992, Investigation of the Sandy River Mudstone Aquifer, City of Vancouver.

Robinson, Noble & Carr, Inc., 1980, City of Vancouver Groundwater Source and Use Study, Volume 1 Summary.

Gray & Osborne, Inc., 1996. Water System Comprehensive Plan, City of Vancouver, November 1996.

HDR Engineering, Inc. 2006 Water System Comprehensive Plan, Draft March 2006.

Exhibit 3-7c. Hydrogeologic Cross Section C-C'

Columbia River CROSSING

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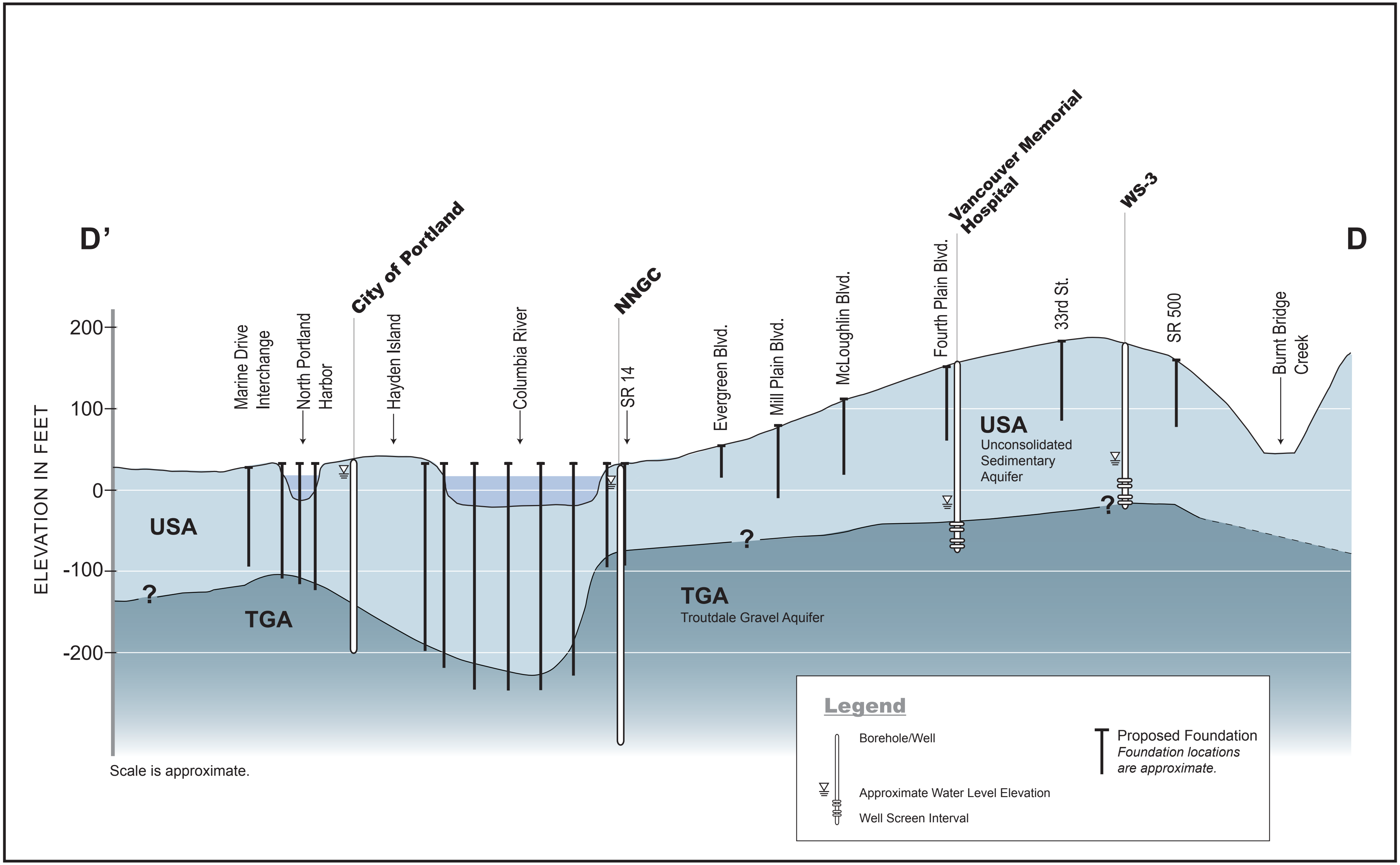

Exhibit 3-7d.
Hyrdogeologic Cross Section D'-D

Columbia River CROSSING

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3.2.6.3 Flow Direction and Gradient

The movement of groundwater (flow direction and gradient) is generally controlled by topography, river levels, and supply well pumping. However, due to the high transmissivity of the USA, groundwater gradients in the project area remain relatively flat. Exhibit 3-8 indicates that at elevations of approximately 250 feet above mean sea level (MSL) near recharge areas at the foothills of the Cascade Mountains east of the project area, groundwater flows west-southwest towards the Columbia or Willamette Rivers.

The groundwater table elevation along the banks of the Columbia River and North Portland Harbor is influenced by tidal fluctuations and upstream dam releases (see the Geology and Groundwater Technical Report) (McFarland and Morgan 1996) (tidal information for Station 14144700 Columbia River, Vancouver, WA). The rapid response between changes in river stage and corresponding changes in groundwater levels indicates a high interconnectivity between the river, the USA, and the upper portion of the TGA. Groundwater table fluctuations due to river stage changes are less significant with increasing distance from the Columbia River and Columbia Slough.

Washington

Groundwater elevations in Washington are typically less than 50 feet MSL just south of the Burnt Bridge Creek drainage and decrease to approximately 20 feet MSL at the Columbia River. Water level elevations sharply increase north of the Burnt Bridge Creek drainage to approximately 150 feet MSL. The large observed drop in groundwater levels south of Burnt Bridge Creek suggests low permeability conditions in the area of the creek. This lower permeability condition functions to reduce the volume of groundwater recharge to the area south of Burnt Bridge Creek.

Oregon

Groundwater elevation on the Oregon side generally ranges between 10 and 30 feet MSL. The generalized groundwater levels within the main project area are typically less than 20 feet in elevation near the Columbia River and Columbia Slough. Water level elevations generally increase with distance from the river and slough (McFarland and Morgan 1996; Snyder 2008).

3.2.6.4 Influence on Groundwater Flow from Pumping

Groundwater flow in the downtown portion of the City of Vancouver is influenced by water supply wells. These wells include Vancouver drinking water supply wells at water stations WS-1 and WS-3; the Port of Vancouver (POV) groundwater pump and treat interim action (GPTIA) well, and Great Western Malting Company supply wells No. 4 and No. 5.

Exhibit 3-9 displays simulated groundwater flow and direction resulting from the pumping of these supply wells. Simulated conditions are based on a numeric groundwater flow model that aids in the future siting of well fields by POV and CPU (Parametrix 2008). Exhibit 3-9 indicates that a majority of the groundwater flow in the downtown Vancouver area is influenced by WS-1 wells, WS-3 wells, Great Western Malting wells, and the GPTIA well. No water supply wells are currently used within the Oregon side of the study area.

Simulated groundwater flow lines have been used to help define the eastern and western boundaries of groundwater capture for activities that occur within the main project area. Specifically, the boundaries are drawn along internal flow lines that represent the hydraulic capture of groundwater movement within the main project area. Stated another way, a particle of water within the main project area will likely be retained within the drawn boundaries and ultimately travel to the WS-1 or WS-3 well head. Model simulations indicate that groundwater within the study area will be primarily captured at the well head for WS-1 or WS-3 (Riley 2010 personal communication). This approach is used to help in evaluating impacts to groundwater from construction activities and/or operation and maintenance of the alternatives.

A number of irrigation and process water wells and a municipal well have been identified on Hayden Island and in North Portland/Delta Park (Exhibit 3-10). The influence on groundwater flow from pumping of wells has not been evaluated. Irrigation wells are thought to be used seasonally, and the two City of Portland's process water wells are not in use (west of I-5) and/or abandoned (east of I-5). Information on the status of the Kernan Livestock water supply well and the ODOT well on N Interstate Avenue could not be obtained using reasonably accessible sources. Withdrawal from these wells likely consists of components of surface water and/or groundwater baseflow from the Columbia River.

City of Vancouver

The City of Vancouver pumps an average of 26 million gallons per day (mgd) from the USA, Troutdale, and Sand and Gravel Aquifers, with peak demands up to approximately 53 mgd in 2003 (HDR 2006). Vancouver maintains 16 water stations but only extracts groundwater from 9 water stations, each with several production wells (Hoiland 2010 personal communication).

Based on the anticipated population growth for the City of Vancouver, average demand on the water system is estimated to increase between approximately 35 mgd by 2012, and to 44 mgd by 2026 (Hoiland 2010 personal communication). These increases in demand will increase stress to the aquifer. Replacement wells will likely be installed and three decommissioned at WS-1. Extraction rates for city water supply wells vary seasonally based on user demands. Water demands on the system are highest during the summer and lowest during the winter (HDR 2006).

WS-1

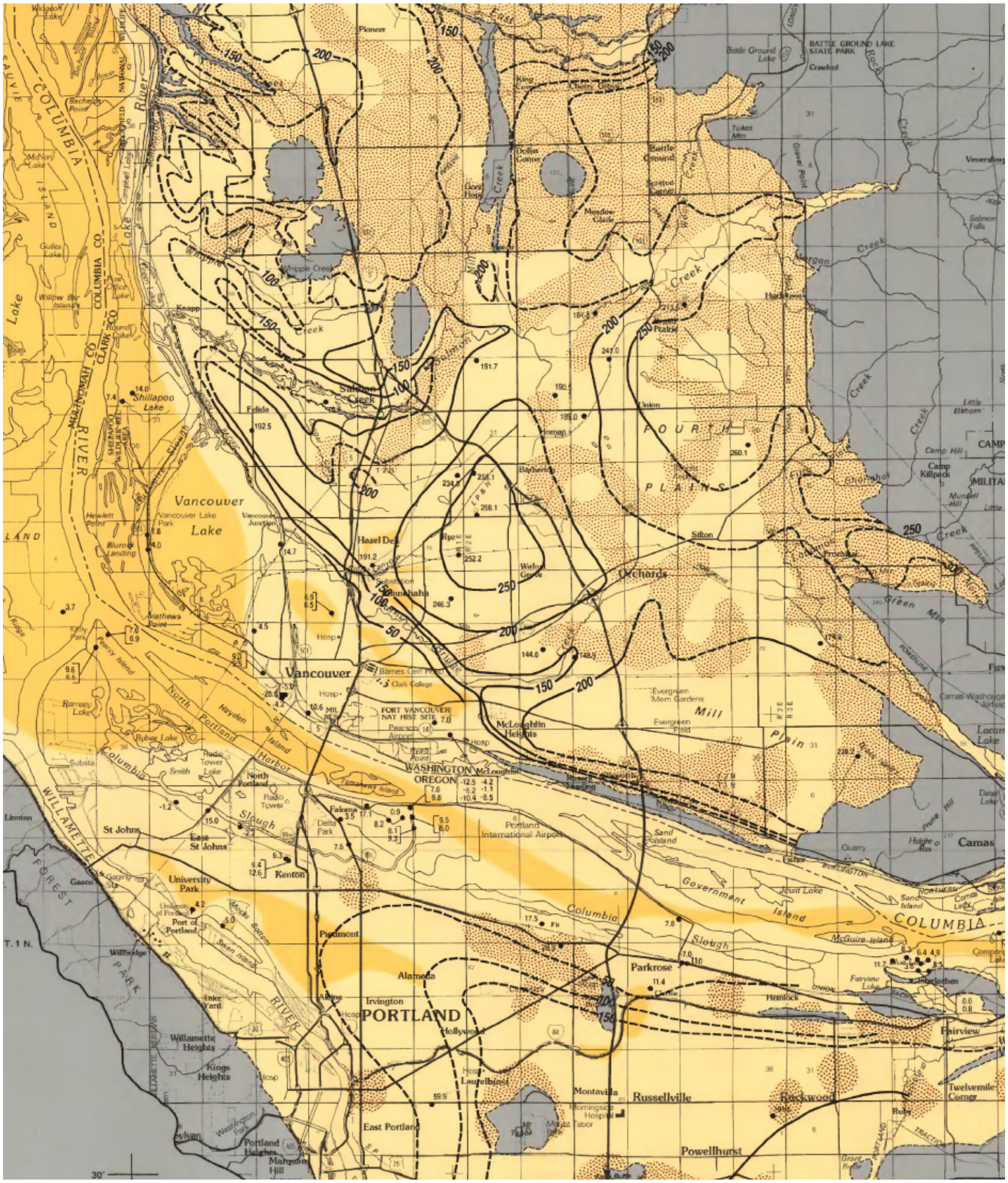
WS-1 is located southeast of the intersection of Fort Vancouver Way and E Fourth Plain and is composed of 12 wells (#1 through #5, and #7 through #13). The wells range in depth from 235 to 280 feet below ground surface (bgs). All wells at this water station extract water from the USA. Each well is capable of producing between 900 and 2,800 gpm, for a total pumping capacity of approximately 22,770 gpm (32.8 mgd). Current water production at this water station is averaging 5.5 mgd (Hoiland, 2010, personal communication). However, production is limited to approximately 27 mgd due to the wellhead treatment system capacity. Treatment consists of aeration/air stripping, chlorination, and fluoridation.

WS-3

WS-3 is located northwest of NW 42nd Street and NW Washington Street and is composed of three wells (#1 through #3). The wells range in depth from 259 to 275 feet bgs. All wells at this water station extract water from the USA. Each well has a pumping capacity of approximately 2,000 gpm, or a total pumping capacity of 6,200 gpm (8.9 mgd). Current water production at this water station is averaging 4.2 mgd (Hoiland 2010 personal communication). This water station capacity is limited to 8.6 mgd due to water rights. Water at the well head is treated by chlorination and fluoridation.

Port of Vancouver

Design and placement of the POV GPTIA well is based on a groundwater flow model developed through a combined effort completed on behalf of the POV and CPU (Parametrix 2008). The well was installed to remove and hydraulically control solvent-contaminated groundwater. Start-up of the well occurred in June 2009, with an observed pumping rate of 2,500 gpm (3.6 mgd).



Legend

---100--- GROUNDWATER LEVEL CONTOUR. Shows altitude, in feet, of groundwater level, Spring 1988, in the unconsolidated sedimentary aquifer. Dashed where approximate. Contour is variable. Datum is sea level.

•6.9 FIELD LOCATED WELL. Completed in the USA. Number is altitude in feet above sea level.

N

0 5 miles

Approximate Scale

Source:

McFarland, W.D. and Morgan, D.S. 1996
Description of Ground-Water Flow System in the Portland Basin, Oregon and Washington
U.S. Geological Survey Water Supply Paper 2470-A

Exhibit 3-8
Groundwater Level Contour Map
USA, Spring 1988
Troutdale SSA Evaluation

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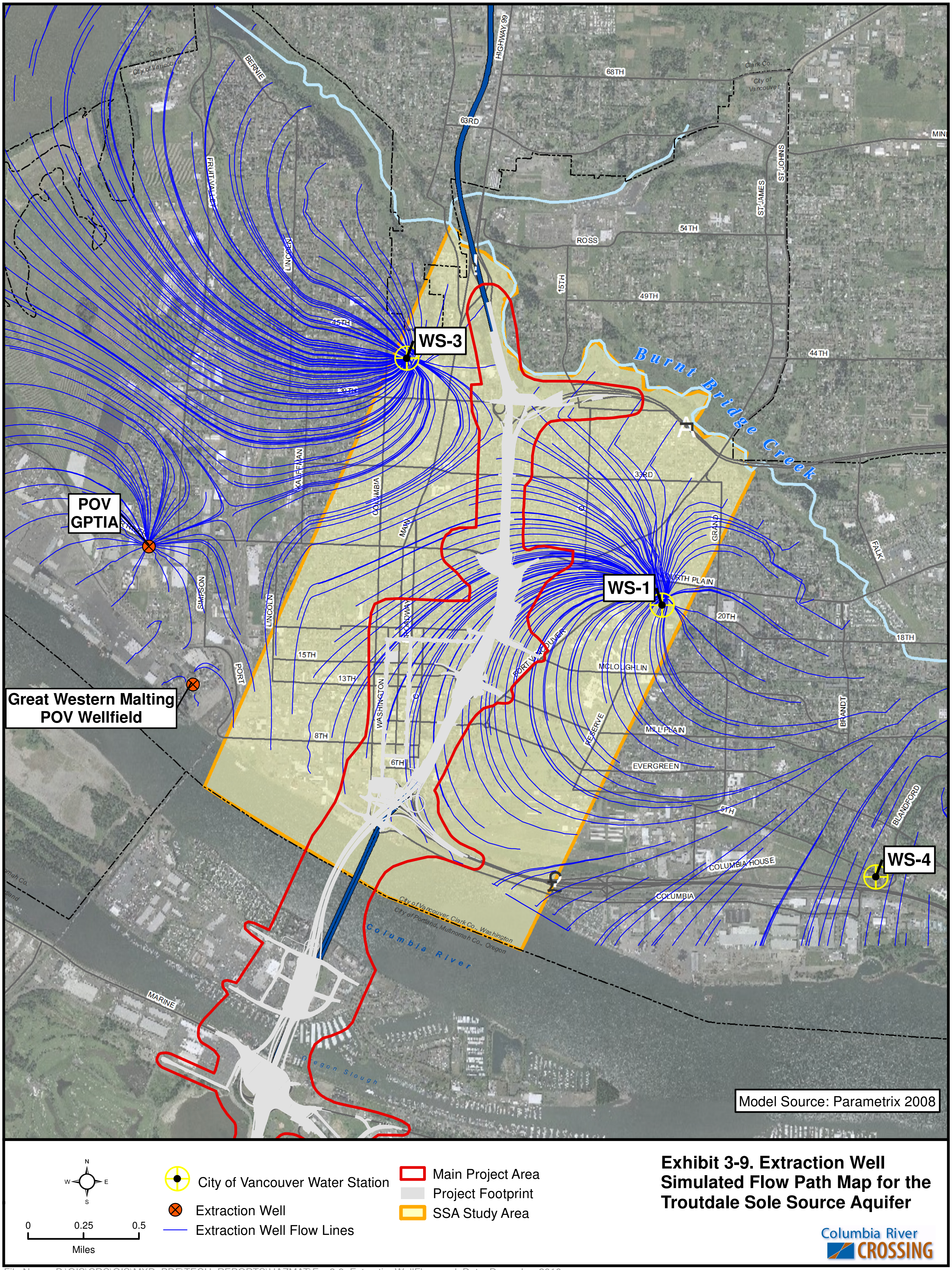

Exhibit 3-9. Extraction Well Simulated Flow Path Map for the Troutdale Sole Source Aquifer

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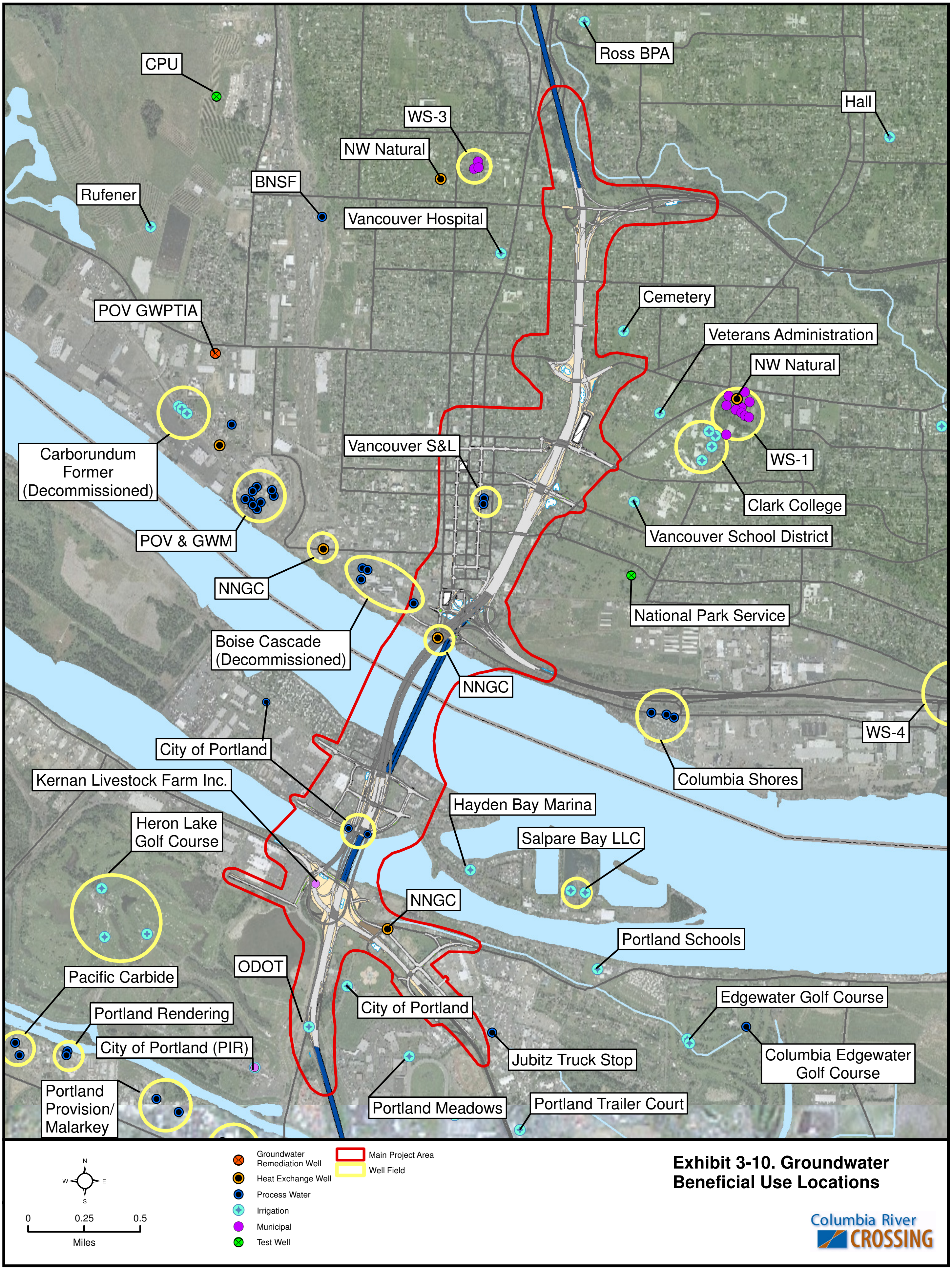

Exhibit 3-10. Groundwater Beneficial Use Locations

Columbia River CROSSING

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Great Western Malting Company

Great Western Malting (a.k.a. ConAgra Malt) currently operates two extraction wells, No. 4 and No. 5, which influence groundwater flow in the western portion of downtown Vancouver. The wells are also being utilized by the POV to help contain and capture a chlorinated solvent plume stemming from the former Swan Manufacturing Company and Cadet Manufacturing sites. As a result, Great Western Malting has been extracting water at a higher capacity than necessary for plant operations, as requested by Ecology and POV. Groundwater from the wells is treated using an air stripper tower. Treated water is used for germination of malt and as process water for cooling. The wells are capable of producing 4,000 gpm, but are currently extracting water at a combined rate of 3,200 gpm. However, the production rate of these wells may be reduced as the POV's GPTIA was activated in June 2009.

3.2.7 Current and Future Groundwater Beneficial Use Survey

The purpose of a beneficial groundwater use survey is to identify the current use of groundwater in the vicinity of the LPA. A review of available supply well information identified approximately 73 water supply wells in Washington and 49 water supply wells in Oregon within 1 mile of the main project area. Verification of the information in the databases is beyond the scope of this work. Current beneficial use includes drinking water supply, agricultural and irrigation, process water, cooling and heat exchange.

Exhibit 3-10 displays the locations of identified supply wells in the vicinity of the main project area. Of these wells, eight appear to fall within the footprint of the main project area.

3.2.7.1 Oregon

The City of Portland primarily uses Bull Run water as a domestic drinking water supply. The Bull Run watershed is a 102-square-mile municipal watershed located about 26 miles east of downtown Portland; it lies within the Mt. Hood National Forest. Rain provides 90-95 percent of the water in the watershed, and precipitation averages 130 inches a year. Occasionally, groundwater from wells of the Columbia South Shore Well Field east of the Portland International Airport augment drinking water supply in summer and early fall, as needed, depending on the Bull Run water supply or when winter storms increase the turbidity levels above acceptable levels.

A number of groundwater beneficial uses have been identified on Hayden Island and in North Portland. These include irrigation, process water, and heat exchange. Information on groundwater demands from these wells is not readily available. Two of these wells are process water wells owned by the City of Portland, one of which is abandoned (east of I-5) and the other is not in use and currently is planned for decommissioning. A third well is a municipal well registered to Kernan Livestock Farms, Inc., which retains its water rights. Review of water rights indicates that the well was used to supply potable water to a Group B water system (less than 15 residents) for a mobile home park. The park currently no longer exists; however, the well may still be used for another beneficial use. A fourth well is owned by ODOT.

3.2.7.2 Washington

The City of Vancouver relies entirely on extracted groundwater for its domestic water supply. Vancouver pumps an average of 26 mgd from the aquifer, with peak demands up to approximately 53 mgd in 2003. Vancouver extracts groundwater from 9 water stations, each with several production wells. This water also supplies public and private systems throughout Clark County. Based on the anticipated population growth for the city, demand on the water system is estimated to increase to between 61 and 71 mgd by 2012 and to between 74 and 90 mgd by 2026 (HDR 2006). These increases in demand will add additional stress to the aquifer.

A number of groundwater beneficial uses have been identified on Hayden Island and in North Portland. These include irrigation, process water, and heat exchange. Information on groundwater demands from these wells is not readily available. A few wells owned by the former Boise Cascade Facility have reportedly been decommissioned west of I-5 near the Columbia River. The Vancouver S&L is also listed with two wells near 13th and C Streets. The current status of these wells is not known.

Sole Source Aquifer Designation and Critical Aquifer Recharge Area

The EPA designated the Troutdale Aquifer System, Clark County, Washington, as a sole source aquifer in July 2006 (EPA 2006). A sole source aquifer is defined by EPA as “an aquifer or aquifer system which supplies at least 50 percent of the drinking water consumed to the area overlying the aquifer and for which there is no alternative source or combination of drinking water sources which could physically, legally and economically act to supply those dependent upon the aquifer” (EPA 2006).

As requested by EPA in a letter to FTA dated July 1, 2008, a separate discipline report was prepared by the CRC project team to address potential impacts to the Troutdale Sole Source Aquifer (TSSA) from construction and operation of the LPA. The TSSA Report (Appendix F) was reviewed by EPA and approved with conditions in July 2010. For the purposes of this report, applicable and appropriate elements of the TSSA report are presented in this report.

Prior to the EPA’s designation of the Troutdale Aquifer System as a sole source aquifer, the City of Vancouver recognized its dependence on the aquifer and the importance of protecting the resource. The City of Vancouver has designated the entire area within the city boundaries as a Critical Aquifer Recharge Area, as specified by the Water Resources Protection Ordinance VMC Title 14 Section 26, dated 2002 (VMC 14.26). The ordinance requires minimum standards to protect the critical aquifer, establishes compliance standards for business and industry to manage hazardous materials, and creates special protection areas around city well heads. Special protection areas are defined as areas that are 1,900 radial feet from any municipal water supply well. As such, the city applies development restrictions to activities inside the special protection areas pursuant to VMC 14.26.135. These restrictions mainly address Class I and II Operations, septic systems, and infiltration systems.

3.2.8 Groundwater Quality

Contaminants from historic commercial and industrial activities within the City of Vancouver have resulted in diminishing groundwater quality. Exhibit 3-11 displays posted contaminant concentrations observed in the Troutdale Aquifer System based on communications with Ecology site managers. The exhibit indicates that contaminants such as chlorinated ethenes, petroleum products, and metals are found in groundwater throughout the study area.[15]

As stipulated in the Safe Drinking Water Act (SDWA) and Washington Administrative Code (WAC) Chapter 290, suppliers of drinking water must monitor for and meet primary and secondary drinking water standards. From approximately January 1979, the City of Vancouver has sampled and analyzed groundwater from its wells for the following classes of compounds: inorganics, volatile organic compounds (VOCs), herbicides, pesticides, insecticides,

[15] No comprehensive study that describes the distribution of contaminants in groundwater for the Vancouver Area is available. Contaminant information was obtained from Ecology Site Managers to help graphically display generalized contaminant impacts.

radionuclides, fumigants, dioxins, and nitrate. Analytical results for WS-1 and WS-3 are tabulated at http://www4.doh.wa.gov/SentryInternet/SingleSystemViews/SamplesSingleSys.aspx.

A review of water quality data by the Washington State Department of Health indicates that no analytes have been detected at or above their respective maximum contaminant limit (MCL) or secondary maximum contaminant limit (SMCL) in groundwater at WS-1, except for tetrachloroethene (PCE) at 9.2 micrograms per liter [µg/L] (MCL = 5 µg/L) in September 1999. However, no exceedance in drinking water standards has been documented in the last 5 years. The most recent available analytical results indicate that PCE and trichloroethylene (TCE) were detected at 1.1 µg/L and 0.94 µg/L at WS-1 in April 2008.

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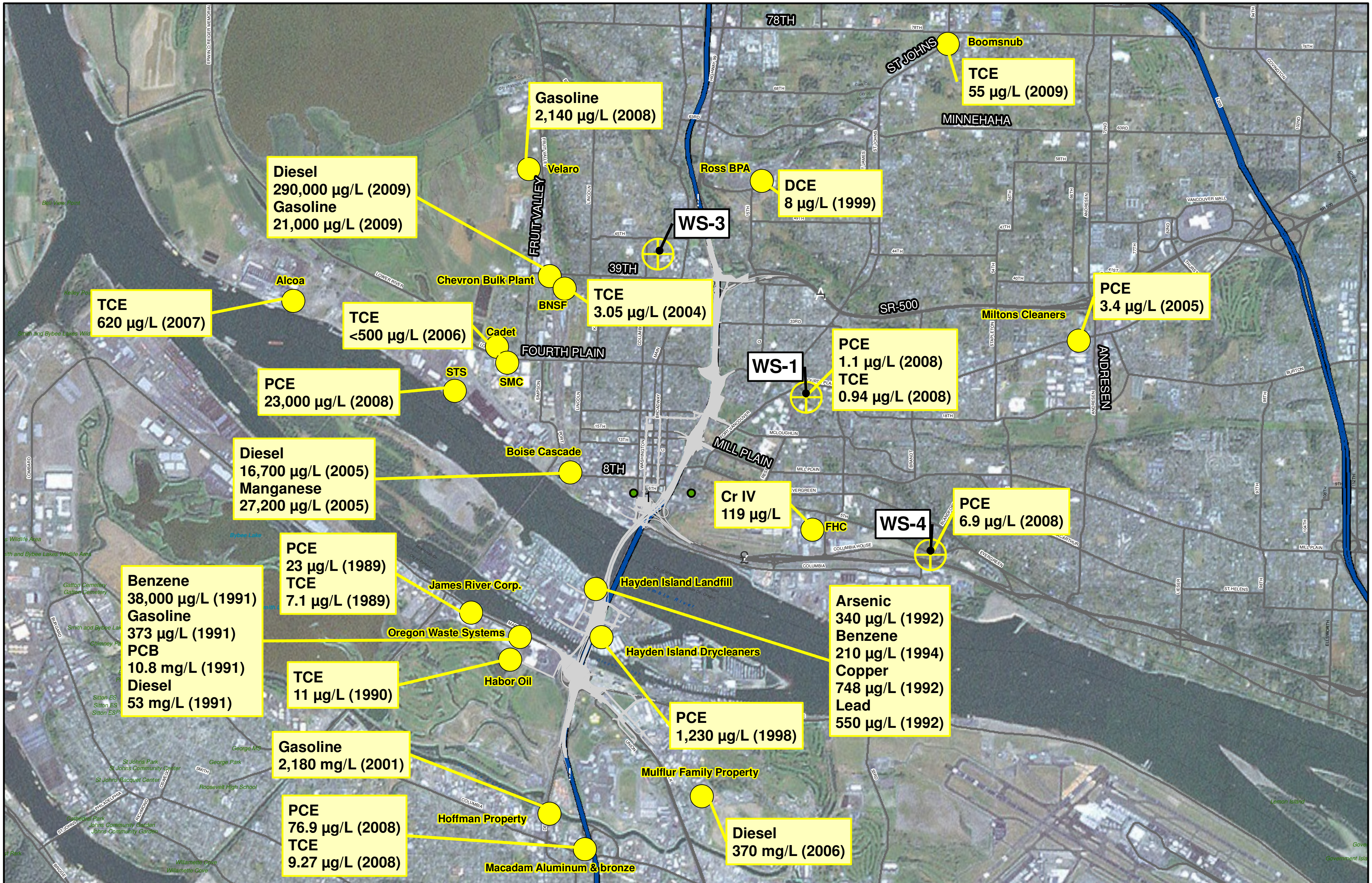

N
W E
S
0 0.25 0.5
Miles

Compound
Concentration (DATE)

Sites with Groundwater Contamination

City of Vancouver Supply Wells

Project Footprint

Compounds
PCE = Tetrachloroethylene
TCE = Trichloroethylene
PCB = Polychlorinated Biphenyl
Cr IV = Chromium IV

Concenrations
µg/L = micrograms per liter
mg/L = milligrams per liter

Exhibit 3-11. Historical Summary of General Contaminant Concentrations in Groundwater

Columbia River CROSSING

File Name: P:\GIS\CRC\GIS\MXD_PDF\TECH_REPORTS\HAZMAT\Ex_3-11_HistoricalConcentrationsGroundwater.mxd Date: December 2010

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3.3 Identified Hazardous Material Sites

3.3.1 Database Search Results

Exhibit 3-12 presents a summary of federal and state environmental database search results within the study area. Each site has been given a unique site identification number (Site ID). In general, Site IDs have been assigned in ascending order from north (Washington) to south (Oregon). Site IDs also have a corresponding non-unique Parcel Insight, Inc. (PI) database listing number. The PI number can be used to find further details regarding a site in the database report (Appendix C). The database search identified 238 hazardous materials sites in the study area. Of these sites, 101 are in the State of Washington and 137 are in the State of Oregon.

Exhibits 3-13a, b, and c display the approximate locations of identified hazardous materials sites. The majority of these sites are located in downtown Vancouver, Hayden Island, North Portland Harbor, and along the Columbia River Slough.

3.3.2 Historical Land Use Results

Sanborn maps were used to identify historical sites that may have RECs (Appendix D). For the purposes of this report, suspected sites fall into the three general categories: 1) automotive services (service stations, auto repair facilities, gas stations), 2) industrial services (e.g. machine shops), and 3) commercial properties (e.g. dry cleaners). In general, these types of businesses use or store hazardous substances or petroleum products and/or generate and dispose of hazardous wastes. A summary of identified sites is displayed on Exhibit 3-14. Each site has been given a unique Site ID and a brief description of its potential impact. The exhibit indicates that 117 historic sites are suspected of having RECs from hazardous materials. Of these sites, 108 are in the State of Washington and 9 are in the State of Oregon. Exhibits 3-15a, b, and c display the approximate locations of identified historical sites. A majority of the sites are located in downtown Vancouver and Hayden Island.

3.3.3 Historical Aerial Photograph Review

Historic aerial photographs of the analysis area were obtained from the University of Oregon Map Library for the years 1939, 1948, 1955, 1964, 1973, 1980, 1990, and 1998. Copies are included in Appendix E. Observations are listed below.

Year	***Description***
1939	The earliest available aerial photograph shows little development on Hayden Island except for an amusement park located west of the highway. The portion of the main project area located between North Portland Harbor and the Columbia Slough is primarily used for agriculture, with a few rural residences. Logs are visible in North Portland Harbor on the east side of the highway, with a possible sawmill immediately southeast of the bridge over North Portland Harbor. Sawmills typically use petroleum products and wood treatment chemicals during operation. Therefore, the sawmill site represents potential REC. Other industry is also visible south of North Portland Harbor. The Vancouver area has well-established commercial, residential, and industrial development, with industry focused near the Columbia River.

1948 The 1948 aerial photograph shows that large portions of the area between the Columbia River (North Portland Harbor) and the Columbia Slough are inundated with water, likely a result of the Vanport Flood of 1948. Many residences and other structures appear to have been moved off of their foundations, with many of them possibly destroyed. The structures destroyed by the flood may represent RECs because asbestos-containing building materials, lead paint, or heating oil tanks associated with residences may not have been removed from affected sites. Commercial sites affected by the flood, such as service stations, may also contain recognized environmental conditions because gasoline and other petroleum products stored at the sites may have spilled or leaked into soil or groundwater on the properties. Increased commercial development is apparent in the Hayden Island area east and west of the highway. Residential development has increased on Hayden Island as well as south of Columbia Boulevard. Industrial development is apparent along the Columbia Boulevard corridor.

1956 Little appreciable change has occurred in the area since the 1948 aerial photograph. Streets and some of the destroyed residences are still visible in the Vanport Flood area, with little other development noted.

1964 In this photograph, I-5 and the second Interstate bridge are under construction to the east of the previous roadway alignment. Floating homes are docked at the south shore of Hayden Island, and a possible automobile junkyard is located west of I-5 immediately after it crosses the Columbia Slough. The Vanport Flood area is no longer visible, little standing water is present.

1973 The amusement park on Hayden Island has been replaced by a shopping mall in the 1973 aerial photograph. The construction of the I-5 realignment shown in the 1964 aerial photograph is complete.

1980-1998 A considerable increase in residential and commercial development is evident in the Hayden Island area east and west of I-5 in the 1980 through 1998 aerial photographs.

Exhibit 3-12. Identified Hazardous Material Sites Summary Table

					Regulatory Databases [1]																												
					Federal															State													
																				WASHINGTON							OREGON						
Site ID	Database Report ID	NAME	ADDRESS	STATE	RCRA-CESQG	RCRA-SQG	RCRA-LQG	RCRA-ND	RCRA-TSD	RCRA-CORRACTS	CERCLIS	CERCLIS-NFRAP	ENG-CONTROLS	INST-CONTROLS	NPL	TRIS	HMIRS	WATER	AIR	CSCSL	CSCSL NFA	SWF/LF	LUST	UST	CSCSL	DECISIONS	ECSI	UST-DECOM	LUST	UST	SW/LF	HAZMAT	BROWNFIELD
1	1	ARCO SS 6211	6213 NE HIGHWAY 99	WA																	●												
2	2, 3, 4, 5, 6	US BPA ROSS/USDOE BONNEVILLE PWR COMPLEX	5411 NE HIGHWAY 99/5411 NE HWY 99 BL	WA			●		●	●	●		●	●	●						●		●	●									
3	7	WA DOT RETENTION POND	I5 MP 3	WA																●													
4	8	TIME OIL HANDY ANDY 8	3314 NE 44TH ST	WA																●			●	●		●							
5	9	WDOT-VANCOUVER MAIN ST	4200 MAIN ST	WA				●												●				●		●							
6	10	BURLINGTON NORTHERN-SANTA FE RAILWAY CO	W 39TH ST	WA	●															●													
7	11	76 24 HR FOOD MART	3901 MAIN ST	WA																	●			●									
8	12	ARCO 5739 PSI 5379	3817 MAIN ST	WA	●																			●									
9	13	HIDDEN BROTHERS	3824 S ST	WA																				●									
10	14	RUDYS RELIABLE AUTO CARE	3800 MAIN ST	WA	●																												
11	15	SOUTHWEST WASHINGTON MEDICAL CENTER	3400 MAIN ST	WA																			●	●									
12	16	DEGAGNE PROPERTY	3500 S ST	WA																●													
13	17	FIRST UNITED METHODIST CHURCH	401 E 33RD ST	WA																				●									
14	18	KADELS CASCADE AUTO BODY	2600 E 33RD ST	WA	●																		●	●									
15	19	Valero LP	2625 NW Harborside Drive	WA													●																
16	20	VANCOUVER GAS MANUFACTURING SITE	9TH & LINCOLN STREETS	WA								●																					
17	21	TETRA PAK	3125 THOMPSON AVE	WA				●												●													
18	22	GOODWIN RD ACID DRUM	2100 GOODWIN RD	WA				●																									
19	23	QUICK SHOP MINIT MART 28	2901 ST JOHNS BLVD	WA				●															●	●									
20	24	CRITES PROPERTY	320 W 28TH ST	WA																●													
21	25	SHULL PROPERTY	317 W 28TH ST	WA																●													
22	26	USARMY NG VANCOUVER BARRACKS	HQ VANCOUVER BARRACKS B-638	WA								●																					
23	27	CITY OF VANCOUVER	28TH AND MAIN STREET	WA																				●									
24	28	PIERRE'S FOREIGN CAR REPAIR	2612 MAIN ST	WA																	●			●									
25	29	VA MEDICAL CENTER VANCOUVER DIVISION	FOURTH PLAIN BLVD & O ST	WA	●																												
26	30	DEPT OF VETERANS AFFAIRS	1601 E FOURTH PLAIN BLVD	WA																			●	●									
27	31	WA AGR CLARK 2	213B SE 120TH AVE	WA				●																									

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Exhibit 3-12. Identified Hazardous Material Sites Summary Table

					Regulatory Databases [1]																												
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																				WASHINGTON							OREGON						
Site ID	Database Report ID	NAME	ADDRESS	STATE	RCRA-CESQG	RCRA-SQG	RCRA-LQG	RCRA-ND	RCRA-TSD	RCRA-CORRACTS	CERCLIS	CERCLIS-NFRAP	ENG-CONTROLS	INST-CONTROLS	NPL	TRIS	HMIRS	WATER	AIR	CSCSL	CSCSL NFA	SWF/LF	LUST	UST	CSCSL	DECISIONS	ECSI	UST-DECOM	LUST	UST	SW/LF	HAZMAT	BROWNFIELD
28	32	USWCOM VANCOUVER OXFORD CO	214 E 24TH ST	WA				●																●									
29	33	PHOENIX 120 GRANT ST PROPERTY	2315 GRANT ST	WA																	●												
30	34	VANCOUVER WATER STATION #1 CONTAMINATION	E. RESERVE AND N.E. FOURTH PLAIN BLV	WA							●				●																		
31	35	TIRES UNLIMITED	2300 E FOURTH PLAIN BLVD	WA								●																					
32	36	MINIT MART 730	2201 MAIN ST	WA																	●			●									
33	37	WA DOT VANCOUVER SR 4	SR 4 MI 25.6	WA				●																									
34	38	PINNACLE INC	300 E 20TH ST	WA																				●									
35	39	MALCOLM MONTAGUE	1600 W 20TH ST	WA																●													
36	40	CITY OF VANCOUVER	1912 MAIN ST	WA																			●	●									
37	41	SAMS AUTO BODY	1813 COLUMBIA ST	WA	●																												
38	42	VELMA B JORDAN	1812 WASHINGTON ST	WA																				●									
39	43	HOESLY AUTO SERVICE INDIVIDUAL	210 W MCLOUGHLIN BLVD	WA																			●	●									
40	44	SHERWIN WILLIAMS CO VANCOUVER	1717 BROADWAY ST	WA				●																									
41	45	DON LORENTZ & ASSOCIATES	1714 BROADWAY ST	WA																				●									
42	46	LARKINS GARAGE	1708 WASHINGTON ST	WA				●																									
43	47	ESTATE OF MARY E MACKAY	1700 BROADWAY ST	WA			●																	●									
44	48	HOLLAND/BURGERVILLE PROPERTY	17TH W & COLUMBIA	WA																				●									
45	49	VALERO LP	3103 PORT OF VANCOUVER TERMINAL 2	WA			●					●													●	●							
46	50	VANPORT INDUSTRIES INC.	ELEVATOR WAY	WA				●		●														●									
47	51	VANCOUVER ENGINE EXCHANGE	1505 COLUMBIA ST	WA				●																									
48	52	PINKERTONS AUTO REPAIR	1520 WASHINGTON ST	WA																				●									
49	53	KYUNGSHIN CHOI/MATTHIEU'S CAR CARE	1505 BROADWAY ST	WA																			●	●									
50	54	TREADS R US	1300 W 15TH ST	WA				●													●												
51	55/56	WHATLEY DECANT STATION CLARK COUNTY PUBLIC WORKS	1408 FRANKLIN ST	WA																		●		●									
52	57	CHUCK'S TIRE & AUTO SERVICE	1416 BROADWAY ST	WA																			●	●									
53	58	QC CLEANERS	1401 WASHINGTON ST	WA	●																												
54	59	VANCOUVER CHEVRON	210 E MILL PLAIN BLVD	WA																				●									

Exhibit 3-12. Identified Hazardous Material Sites Summary Table

					Regulatory Databases [1]																												
																				State													
					Federal															WASHINGTON							OREGON						
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55	60/61	VANCOUVER IRON & STEEL INC/ VANRICH CASTING	1200 W 13TH ST	WA								●									●												
56	62	SPECIAL EVENTS & CONVENTION CENTER	BTW 4TH & 6TH & COLUMBIA & W ESTHER	WA																	●												
57	63	ROYAL APTS	706 W 13TH ST	WA																				●									
58	64	VANCOUVER POLICE BUILDING	300 E 13TH ST	WA				●																									
59	65	CLARK COUNTY CORRECTION CENTER	707 W 13TH ST	WA				●																●									
60	66	CLARK PUBLIC UTILITY DISTRICT	1200 FORT VANCOUVER WAY	WA																				●									
61	67	EMERALD PETROLEUM SERVICES VANCOUVER	1300 W 12TH ST	WA			●					●								●				●									
62	68	FT VANCOUVER REGIONAL LIBRARY	1007 E MILL PLAIN BLVD	WA																				●									
63	69	PACIFIC COGENERATION, INC.	W 11TH ST	WA	●															●													
64	70	OLTMANN'S MOBIL SERVICE	1114 WASHINGTON ST	WA																				●									
65	71	CLARK COUNTY JUVENILE DEPT	500 W 11TH ST	WA																				●									
66	72	HEGEWALD INC	701 W 11TH ST	WA																				●									
67	73	WOLF SUPPLY CO VANCOUVER	301 W 11TH ST	WA				●																●									
68	74	MARSHALL VANCOUVER FORD	1004 WASHINGTON ST	WA				●																									
69	75	THE ACADEMY	400 E EVERGREEN BLVD	WA																				●									
70	76	WA STATE PATROL VANCOUVER	605 E EVERGREEN BLVD	WA	●																			●									
71	77	METRO BUICK OLDS VANCOUVER	904 WASHINGTON ST	WA				●															●	●									
72	78	EOFF ELECTRIC CO	808 HARNEY ST	WA																				●									
73	79	PACIFIC TELECOM CORP OFFICE	805 BROADWAY CORPORATE OFFICE	WA				●																									
74	80	BILL COPPS INC.	901 C ST	WA	●																			●									
75	81	VANCOUVER WELDING SUPPLY COMPANY	710 W 8TH ST	WA																				●									
76	82	VANCOUVER CITY BREWERY BLOCKS	400 W 8TH ST	WA																	●												
77	83	COLUMBIAN PUBLISHING CO THE	701 W 8TH ST	WA	●																			●									
78	84	VANCOUVER ICE AND FUEL	1112 W 7TH ST	WA																	●			●									
79	85	GENERAL BREWING COMPANY	615 COLUMBIA ST	WA																				●									
80	86/87	BOISE CASCADE WHITE PAPER VANCOUVER	907 W 7TH ST	WA			●													●				●		●							
81	88/89	USARMY HQ VANCOUVER BARRACKS/SUB-INSTALLATION	VANCOUVER BARRACKS BLDG 638	WA		●																		●									

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Exhibit 3-12. Identified Hazardous Material Sites Summary Table

Site ID	Database Report ID	NAME	ADDRESS	STATE	Regulatory Databases [1]																												
					Federal															State													
																				WASHINGTON							OREGON						
					RCRA-CESQG	RCRA-SQG	RCRA-LQG	RCRA-ND	RCRA-TSD	RCRA-CORRACTS	CERCLIS	CERCLIS-NFRAP	ENG-CONTROLS	INST-CONTROLS	NPL	TRIS	HMIRS	WATER	AIR	CSCSL	CSCSL NFA	SWF/LF	LUST	UST	CSCSL	DECISIONS	ECSI	UST-DECOM	LUST	UST	SW/LF	HAZMAT	BROWNFIELD
82	90	CITY OF VANCOUVER	512 W 6TH	WA																				●									
83	91	LUCKY LAGER BREWERY	230 W 6TH ST	WA				●																									
84	92	HANNAH MOTOR COMPANY VW	114 E 6TH ST	WA																				●									
85	93	VANCOUVER BARRACKS	HATHAWAY RD BLDG 404	WA																			●	●									
86	94	SOUTHWEST DELIVERY CO INC	415 W 6TH ST	WA				●															●	●									
87	95	FAULKNER USA	512 COLUMBIA ST	WA			●																										
88	96	FROM THE KENNELS	500 WASHINGTON ST	WA				●																									
89	98	ADMIRAL DISTRIBUTING	301 W 5TH ST	WA																				●									
90	97	HANNAH MOTOR CO	411 W 5TH ST	WA				●																									
91	99	USDOT FEDERAL HIGHWAY ADMIN - VANCOUVER	610 E 5TH ST	WA				●															●	●									
92	100	SW WASHINGTON MEDICAL CENTER	400 NE MOTHER JOSEPH WAY	WA		●																											
93	101	CAPITAL TACKEL MFG	404 W 4TH ST	WA	●																			●									
94	102	HANNAH MOTOR COMPANY	400 WASHINGTON ST	WA																				●									
95	103	HANNAH MOTOR COMPANY UST 10252	300 WASHINGTON ST	WA				●															●	●									
96	104	HAYDEN ISLAND DUMPING AREA	HAYDEN ISLAND	OR																							●						
97	105	HAYDEN ISLAND DRUM	COLUMBIA RIVER	OR								●																					
98	106/107	Frontier Hard Chrome, Inc.	113 Y ST	WA				●			●				●					●													
99	108	SCHOONER CREEK BOAT WORKS	3255 N HAYDEN ISLAND DR	OR														●									●						
100	109	VANCOUVER WATER STATION #4 CONTAMINATION	5TH & BLANDFORD ST	WA							●				●																		
101	110	COLUMBIA BUSINESS PARK BLDG 41 BAY 3	3001 SE COLUMBIA WAY BLDG 41 BAY 3	WA																	●												
102	111	FMC CORP VANCOUVER	1710 S ACCESS RD	WA				●				●									●			●									
103	112	HAYDEN ISLAND LANDFILL	N HAYDEN ISLAND RD	OR																							●						
104	113	HILLMAN PROPERTIES NW BLDG 39	503 SE MARITIME AVE	WA				●		●		●																					
105	114	HILLMAN PROPERTIES NORTHWEST M	500 SE MARITIME AVE BLDG 5	WA	●					●																							
106	115	SPILL	1401 N HAYDEN ISL DR	OR																												●	
107	116/117/118	ARCO SS #4475/ ATLANTIC RICHFIELD COMPANY	1305 N HAYDEN ISLAND DR	OR				●																				●	●				
108	119	MONTGOMERY WARDS JANTZEN BEACH	1400 N HAYDEN ISLAND DR	OR		●																											

Exhibit 3-12. Identified Hazardous Material Sites Summary Table

					Regulatory Databases [1]																												
					Federal															State													
																				WASHINGTON							OREGON						
Site ID	Database Report ID	NAME	ADDRESS	STATE	RCRA-CESQG	RCRA-SQG	RCRA-LQG	RCRA-ND	RCRA-TSD	RCRA-CORRACTS	CERCLIS	CERCLIS-NFRAP	ENG-CONTROLS	INST-CONTROLS	NPL	TRIS	HMIRS	WATER	AIR	CSCSL	CSCSL NFA	SWF/LF	LUST	UST	CSCSL	DECISIONS	ECSI	UST-DECOM	LUST	UST	SW/LF	HAZMAT	BROWNFIELD
109	120	MORRISON OIL CO.	3747 N SUTTLE RD	OR	●																						●		●				
110	121	GRAPHIC PACKAGING CORPORATION	3400 N MARINE DR	OR			●					●						●	●								●		●				
111	122/123/124/125	MILWAUKIE DUMPING AREA/ CANOE BAY/ HAYDEN ISLAND LANDFILL/ SCHOONER BOAT WORKS	HAYDEN IS (UNION PACIFIC RR)	OR				●			●	●																					
112	126/127	ISLAND CONSTRUCTION SHOP YARD/ HILLMAN PROPERTIES	1750 JANTZEN BEACH CTR	OR				●																				●	●				
113	128	K MART #(3430)	1716 JANTZEN BEACH CTR	OR																							●						
114	129	LACAMAS LABORATORIES	3625 N SUTTLE RD	OR			●									●											●		●				
115	130	COMPUTER CITY	1405 JANTZEN BEACH CTR	OR	●																												
116	131/132/133/134	CONOCOPHILLIPS COMPANY - 255953/ UNOCAL SS 5953	12205 N CENTER AVE	OR				●										●										●	●				
117	135/136	JANTZEN BEACH SHELL/ SHELL OIL COMPANY	12235 N JANTZEN DR	OR	●																							●	●				
118	137/138	CHEVRON STATION - 90706/ CHEVRON JANTZEN BEACH 90706	12105 N JANTZEN DR	OR	●																							●	●	●			
119	139	ROD'S TRUCK STOP	2632 N MARINE DR	OR																							●	●					
120	140	HOME DEPOT NO 4007	1728 N JANTZEN BEACH CTR	OR		●																											
121	141	ENGINE-17	12070 N JANTZEN AVE	OR																								●					
122	142	PAYLESS 1506	900 N TOMAHAWK ISLAND DR	OR				●																									
123	143	SPILL	2500 N MARINE DRIVE	OR																												●	
124	144	MONTGOMERY WARD #2237	1400 JANTZEN CENTER	OR																								●					
125	145/146	COLUMBIA CROSSINGS L.L.C./ JANTZEN BEACH MOORAGE	1130 N JANTZEN AVE	OR																								●	●	●			
126	147	BLUE HERON LANDING	2335 N MARINE DR	OR																							●						
127	148	WASTE MGMT FORMER MERIT TRUCK STOP	2331 N MARINE DR	OR	●																												
128	149/150	SF PROPERTY INVESTMENTS LLC/ STOCKYARDS PROPERTY	2416 N MARINE DR	OR																								●	●				
129	151	ASHLAND INC	11699 N FORCE AVE	OR															●														
130	152	HAYDEN ISLAND CLEANERS	1190 N JANTZEN DR	OR				●																			●						
131	153/154	WASTE MANAGEMENT OF OREGON INC./ MERIT USA, INC.	2360 N MARINE DR	OR																								●	●				
132	155	OREGON WASTE SYSTEMS - PROPOSED TRANSFER STATION	SW CORNER N MARINE DR. AND N FORCE	OR																							●						
133	156	SPILL	2200 N MARINE DR	OR																												●	

Exhibit 3-12. Identified Hazardous Material Sites Summary Table

Site ID	Database Report ID	NAME	ADDRESS	STATE	RCRA-CESQG	RCRA-SQG	RCRA-LQG	RCRA-ND	RCRA-TSD	RCRA-CORRACTS	CERCLIS	CERCLIS-NFRAP	ENG-CONTROLS	INST-CONTROLS	NPL	TRIS	HMIRS	WATER	AIR	CSCSL	CSCSL NFA	SWF/LF	LUST	UST	CSCSL	DECISIONS	ECSI	UST-DECOM	LUST	UST	SW/LF	HAZMAT	BROWNFIELD
					Regulatory Databases [1]																												
					Federal															State: WASHINGTON							State: OREGON						
134	157	BULK TRANSPORTATION PORTLAND TERMINAL	11619 N FORCE AVE	OR												●																	
135	158/159	BULK TRANSPORTATION SPILL PENINSULA TERMINAL	11645 N FORCE AVE	OR	●			●									●																
136	160	EXPO CENTER	2060 N MARINE DR	OR																							●	●	●				
137	161	VANPORT PLANT	1835 N MARINE DR	OR																								●		●			
138	162/163/164	DIVERSIFIED MARINE INC.	1801 N MARINE DR	OR	●						●							●									●					●	
139	165	PENINSULA TERMINAL RR	11707 N FORCE RD	OR																							●						
140	166	COLUMBIA RIVER YACHT CLUB	37 N TOMAHAWK ISLAND DR	OR																								●	●	●			
141	167/171	HARBOR OIL INC./ CHEMPRO OF OREGON INC/ ENERGY & MATERIAL RECOVERY INC.	11535 N FORCE AVE	OR				●			●				●			●	●								●						
142	168	SPILL	1600 N MARINE DRIVE	OR																												●	
143	169/170	SCHOONER CREEK BOAT WORKS (FORMER)/ 1610 N PIER 99	1610 N PIER 99 ST	OR							●																●						
144	172	NORTH HARBOUR RESIDENCE INN	1250 N ANCHOR WAY	OR														●															
145	173	FAIRFIELD INN & SUITES - NORTH HARBOUR	901 N. ANCHOR WAY AT N. MARINE DRIVE	OR														●															
146	174	MARINELAND PIER 99	1441 N MARINE DR	OR				●																									
147	175	THE RESIDENCE AT NORTH HARBOUR	909 N ANCHOR WAY	OR														●															
148	177	NATIONWIDE DISTRIBUTORS	N VANCOUVER WAY STE 144	OR				●																									
149	176	SPEED-BUGGY ENT.	N VANCOUVER WAY, #245	OR				●																									
150	178	PRIMA DONNA DEVELOPMENT	1021 N MARINE DR	OR				●																									
151	179/180/181	PLAID PANTRY #209/ POTTER WEBSTER CONVIENCE STORE	1014-1020 N MARINE DR	OR				●																			●	●		●			
152	182	NORTH HARBOR COMMERCIAL 2 & 3	NE CORNER OF N MARINE DR & N ANCHOR	OR														●															
153	183	NORTH HARBOUR EAST PARCEL	917 W. MARINE DRIVE	OR														●															
154	184	WEST ALICE	118 N BRIDGETON RD	OR																									●				
155	185	SPILL	719 N MARINE DR	OR																												●	
156	186	BROWN K AHOT	138 NE BRIDGETON RD	OR																									●				
157	187	MOORE JIM	184 NE BRIDGETON RD	OR																									●				
158	188	SPILL	180 N MARINE DR	OR																												●	
159	189/190	MARKET TRANSPORT LTD.	110 N MARINE DR	OR	●													●									●	●	●	●			

Exhibit 3-12. Identified Hazardous Material Sites Summary Table

					Regulatory Databases [1]																												
					Federal															State: WASHINGTON							State: OREGON						
Site ID	Database Report ID	NAME	ADDRESS	STATE	RCRA-CESQG	RCRA-SQG	RCRA-LQG	RCRA-ND	RCRA-TSD	RCRA-CORRACTS	CERCLIS	CERCLIS-NFRAP	ENG-CONTROLS	INST-CONTROLS	NPL	TRIS	HMIRS	WATER	AIR	CSCSL	CSCSL NFA	SWF/LF	LUST	UST	CSCSL	DECISIONS	ECSI	UST-DECOM	LUST	UST	SW/LF	HAZMAT	BROWNFIELD
160	191	MARQUEZ JOHN	49 NE MARINE DR	OR																									●				
161	192	FAZIO PROPERTY	10365 N VANCOUVER WAY	OR																								●	●				
162	193	EAST DELTA PARK	10910 N DENVER	OR																								●					
163	194	PORTLAND INTERNATIONAL RACEWAY	1940 N VICTORY BLVD	OR				●																									
164	195/196/197	YELLOW TRANSPORTATION/ YELLOW FREIGHT SYSTEM INC.	10510 N VANCOUVER WAY	OR	●												●	●									●	●	●	●		●	
165	198/199	FRUEHAUF TRAILER SERVICES, INC/ NORTH AMERICAN TRAILER CENTERS	10498 N VANCOUVER WAY	OR	●													●										●	●				
166	201	SHELL OIL PRODUCTS, US	5829 NE UNION AVE	OR																								●					
167	200	LYNCH COMPANY, THE	6000 NE UNION AVE	OR																								●					
168	202	TED LAMM DBA LAMM MOTOR CO.	8250 NE UNION AVE	OR																								●					
169	203	A-1 CONTAINER SERVICES	8330 NE UNION AVE	OR																								●					
170	205	OR ST HWY 1-2B JANTZEN BEACH	12345 N UNION	OR																								●					
171	204	U-HAUL CENTER OF UNION AVE	6431 NE UNION AVE	OR																								●					
172	206	HANEY TRUCK LINE INC.	10505 NE 2ND AVE	OR	●													●									●		●				
173	207	SULLIVAN BRUCE	NE 6TH DR	OR				●				●																					
174	208	CITY OF PORTLAND PARKS	10850 N DENVER AVE	OR																									●				
175	209/210	QUALITY CARRIERS INC/ STAR-OILCO	10360 N VANCOUVER WAY	OR				●																				●	●				
176	211/212/213	JUBITZ TRAVEL CENTER/ JUBITZ TRUCK STOP	10205 N VANCOUVER WAY	OR																								●		●		●	
177	214	JUBITZ TRAVEL CENTER	10350 N VANCOUVER WAY	OR																								●		●			
178	215/216/217/218/219	WILLIG FREIGHT LINES/ WATKINS MOTORLINE/ WATKINS MOTOR LINES - PORTLAND	720 N HAYDEN MEADOWS DR	OR													●	●										●	●			●	
179	220	SPILL	9727 N MLK	OR																												●	
180	221	BRUCE SULLIVAN	10200 NE 6TH DR	OR																							●						
181	222	JUBITZ RETREAD PLANT	121 NE MIDDLEFIELD RD	OR																							●	●	●				
182	223	JUBITZ	33 NE MIDDLEFIELD RD	OR														●											●				
183	224/225/226/227	SPILL	10210 N VANCOUVER WAY	OR																												●	
184	228	BCB PROPERTIES	225 NE MIDDLEFIELD RD	OR																							●						
185	229	KOGLE, FLOYD	10149 N VANCOUVER WAY	OR																								●					

Exhibit 3-12. Identified Hazardous Material Sites Summary Table

					Regulatory Databases[1]																												
					Federal															State													
																				WASHINGTON							OREGON						
Site ID	Database Report ID	NAME	ADDRESS	STATE	RCRA-CESQG	RCRA-SQG	RCRA-LQG	RCRA-ND	RCRA-TSD	RCRA-CORRACTS	CERCLIS	CERCLIS-NFRAP	ENG-CONTROLS	INST-CONTROLS	NPL	TRIS	HMIRS	WATER	AIR	CSCSL	CSCSL NFA	SWF/LF	LUST	UST	CSCSL	DECISIONS	ECSI	UST-DECOM	LUST	UST	SW/LF	HAZMAT	BROWNFIELD
186	230	PUGET SOUND TRUCK LINES INC	10031 N VANCOUVER WAY	OR																								●					
187	231	R & J METAL FABRICATORS	10001 N VANCOUVER WAY	OR																								●					
188	232	ANDERSON JOHN	10020 N VANCOUVER WAY	OR																									●				
189	233	R&J METAL FABRICATORS INC.	9939 N VANCOUVER WAY	OR														●															
190	234/235/236	REDI-STRIP OF OREGON/PRUDEN PACIFIC/ SUPERIOR STRIPPING SERVICES	9942-9940 N VANCOUVER WAY	OR	●							●						●									●						
191	237/238/239/240	UNOCAL SS 6407, DELTA PARK 76, UNOCAL SS 6407	9950 N WHITAKER RD	OR				●																				●	●	●		●	
192	241	GI JOE'S	1140 N HAYDEN MEADOWS DR	OR																								●					
193	242	SAM'S TOWING	9731 NE 6TH DR	OR																							●						
194	243/244	GALLUS INC/ DENNIS HARDING PAINTING	9425 N BURRAGE AVE	OR		●																					●		●				
195	245	PACIFIC MOLASSES CO.	TERMINAL 4	OR																								●					
196	246	MULFLUR FAMILY LLC GERTZ RD. BLDG.	9414 NE VANCOUVER WAY	OR														●									●						
197	247/248	EXPRESS CARE LUBRICATION SERVICES, LLC/ ERICS OILERY	9330 N WHITAKER RD	OR																								●		●			
198	249/250	PACIFIC MEAT CO.	2701 N NEWARK ST	OR								●															●						
199	251	BLUELINE TRANSPORTATION	2606 N NEWARK ST	OR																									●				
200	252	GROUNDWATER - N COLUMBIA BLVD	N. COLUMBIA BLVD.	OR																							●						
201	253	DETZ TERRI	1101 N SCHMEER RD	OR																									●				
202	254	CONTAINER CARE INTL INC	1501 N SCHMEER RD	OR				●										●									●						
203	255	MEC OREGON RACING INC.	1001 N SCHMEER RD	OR	●													●											●				
204	256	HERBERT MALARKEY ROOFING COMPANY	3131 N COLUMBIA BLVD	OR														●	●								●		●		●		
205	257	NW CAST PARTS	9233 N CALVERT AVE	OR																							●						●
206	258/268/276	TIMBERLINE FOREST PRODUCT/ NICOLAI CO.	9000 N DENVER AVE	OR				●				●																●	●				
207	259	FORMER PAY N' PAK	8900 N VANCOUVER AVE	OR																							●	●	●				
208	260	DYNO OVERLAYS INC.	2301 N COLUMBIA BLVD	OR			●									●		●	●								●						
209	261	GENERAL ELECTRIC INDUSTRIAL CO.	2410 N COLUMBIA BLVD	OR																							●						
210	262	GOODYEAR DISTRIBUTION CENTER #9000	2344 N COLUMBIA BLVD	OR																							●						
211	263	BLASEN BLASEN LUMBER	2155 N COLUMBIA BLVD	OR															●								●						
212	264	FAMIILIAN NW - 2121 N COLUMBIA BLVD	2121 N COLUMBIA BLVD	OR																							●						

Exhibit 3-12. Identified Hazardous Material Sites Summary Table

					Regulatory Databases [1]																												
					Federal															State													
																				WASHINGTON							OREGON						
Site ID	Database Report ID	NAME	ADDRESS	STATE	RCRA-CESQG	RCRA-SQG	RCRA-LQG	RCRA-ND	RCRA-TSD	RCRA-CORRACTS	CERCLIS	CERCLIS-NFRAP	ENG-CONTROLS	INST-CONTROLS	NPL	TRIS	HMIRS	WATER	AIR	CSCSL	CSCSL NFA	SWF/LF	LUST	UST	CSCSL	DECISIONS	ECSI	UST-DECOM	LUST	UST	SW/LF	HAZMAT	BROWNFIELD
213	265	ROVALVE DIV. OF TECHNAFLOW INC	1945 N COLUMBIA BLVD	OR																							●		●				
214	266	ALLIED ROOFERS SUPPLY CORP	9111 N DENVER AVE	OR																								●	●				
215	267	WASTECH INC.	701 N HUNT ST	OR	●							●						●									●				●		
216	269	NICOLAI-MORGAN	1812 N COLUMBIA BLVD	OR																							●						
217	270	METROPOLITAN DISPOSAL & RECYCLING CORP	8520 N KERBY AVE	OR																							●						
218	271	PRECISION EQUIPMENT INC	8440 N KERBY AVE	OR		●						●						●	●								●						
219	272	NORSTAR BUSINESS CENTER	8501 N ALBINA AVE	OR																							●						
220	273	BLASEN FAMILY LLC	1601 N COLUMBIA BLVD	OR																							●						
221	274	WAYMIRE DRUM CO.	8443 N KERBY AVE	OR																							●						
222	275	EVERGREEN STAGES LINES	9038 N DENVER AVE	OR																							●						
223	277	QWEST - PORTLAND ARGYLE SOC (R00710)	2111 NE ARGYLE	OR																								●					
224	278	BRUNDAGE-BONE CONCRETE PUMPING, INC.	1627 NE ARGYLE ST.	OR																								●					
225	279	SPILL	2519 NW ARGYLE	OR																												●	
226	280	RB RECYCLING INC.	8501 N BORTHWICK AVE	OR														●									●				●		
227	281	P. C. DEVELOPMENT INC.	955 N COLUMBIA BLVD	OR																							●						
228	282	MACADAM ALUMINUM & BRONZE CO.	1255 N COLUMBIA BLVD	OR	●													●	●								●						
229	283	COLUMBIA ALUMINUM RECYCLING CORP	900 N COLUMBIA BLVD	OR				●																			●						
230	284/285	NELSON VIC PROPERTY/ CARL BUD HOFFMAN FACILITY	N DENVER AVE	OR				●																									
231	286	AMERICAN AUTO RECYCLING WRECKING	626 N COLUMBIA BLVD	OR																							●						
232	287	BRADFORD PROPERTY	511 N COLUMBIA BLVD	OR																							●						
233	288	LORD BROTHERS CONTRACTORS	437 N COLUMBIA BLVD	OR	●																						●	●	●				
234	289	FAIRMONT FINANCIAL PROPERTY	570 N COLUMBIA BLVD	OR																							●						
235	290	ALLIED PLATING, INC.	8135 NE UNION AV	OR				●			●				●												●						
236	291	RYDER TRANSPORTATION RESOURCES	310 N COLUMBIA BLVD	OR	●																						●		●	●			
237	292	CENTRAL MACHINE WORKS INC.	8009 N KERBY ST	OR																							●						
238	293	SPILL	7800 N DENVER & FARRAGAT	OR																												●	

Notes 1 = For detailed description of databse see Appendix B; for further information on identified sites see Appendix B

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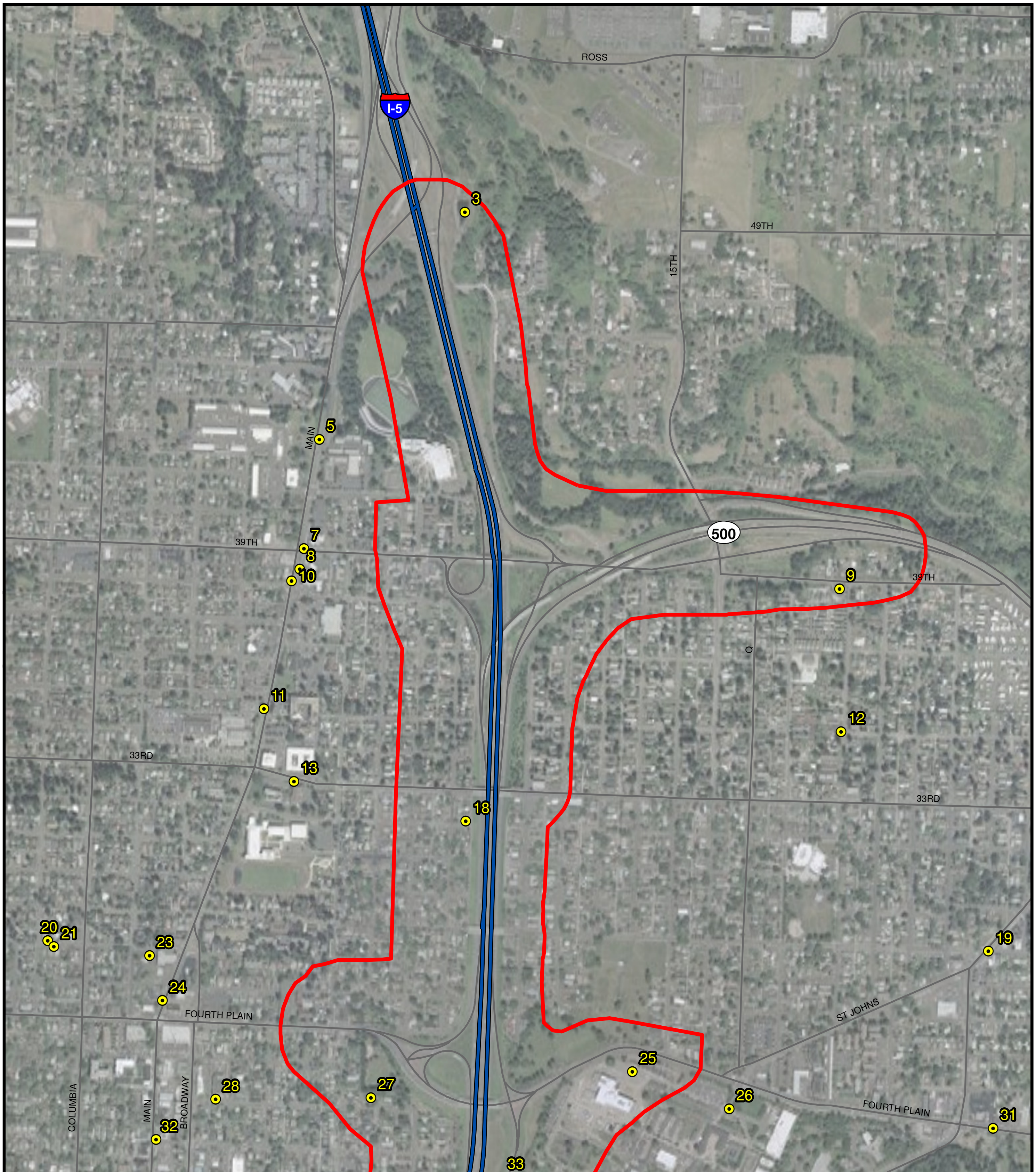

N
W E
S

0 500 1,000
Feet

Main Project Area
Database Site

*Note: Only sites that are visible in this extent are shown.
Sites located at greater distances are not mapped.

Exhibit 3-13a. Database Hazardous Material Sites Fourth Plain to SR 500

Columbia River CROSSING

Analysis by Marshall; Analysis Date: Feb. 2010; File Name: P:\GIS\CRC\GIS\MXD_PDF\TECH_REPORTS\HAZMAT\Ex_3-13a_Database_HAZMAT-Sites_North.mxd

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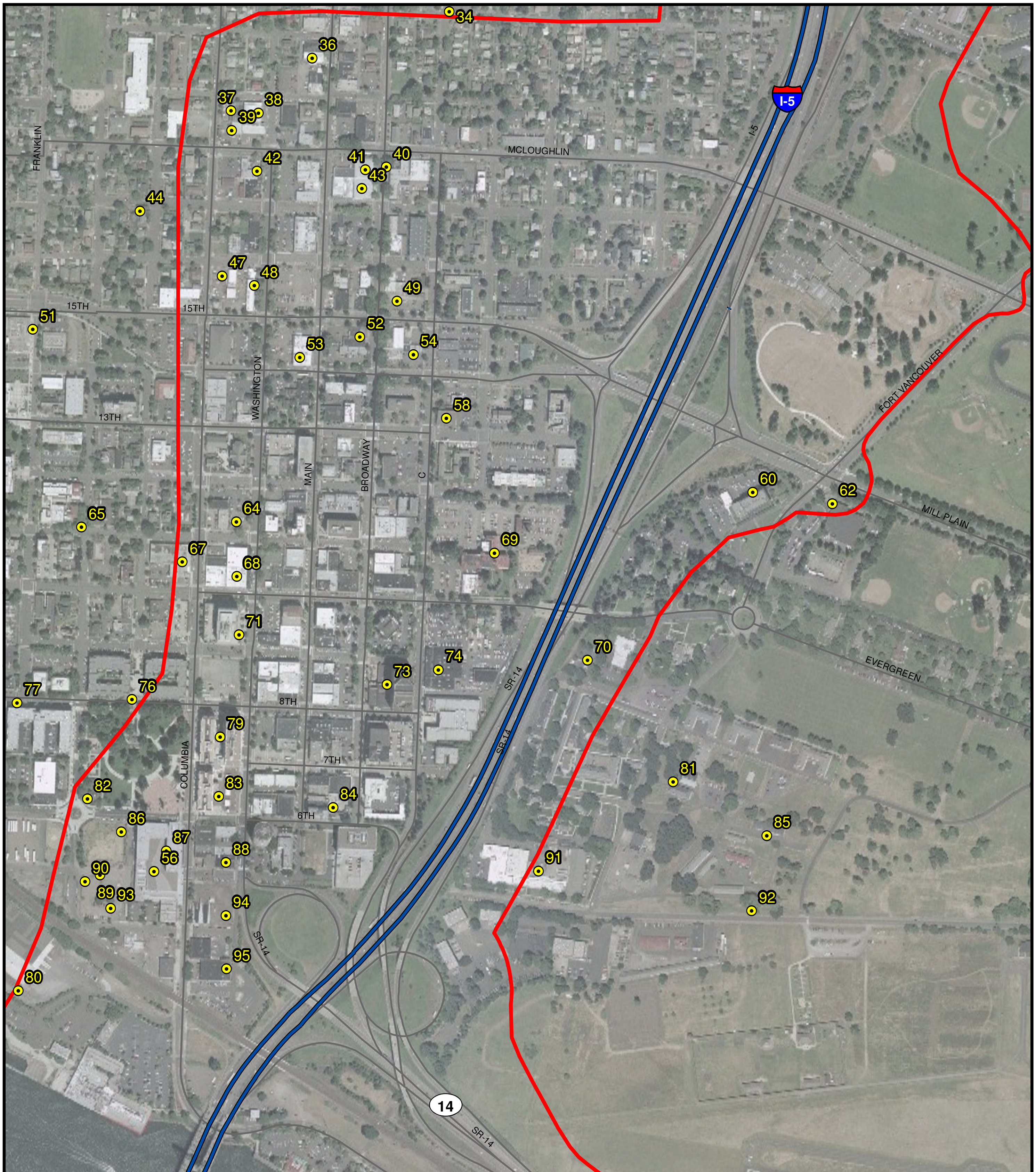

N W E S

0 500 1,000
Feet

Main Project Area
Database Site

*Note: Only sites that are visible in this extent are shown.
Sites located at greater distances are not mapped.

Exhibit 3-13b. Database Hazardous Material Sites SR 14 to McLoughlin Boulevard

Columbia River CROSSING

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N
W E
S

0 500 1,000
Feet

Main Project Area
Database Site

*Note: Only sites that are visible in this extent are shown.
Sites located at greater distances are not mapped.

Exhibit 3-13c. Database Hazardous Material Sites
Marine Drive and Hayden Island

Columbia River CROSSING

Analysis by Marshall; Analysis Date: December 2010; File Name: P:\GIS\CRC\GIS\MXD_PDF\TECH_REPORTS\HAZMAT\Ex_3-13c_Database_HAZMAT-Sites_South.mxd

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Exhibit 3-14. Sanborn Map Review Summary Table

Site ID	Title/ Business Description	Address	City / State	Year	Ranking	Rationale
S-1	Service Station	N Union and N Denver	Portland, OR	1950	H	1
S-2	Service Station	11348 N Denver	Portland, OR	1950	H	1
S-3	Service Station	12020 N Union Ave.	Portland, OR	1950	H	1
S-4	Old Mill	Vicinity of former Hayden Island	Portland, OR	1950	H	1
S-5	Service Station	12022 N Union Ave.	Portland, OR	1969	H	1
S-6	Boiler House	Vicinity of former Hayden Island	Portland, OR	1950	L	6
S-7	Boat Construction and Repair	Pier 99	Portland, OR	1950	H	1
S-8	Service Station	N Denver	Portland, OR	1950	H	1
S-9	Service Station	N Denver/N Union north	Portland, OR	1950	H	1
S-10	Hardware/Paint store	605/607 Main	Vancouver, WA	1911	L	5
S-11	Paint Store/ Gas & Oil	413 Main	Vancouver, WA	1911	H	1
S-12	Paint/Hardware Store	715 Washington	Vancouver, WA	1911	L	5
S-13	Paint/Wallpaper Store	119 E 5th	Vancouver, WA	1911	L	5
S-14	Paint/Wallpaper Store	815 Washington	Vancouver, WA	1911	L	5
S-15	Anderson Stringfellow Planing Mill	115 E 15th St	Vancouver, WA	1911	H	1
S-16	Upholstery and Carpet Cleaning	109 E 15th St	Vancouver, WA	1911	H	4
S-17	Auto Parts and Service	1000 Main/100 W 10th	Vancouver, WA	1949	H	1
S-18	Auto Repair	1610 Broadway	Vancouver, WA	1949	H	1
S-19	Auto Repair	309 Main	Vancouver, WA	1949	H	1
S-20	Auto Repair	3909 H St.	Vancouver, WA	1949	H	1
S-21	Auto/Radiator Repair	201/207 W 2nd	Vancouver, WA	1949, 1966	H	1
S-22	Auto Sales	100 W 2nd	Vancouver, WA	1949	L	7
S-23	Auto Sales	1009-1015 Washington/115 W 11th	Vancouver, WA	1949	L	7
S-24	Auto Sales	115 E 11th	Vancouver, WA	1949	L	7
S-25	Auto Sales	1601-1605 Washington	Vancouver, WA	1949, 1966	L	7
S-26	Auto Sales	202 E 9th	Vancouver, WA	1949	L	7
S-27	Auto Sales	215 W 5th	Vancouver, WA	1949	L	7
S-28	Auto Sales	316 Washington	Vancouver, WA	1949	L	7
S-29	Auto Sales	500 Broadway	Vancouver, WA	1949, 1966	L	7
S-30	Auto Sales	900 Broadway	Vancouver, WA	1949, 1966	L	7
S-31	Auto Sales and Repair	305 Main	Vancouver, WA	1949	H	1
S-32	Auto Sales and Repair	814 C St.	Vancouver, WA	1949	H	1
S-33	Auto Sales and Service	100/102 W 3rd	Vancouver, WA	1949	H	1
S-34	Auto Sales and Service	1900 Main/100 W 19th	Vancouver, WA	1949	H	1
S-35	Auto Sales and Service	2000/2002 Main/100 W 20th	Vancouver, WA	1949	H	1
S-36	Auto Service and Repair	700 E 22nd	Vancouver, WA	1949, 1966	H	1
S-37	Auto Service Shop/Painting	1501 Main	Vancouver, WA	1949	H	2
S-38	Auto Wrecking Yard	201/203 W 3rd	Vancouver, WA	1949	H	3
S-39	Battery Repair	1010 Washington/206 W 10th	Vancouver, WA	1949	H	8
S-40	Car Lot and garage	1800/1810 Washington	Vancouver, WA	1949, 1966	H	1
S-41	Auto Spray Painting	1011 Columbia	Vancouver, WA	1949	H	2
S-42	Columbia Feed and Fuel Company	515 Broadway	Vancouver, WA	1949	L	7
S-43	Motorcycle Sales and Service	307 W 4th	Vancouver, WA	1949	L	1

Exhibit 3-14. Sanborn Map Review Summary Table

Site ID	Title/ Business Description	Address	City / State	Year	Ranking	Rationale
S-44	Neon Sign Store	205 E 15th	Vancouver, WA	1949	L	
S-45	Oil Warehouse	1612 Broadway	Vancouver, WA	1949	H	1
S-46	Service Station	1003 Washington	Vancouver, WA	1949	H	1
S-47	Service Station	1100 Washington	Vancouver, WA	1949, 1966	H	1
S-48	Service Station	1215 Main	Vancouver, WA	1949	H	1
S-49	Service Station	1301 Main	Vancouver, WA	1949	H	1
S-50	Service Station	1302 Main	Vancouver, WA	1949	H	1
S-51	Service Station	1600 Main/100 W 16th	Vancouver, WA	1949	H	1
S-52	Service Station	1615 Washington	Vancouver, WA	1949	H	1
S-53	Service Station	1700 Washington	Vancouver, WA	1949, 1966	H	1
S-54	Service Station	1715 Washington	Vancouver, WA	1949	H	1
S-55	Service Station	1800 Main/100 W 18th	Vancouver, WA	1949, 1966	H	1
S-56	Service Station	1801 Main/100 E 18th	Vancouver, WA	1949	H	1
S-57	Service Station	212 W 8th	Vancouver, WA	1949	H	1
S-58	Service Station	1114 Washington	Vancouver, WA	1949	H	1
S-59	Service Station	301 Washington	Vancouver, WA	1949	H	1
S-60	Service Station	401-405 Washington	Vancouver, WA	1949, 1966	H	1
S-61	Service Station	414 Reserve/213 E 5th	Vancouver, WA	1949	H	1
S-62	Service Station	415 Washington/109 W 5th	Vancouver, WA	1949	H	1
S-63	Service Station	501 Washington/114 W 5th	Vancouver, WA	1949, 1966	H	1
S-64	Service Station	601 Broadway	Vancouver, WA	1949	H	1
S-65	Service Station	909-915 Washington	Vancouver, WA	1949	H	1
S-66	Sheet Metal Works	1410-1412 Main	Vancouver, WA	1949, 1966	H	1
S-67	Sign Painting	209-211 Main	Vancouver, WA	1949	L	2
S-68	Tire Service	611 Broadway	Vancouver, WA	1949	L	7
S-69	Furniture Factory	100 Washington	Vancouver, WA	1949	L	5
S-70	Tractor Sales and Service	304 Columbia	Vancouver, WA	1949, 1966	H	1
S-71	Use Auto Sales	1707 Washington	Vancouver, WA	1949	L	7
S-72	Auto and Truck Servicing	313-315 W 5th	Vancouver, WA	1966	H	1
S-73	Auto Body Shop	210 W 16th	Vancouver, WA	1966	H	2
S-74	Auto Repair	211 W 16th	Vancouver, WA	1966	H	1
S-75	Auto Repair	112 E 15th St	Vancouver, WA	1966	H	1
S-76	Auto Sales	201 W 15th	Vancouver, WA	1966	L	7
S-77	Auto Sales	201 E 17th	Vancouver, WA	1966	L	7
S-78	Auto Sales	NE corner of Broadway and E 8th	Vancouver, WA	1966	L	7
S-79	Auto Sales	1628 Broadway	Vancouver, WA	1966	L	7
S-80	Auto Sales	101 E 15th St	Vancouver, WA	1966	L	7
S-81	Auto Sales and Paint	NW corner of C St. and E 8th	Vancouver, WA	1966	H	2
S-82	Auto Sales and Service	900 C St.	Vancouver, WA	1966	H	1
S-83	Auto Sales-Service-Repair	115 E 7th St	Vancouver, WA	1966	H	1
S-84	Auto Service	204 W 8th	Vancouver, WA	1966	L	7
S-85	Motorcycle Sales	1711 Main	Vancouver, WA	1966	L	7
S-86	Planing Mill	SW corner of Main and W 16th	Vancouver, WA	1966	H	1

Exhibit 3-14. Sanborn Map Review Summary Table

Site ID	Title/ Business Description	Address	City / State	Year	Ranking	Rationale
S-87	Service Station	1215 Washington/115 E 13th	Vancouver, WA	1966	H	1
S-88	Service Station	1408 Broadway/112 Mill Plain Blvd	Vancouver, WA	1966	H	1
S-89	Service Station	715 Broadway/201 E 8th	Vancouver, WA	1966	H	1
S-90	Service Station	812 Columbia	Vancouver, WA	1966	H	1
S-91	Service Station	214 W Evergreen	Vancouver, WA	1966	H	1
S-92	Service Station	1405 Main St/ 200 Mill Plain	Vancouver, WA	1966	H	1
S-93	Tire Sales and Service	800 Block of C St.	Vancouver, WA	1966	L	7
S-94	Auto Junk Yard, Truck&Equipment	500 Columbia	Vancouver, WA	1949, 1966	H	3
S-95	Used Auto Sales	SE corner of Main and McLoughlin	Vancouver, WA	1966	L	7
S-96	Modern Steam Laundry	215 E 6th	Vancouver, WA	1911	H	4, 6
S-97	Machine Shop For Ice Factory	209 W 7th	Vancouver, WA	1911	H	6
S-98	Hotel St. Elmo	414 Washington	Vancouver, WA	1911, 1949	L	6
S-99	Columbia Hotel	214 Main St	Vancouver, WA	1911	L	6
S-100	Service Station	910 E 22nd St	Vancouver, WA	1949	H	1
S-101	Service Station	1012 E 24th sty	Vancouver, WA	1949	H	1
S-102	Service Station	1827 E 39th	Vancouver, WA	1949, 1966	H	1
S-103	Asphalt Paving Plant	415 W 4th St	Vancouver, WA	1949, 1966	H	1
S-104	Service Station	1803 Washington	Vancouver, WA	1949	H	1
S-105	Auto Repair	101 Columbia	Vancouver, WA	1966	H	1
S-106	Central Manufacturing	1510 Main St	Vancouver, WA	1911, 1949	H	6
S-107	Elite Stream Laundry	215 Main St.	Vancouver, WA	1911	H	4
S-108	Service Station	111 W 8th St.	Vancouver, WA	1949	H	1
S-109	Machine Shop	400 Columbia St	Vancouver, WA	1949, 1966	H	1
S-110	Evergreen Laundry	1929 Main St	Vancouver, WA	1966	H	4
S-111	Auto Repair	500 E Mill Plain	Vancouver, WA	1966	H	1
S-112	Machine Shop (1949), Auto & Truck	317 W 4th	Vancouver, WA	1949, 1966	H	1
S-113	Gas, Oil & Servicing	215 Washington	Vancouver, WA	1949	H	1
S-114	Auto Repair	114 W 2nd St	Vancouver, WA	1949	H	1
S-115	Vancouver Laundry	309/311 Main	Vancouver, WA	1949	H	4
S-116	Service Station	2900 K St.	Vancouver, WA	1949	H	1
S-117	Auto Repair	901 Columbia	Vancouver, WA	1949	H	1

Notes:

Rationale

1 May have used and/or stored: solvents for parts cleaning; petroleum products diesel, gasoline, lube and waste oils
2 May have used and/or stored paints and solvents
3 Likely conducted dismantling of vehicles and stored metal parts and debris
4 Likely used and stored drycleaning chemicals
5 May have stored adhesives and paints
6 Boiler present
7 Likely stored petroleum products
8 Likely stored acids and metals

Ranking

H = high probability of encountering contamination
L = low probability of encountering contamination

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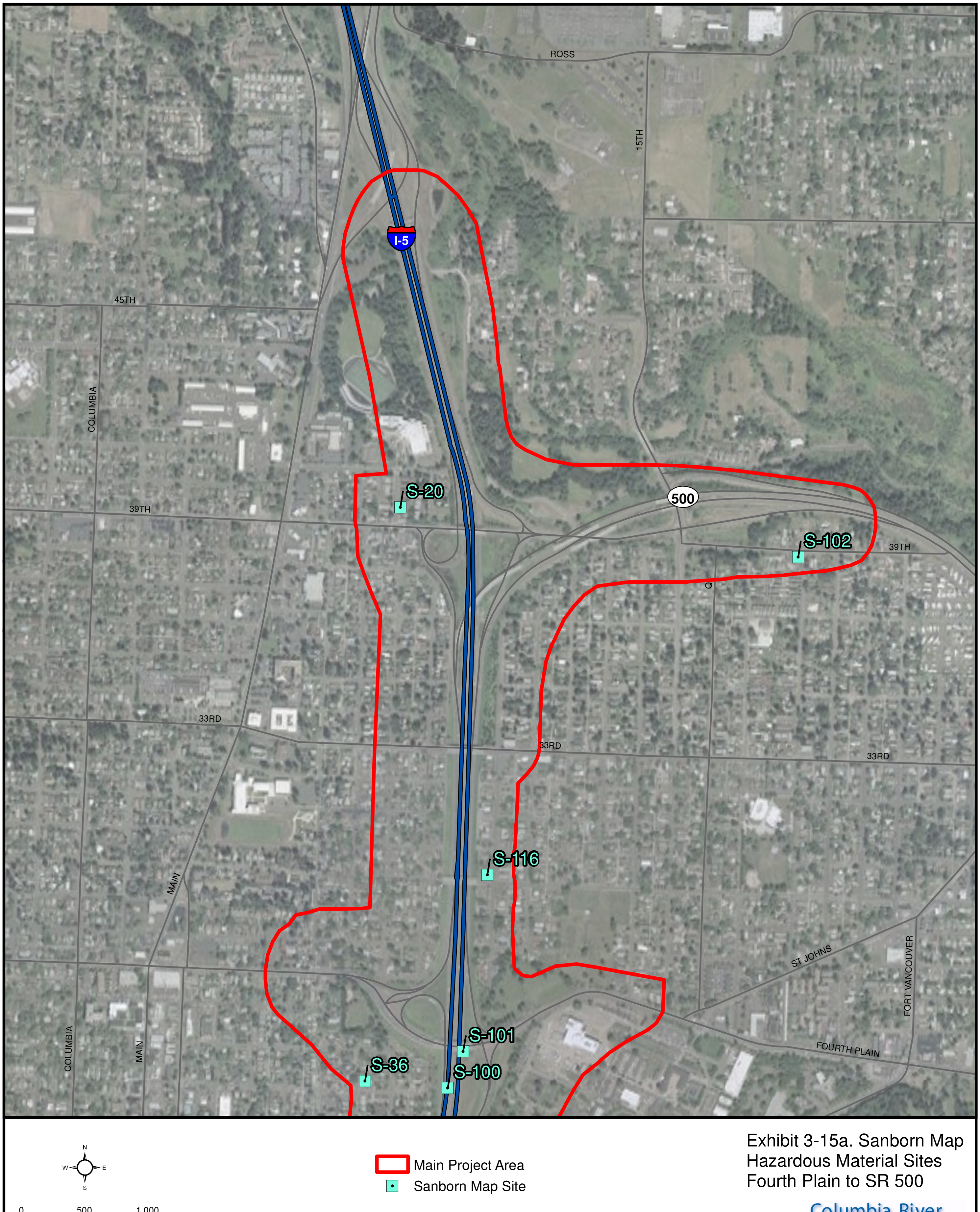

Exhibit 3-15a. Sanborn Map Hazardous Material Sites Fourth Plain to SR 500

Columbia River CROSSING

Analysis by Marshall; Analysis Date: December 2010; File Name: P:\GIS\CRC\GIS\MXD_PDF\TECH_REPORTS\HAZMAT\Ex_3-15a_Sanborn_HAZMAT-Sites_North.mxd

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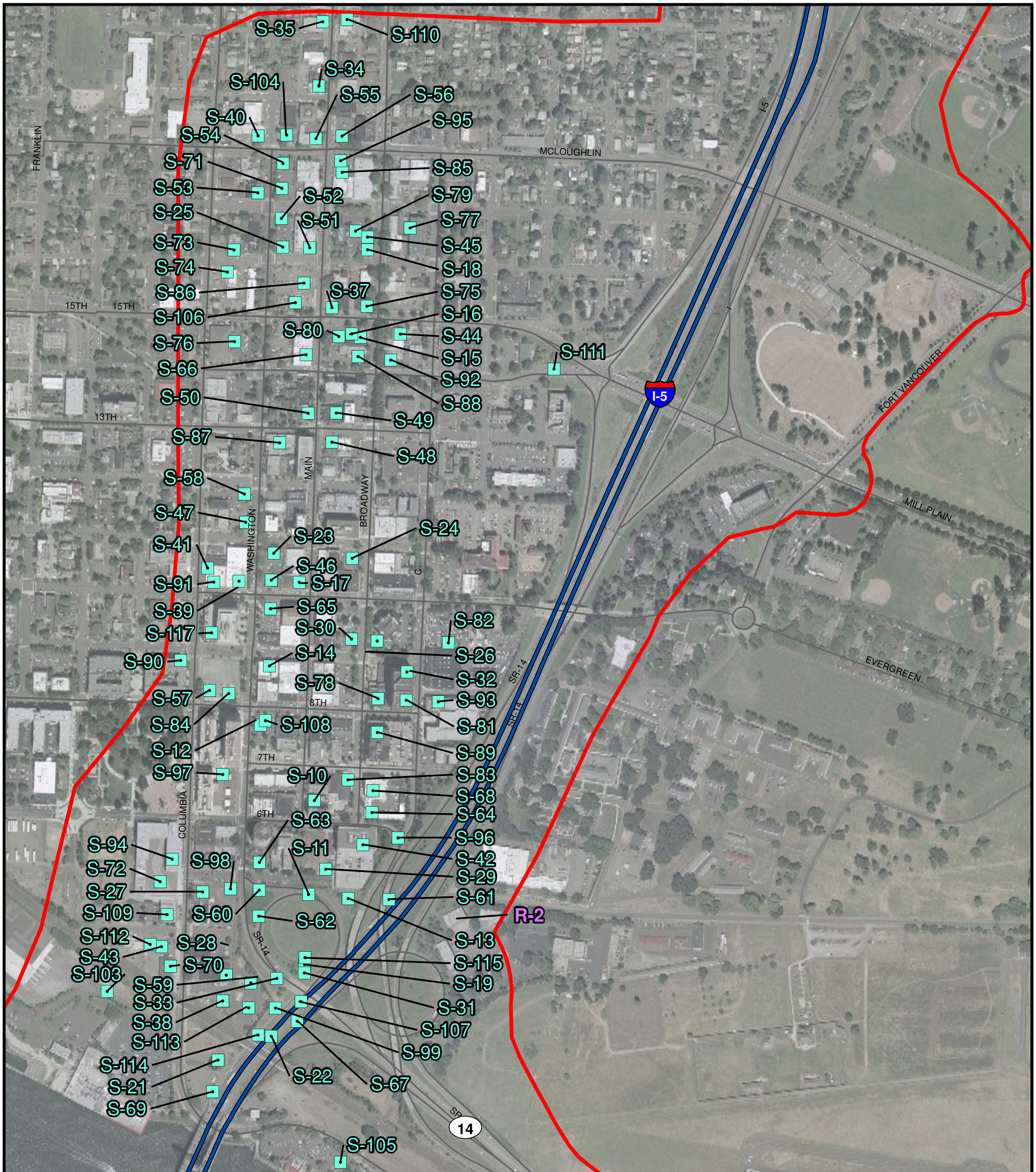

Main Project Area

Sanborn Map Site

Exhibit 3-15b. Sanborn Map Hazardous Material Site SR 14 to McLoughlin Boulevard

Columbia River CROSSING

Analysis by Marshall; Analysis Date: December 2010; File Name: P:\GIS\CRC\GIS\MXD_PDF\TECH_REPORTS\HAZMAT\Ex_3-15b_Sanborn_HAZMAT-Sites_Mid.mxd

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N
W E
S

0 500 1,000
Feet

Main Project Area
Sanborn Map Site

Exhibit 3-15c. Sanborn Map Hazardous Material Sites Marine Drive and Hayden Island

Columbia River CROSSING

Analysis by Marshall; Analysis Date: December 2010; File Name: P:\GIS\CRC\GIS\MXD_PDF\TECH_REPORTS\HAZMAT\Ex_3-15c_Sanborn_HAZMAT-Sites_South.mxd

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3.3.4 Site Reconnaissance Results

A drive-by survey was conducted on May 15 and 16, 2006. The survey was conducted to confirm or correct the physical locations of several sites identified during the DEIS process. In cases where the same sites were identified in both the DEIS and the FEIS, these confirmations or corrections were applied to the FEIS. Remaining sites were confirmed using Google Streetview Software and Bing maps Bird’s Eye viewer. Based on site reconnaissance, two sites (Speed Tech Garage, 11051 N Vancouver Way, Portland OR [R-1] (Exhibit 3-15c), and Military Motor Pool, 610 E 5th Street, Vancouver, Washington [R-2]) have potential RECs (Exhibit 3-15b).

3.4 Properties External to the Main Project Area

3.4.1 TriMet Ruby Junction Maintenance Facility

Planned increases in light rail service are anticipated with the inclusion of the CRC project and/or with the inclusion of Portland Milwaukie Light Rail (PMLR). These increases in service will necessitate the expansion of the Ruby Junction Maintenance Facility, which will require land acquisition and modification to the existing structure. Therefore, this site, which is located in Gresham, Oregon, has been added to the CRC hazardous materials evaluation as part of property acquisition activities.

Review of DEQ files for this site indicates that this parcel completed cleanup activities for leaking underground storage tanks (LUSTs) in 1994 and 1998. The facility is also a small quantity generator for hazardous wastes, including solvents, batteries, and paints.

Review of the DEQ facility profiler indicates that a number of sites with RECs are within 500 feet of the expanded facility boundaries (Exhibit 3-16). These sites include:

- MAACO Auto Paint, OR-ECSI ID 132: Alleged solvent dumping at site; low level of solvent and gas/oil soil contamination, DEQ determined no hazardous waste violation. No Further Action (NFA) February 1992.
- AAMCO, OR-LUST: Overfill of waste oil UST. Cleanup start June 1993, end November 1997.
- Zeller, Frankie - DBA, OR-LUST: Gasoline UST, decommissioned. Cleanup start May 1992, end October 1996.
- Toms Auto Body & Painting, OR-HazWaste: Conditionally Exempt Generator (CEG), inactive January 2003.
- TRIMET, OR-LUST, OR-HazWaste: LUST Cleanup start March 1994, end November 1994. CEG as of December 2007.
- Coachmen Body & Frame HOT, OR-LUST: Heating oil, Cleanup start October 1991, end March 1992.
- Gresham Sanitary Service Birdsdale Collection Site, OR-SWL-LF: Transfer station, no violations reported.

3.4.2 Staging Areas

Three sites have been identified as possible major staging areas for the project. These sites include the Former Thunderbird Hotel, Red Lion, and Port of Vancouver Parcel 1A site (Exhibit

1-4). A summary of database findings for the staging area sites and their respective adjacent properties is provided below.

Former Thunderbird Hotel

Review of the DEQ facility profiler indicates that historical site uses include a solid waste landfill (Site ID 103) and a service station (Site ID 107). Description of the nature and extent of contamination, if any, is not easily available. These former site uses represent a REC.

Red Lion

Review of the Ecology EMI System indicates no database hits. Review of Sanborn maps indicates that a historic asphalt plant was located at the site as part of the Boise Cascade facility. The previous operation at this site represents a REC.

Port of Vancouver Parcel 1A

Review of the Ecology EMI System indicates no database hits.

3.4.3 Casting Areas

Two sites have been identified as possible casting area/staging yards. These are the Sundial Road Site and the Alcoa/Evergreen Site (Exhibit 1-4). A summary of database findings for the casting area sites and their respective adjacent properties is provided below.

Knife River Sundial Site, 5700 NE Sundial Road, Trou**tdale Oregon**

The site is also known as the former Morse Brothers Site. Review of the DEQ facility profiler indicates that the facility currently holds an NPDES General Industrial Permit for Industrial Stormwater Discharge (No. 16767) and an Air Quality Permit (No. 26-0101-09-01). No permit violations were identified.

Aerial photograph review of the site using Microsoft Bing Map Search suggests that the facility may have environmental issues that include, but are not limited to: truck wash rack, storage of on-site chemicals or amendments for concrete production, an asphalt waste pile, settling or solids ponds, Company Lake slough along the east side of the property, distressed vegetation on the south side of the property, and potential fueling operations.

N W E S

0 0.025 0.05
Miles

Taxlots to be Acquired for Facility Expansion

Proposed Rail Expansion

Proposed Maintenance Shop

Exhibit 3-16. Ruby Junction and Identified Hazardous Material Sites Location Map

Columbia River CROSSING

Analysis by Marshall; Analysis Date: Feb. 2010; File Name: P:\GIS\CRC\GIS\MXD_PDF\TECH_REPORTS\HAZMAT\Ex_3-16_Ruby_Junction.mxd

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Sites Adjacent to Knife River

Sundial Marine Tugboat and Barge Works, Inc., 5605 NE Sundial Road

Review of DEQ's facility profiler indicates that the site is an identified small quantity hazardous waste generator. Waste stream includes paint thinners and petroleum distillates related to painting, coating, dipping and spraying. Other waste streams include aqueous solutions used for parts cleaners and lead paint chips from chipping and scrapping activities. The facility also has an individual NPDES permit for industrial wastewater discharge.

Review of the site using Microsoft's Bing Map Search suggests that the facility may have environmental issues associated with outbuildings that store hazardous substances or petroleum products, and sediment impacts associated with tug and barge maintenance. The site is downriver of and adjacent to the Knife River Site.

Reynolds Metals Company, 5100 NE Sundial Road

Review of DEQ's facility profiler indicates that the site is in DEQ's cleanup program (ESCI No. 154) and is an EPA NPL site. Historic aluminum production resulted in metals (arsenic, cyanide, barium, and magnesium), PAHs, PCBs, and fluoride contamination to soil, groundwater, and sediments in Company Lake and to the wetlands north of the dike. Numerous remedial cleanup actions have been completed. Currently all soil and debris cleanup has been completed and an active groundwater pumping system is operating. The former main facility is just south and approximately 1,000 feet and Company Lake is immediately adjacent to the Knife River Site.

US Department of Energy-Bonneville Power Administration Substation, 5200 NE Sundial Road

Review of DEQ's facility profiler indicates that the site is enrolled in DEQ's cleanup program (ESCI No. 251); however, the site has received a NFA determination. The substation provided electricity to the Reynolds Aluminum Plant. Historic site activities resulted in PCB contamination to soil. PCB levels were cleaned up to 1 part per billion (ppb) and the site was capped. The site is just south and within approximately 1,000 feet of the Knife River Site.

Port of Vancouver - Alcoa/Evergreen West Sites, 5509 Lower River Road, Vancouver

Review of Ecology's facility information sheet indicates that the site is currently enrolled in the cleanup program (Facility Site IDs 21 & 25) and was formerly an EPA NPL site. The site is a former aluminum smelter which discontinued operations in 1985. Alcoa sold the aluminum smelter to VANALCO. VANALCO has since been sold to Evergreen Aluminum (Glencore). While Alcoa has sold or discontinued all operations and divested much of the smelter property, the company has retained ownership of certain parcels, including the dock and alumina unloading facilities. Industrial and solid wastes from construction and operation of the aluminum smelter were stored in waste piles and consolidated in landfills on-site over the years. Historic activities resulted in contamination to soil, groundwater and sediments. Contaminants include petroleum hydrocarbons, PCBs, cyanide, fluoride, TCE, low-level organic chemicals, and metals.

Current Cleanup Status

East Landfill

East Landfill is located on Alcoa's eastern parcel. Contaminated waste and soil associated with the landfill were consolidated and placed in a double-lined cap system with river bank armor. Ecology is still actively negotiating a cleanup strategy with Alcoa to address the TCE contamination in the groundwater beneath the landfill. In December 2008 and January 2009, Alcoa evaluated the impact of groundwater contamination from the East Landfill on the Columbia River. Samples of surface water and transition zone groundwater were analyzed for landfill contaminants and indicate the groundwater entering the Columbia River did not exceed MTCA surface water cleanup levels. Additional groundwater samplings of the sediment are currently underway to verify these initial results.

Columbia River Work

In late November 2008, the U.S. Army Corps of Engineers approved Alcoa's permit application to work in the Columbia River. Alcoa began dredging contaminated sediments on December 1, 2008. Within the first week, the majority of high-level PCB-contaminated sediment was removed. Alcoa began removing contaminated sediment from the clam beds the week of December 4, 2008. Dredging of low-level PCB-contaminated sediment was completed in January 2009. In February, clean sediment was placed in the dredged areas and in low- level contaminated areas near the smelter dock. Sampling results from the dredged riverbed show the project successfully achieved the PCB cleanup goals. Water quality was checked throughout the project, and there were no violations of the standards.

Upland soil removal and bank stabilization work is proceeding along the river bank in front of the dredged areas. The south shoreline contains brick and tar waste. All of the upland aluminum manufacturing and fabrication buildings have been removed. Demolition of the ore storage silos that remain along the Columbia River was completed in early 2009.

The river cleanup addresses: 1) PCB-impacted sediments found in the Columbia River, 2) petroleum-impacted soils found in buried lagoons called the Crowley Parcel, 3) petroleum-impacted soils found near four underground storage tanks on the river dike, and 4) PCB-impacted soils found in an area known as the Soluble Oil Area on the east side of the site.

Vanexco Inc., 5509 Lower River Road

Vanexco is located on the eastern parcel of the Alcoa site. PCB-contaminated soil is present under building sub slabs. Impacted soils have been excavated and properly disposed.

Northeast Parcel Jail Site

The jail site was reported on Ecology's website as being remediated.

Alcoa Vancouver Works Industrial Lagoons

The industrial lagoons are located on Alcoa's western parcel. Sludge waste associated with the two lagoons was characterized and disposed of in 1994. The two lagoons were relined and currently contain wastewater. The Port of Vancouver indicated that the lagoons posed low risk during their due diligence process.

Site Wide Groundwater

Site-wide groundwater has contaminant levels that exceed generic risk levels. Future remediation of groundwater will not likely occur. However, a groundwater monitoring program is in place.

Sites Adjacent to Alcoa

Columbia Marine Lines, 6305 Lower River Road

A review of the Ecology database indicates that the site has confirmed soil and groundwater impacts. Remedial actions have been implemented and on-going operations and maintenance activities are occurring.

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4. Identified Hazardous Material Sites Data Evaluation

This section evaluates information on existing conditions provided in Section 3 as a means to help assesses potential future effects to the environment and to construction from the No-Build Alternative and the LPA.

4.1 Ranking of Database Sites

A summary of hazardous materials sites identified during the database search is displayed on Exhibit 4-1. The exhibit indicates that out of the 238 sites, 21 sites have a #4 ranking, and 8 sites have a #5 ranking (see Section 2 for a full description of ranking procedures). These 29 sites are referred to as higher priority sites because of their potential to cause adverse environmental effects.

- The #4 sites are within the main project area and have a known or suspected release of a hazardous substance or petroleum product. However, these sites are inactive, or have received a NFA determination for the federal or state agency. In general, releases at these sites typically stemmed from a LUST or spill.
- The #5 sites are within the main project area and have a known or suspected release of a hazardous substance or petroleum product. These sites are in an active phase of investigation, cleanup or long-term action. Therefore, these sites have a higher likelihood of encountering hazardous materials.

4.2 State Environmental Informational Review of Priority Database Hazardous Material Sites

Based on the ranking results a more detailed informational review was performed on the following 29 priority database hazardous material sites (21 #4 ranked sites and eight #5 ranked sites). The review was conducted in late 2009 and early 2010. The intent of the review was to gain further understanding of the release mechanism, type of contaminants, affected media, and site status. The approximate location of the sites is shown on Exhibits 4-2a through 4-2c.

Exhibit 4-1. Ranked Database Hazardous Material Site Summary Table

			Location						Known or Suspected Release		Cleanup Complete		
			API		0.5 mile Perimeter		1.0 mile Perimeter						
Site ID	NAME	City / State	Out	In	Out	In	Out	In	Yes	No	Yes	No	Rank
1	ARCO SS 6211	Vancouver, WA	●			●	●		●		●		3
2	US BPA ROSS/USDOE BONNEVILLE PWR COMPLEX	Vancouver, WA	●			●	●		●		●		3
3	WA DOT RETENTION POND	Vancouver, WA		●	●		●		●			●	5
4	TIME OIL HANDY ANDY 8	Vancouver, WA	●		●			●	●			●	3
5	WDOT-VANCOUVER MAIN ST	Vancouver, WA	●			●	●		●			●	3
6	BURLINGTON NORTHERN-SANTA FE RAILWAY CO	Vancouver, WA	●		●			●	●			●	3
7	76 24 HR FOOD MART	Vancouver, WA	●			●	●		●		●		3
8	ARCO 5739 PSI 5379	Vancouver, WA	●			●	●			●			1
9	HIDDEN BROTHERS	Vancouver, WA		●	●		●			●			2
10	RUDYS RELIABLE AUTO CARE	Vancouver, WA	●			●	●			●			1
11	SOUTHWEST WASHINGTON MEDICAL CENTER	Vancouver, WA	●			●	●		●		●		3
12	DEGAGNE PROPERTY	Vancouver, WA	●			●	●		●			●	3
13	FIRST UNITED METHODIST CHURCH	Vancouver, WA	●			●	●			●			1
14	KADELS CASCADE AUTO BODY	Vancouver, WA	●			●	●		●		●		3
15	Valero LP	Vancouver, WA	●		●			●	●			●	3
16	VANCOUVER GAS MANUFACTURING SITE	Vancouver, WA	●		●			●	●		●		3
17	TETRA PAK	Vancouver, WA	●		●			●	●			●	3
18	GOODWIN RD ACID DRUM	Vancouver, WA		●	●		●			●			2
19	QUICK SHOP MINIT MART 28	Vancouver, WA	●			●	●		●		●		3
20	CRITES PROPERTY	Vancouver, WA	●			●	●		●			●	3
21	SHULL PROPERTY	Vancouver, WA	●			●	●		●			●	3
22	USARMY NG VANCOUVER BARRACKS	Vancouver, WA	●		●			●	●		●		3
23	CITY OF VANCOUVER	Vancouver, WA	●			●	●			●			1
24	PIERRE'S FOREIGN CAR REPAIR	Vancouver, WA	●			●	●		●		●		3
25	VA MEDICAL CENTER VANCOUVER DIVISION	Vancouver, WA		●	●		●			●			2
26	DEPT OF VETERANS AFFAIRS	Vancouver, WA	●			●	●		●			●	3
27	WA AGR CLARK 2	Vancouver, WA		●	●		●			●			2
28	USWCOM VANCOUVER OXFORD CO	Vancouver, WA	●			●	●			●			1
29	PHOENIX 120 GRANT ST PROPERTY	Vancouver, WA	●			●	●		●		●		3
30	VANCOUVER WATER STATION #1 CONTAMINATION	Vancouver, WA	●			●	●		●			●	3
31	TIRES UNLIMITED	Vancouver, WA	●			●	●		●		●		3
32	MINIT MART 730	Vancouver, WA	●			●	●		●		●		3
33	WA DOT VANCOUVER SR 4	Vancouver, WA		●	●		●			●			2
34	PINNACLE INC	Vancouver, WA	●			●	●			●			1
35	MALCOLM MONTAGUE	Vancouver, WA	●		●			●	●			●	3
36	CITY OF VANCOUVER	Vancouver, WA		●	●		●		●		●		4
37	SAMS AUTO BODY	Vancouver, WA		●	●		●			●			2
38	VELMA B JORDAN	Vancouver, WA		●	●		●			●			2

Exhibit 4-1. Ranked Database Hazardous Material Site Summary Table

Site ID	NAME	City / State	Location						Known or Suspected Release		Cleanup Complete		Rank
			API		0.5 mile Perimeter		1.0 mile Perimeter						
			Out	In	Out	In	Out	In	Yes	No	Yes	No	
39	HOESLY AUTO SERVICE INDIVIDUAL	Vancouver, WA		●	●		●		●		●		4
40	SHERWIN WILLIAMS CO VANCOUVER	Vancouver, WA		●	●		●			●			2
41	DON LORENTZ & ASSOCIATES	Vancouver, WA		●	●		●			●			2
42	LARKINS GARAGE	Vancouver, WA		●	●		●			●			2
43	ESTATE OF MARY E MACKAY	Vancouver, WA		●	●		●			●			2
44	HOLLAND/BURGERVILLE PROPERTY	Vancouver, WA	●			●	●			●			1
45	VALERO LP	Vancouver, WA	●			●	●		●			●	3
46	VANPORT INDUSTRIES INC.	Vancouver, WA	●		●			●		●			0
47	VANCOUVER ENGINE EXCHANGE	Vancouver, WA		●	●		●			●			2
48	PINKERTONS AUTO REPAIR	Vancouver, WA		●	●		●			●			2
49	KYUNGSHIN CHOI/MATTHIEU'S CAR CARE	Vancouver, WA		●	●		●		●		●		4
50	TREADS R US	Vancouver, WA	●			●	●		●		●		3
51	WHATLEY DECANT STATION CLARK COUNTY PUBLIC WORKS	Vancouver, WA	●			●	●			●			1
52	CHUCK'S TIRE & AUTO SERVICE	Vancouver, WA		●	●		●		●		●		4
53	QC CLEANERS	Vancouver, WA		●	●		●			●			2
54	VANCOUVER CHEVRON	Vancouver, WA		●	●		●			●			2
55	VANCOUVER IRON & STEEL INC/ VANRICH CASTING	Vancouver, WA	●			●	●		●		●		3
56	SPECIAL EVENTS & CONVENTION CENTER	Vancouver, WA		●	●		●		●		●		4
57	ROYAL APTS	Vancouver, WA	●			●	●			●			1
58	VANCOUVER POLICE BUILDING	Vancouver, WA		●	●		●			●			2
59	CLARK COUNTY CORRECTION CENTER	Vancouver, WA	●			●	●			●			1
60	CLARK PUBLIC UTILITY DISTRICT	Vancouver, WA		●	●		●			●			2
61	EMERALD PETROLEUM SERVICES VANCOUVER	Vancouver, WA	●			●	●		●			●	3
62	FT VANCOUVER REGIONAL LIBRARY	Vancouver, WA		●	●		●			●			2
63	PACIFIC COGENERATION, INC.	Vancouver, WA	●			●	●		●			●	3
64	OLTMANN'S MOBIL SERVICE	Vancouver, WA		●	●		●			●			2
65	CLARK COUNTY JUVENILE DEPT	Vancouver, WA	●			●	●			●			1
66	HEGEWALD INC	Vancouver, WA	●			●	●			●			1
67	WOLF SUPPLY CO VANCOUVER	Vancouver, WA		●	●		●			●			2
68	MARSHALL VANCOUVER FORD	Vancouver, WA		●	●		●			●			2
69	THE ACADEMY	Vancouver, WA		●	●		●			●			2
70	WA STATE PATROL VANCOUVER	Vancouver, WA		●	●		●			●			2
71	METRO BUICK OLDS VANCOUVER	Vancouver, WA		●	●		●		●		●		4
72	EOFF ELECTRIC CO	Vancouver, WA	●			●	●			●			1
73	PACIFIC TELECOM CORP OFFICE	Vancouver, WA		●	●		●			●			2
74	BILL COPPS INC.	Vancouver, WA		●	●		●			●			2
75	VANCOUVER WELDING SUPPLY COMPANY	Vancouver, WA	●			●	●			●			1
76	VANCOUVER CITY BREWERY BLOCKS	Vancouver, WA	●			●	●		●		●		3

Exhibit 4-1. Ranked Database Hazardous Material Site Summary Table

Site ID	NAME	City / State	Location						Known or Suspected Release		Cleanup Complete		Rank
			API		0.5 mile Perimeter		1.0 mile Perimeter						
			Out	In	Out	In	Out	In	Yes	No	Yes	No	
77	COLUMBIAN PUBLISHING CO THE	Vancouver, WA	●			●	●			●			1
78	VANCOUVER ICE AND FUEL	Vancouver, WA	●			●	●		●		●		3
79	GENERAL BREWING COMPANY	Vancouver, WA		●	●		●			●			2
80	BOISE CASCADE WHITE PAPER VANCOUVER	Vancouver, WA	●			●	●		●			●	4
81	USARMY HQ VANCOUVER BARRACKS/SUB-INSTALLATION	Vancouver, WA	●			●	●			●			1
82	CITY OF VANCOUVER	Vancouver, WA		●	●		●			●			2
83	LUCKY LAGER BREWERY	Vancouver, WA		●	●		●			●			2
84	HANNAH MOTOR COMPANY VW	Vancouver, WA		●	●		●			●			2
85	VANCOUVER BARRACKS	Vancouver, WA	●			●	●		●		●		3
86	SOUTHWEST DELIVERY CO INC	Vancouver, WA		●	●		●			●			2
87	FAULKNER USA	Vancouver, WA		●	●		●			●			2
88	FROM THE KENNELS	Vancouver, WA		●	●		●			●			2
89	ADMIRAL DISTRIBUTING	Vancouver, WA		●	●		●			●			2
90	HANNAH MOTOR CO	Vancouver, WA		●	●		●			●			2
91	USDOT FEDERAL HIGHWAY ADMIN - VANCOUVER	Vancouver, WA	●			●	●		●		●		3
92	SW WASHINGTON MEDICAL CENTER	Vancouver, WA	●			●	●			●			1
93	CAPITAL TACKEL MFG	Vancouver, WA		●	●		●			●			2
94	HANNAH MOTOR COMPANY	Vancouver, WA		●	●		●			●			2
95	HANNAH MOTOR COMPANY UST 10252	Vancouver, WA		●	●		●		●		●		4
96	HAYDEN ISLAND DUMPING AREA	Portand, OR	●		●			●	●		●		3
97	HAYDEN ISLAND DRUM	Portand, OR	●		●			●	●		●		3
98	Frontier Hard Chrome, Inc.	Vancouver, WA	●		●			●	●			●	3
99	SCHOONER CREEK BOAT WORKS	Portand, OR	●		●			●	●			●	3
100	VANCOUVER WATER STATION #4 CONTAMINATION	Vancouver, WA	●		●			●	●			●	3
101	COLUMBIA BUSINESS PARK BLDG 41 BAY 3	Vancouver, WA	●			●	●		●		●		3
102	FMC CORP VANCOUVER	Vancouver, WA	●			●	●		●		●		3
103	HAYDEN ISLAND LANDFILL	Portand, OR		●	●		●		●		●		4
104	HILLMAN PROPERTIES NW BLDG 39	Vancouver, WA	●		●			●	●		●		3
105	HILLMAN PROPERTIES NORTHWEST M	Vancouver, WA	●		●			●		●			0
106	SPILL	Portand, OR		●	●		●		●				4
107	ARCO SS #4475/ ATLANTIC RICHFIELD COMPANY	Portand, OR		●	●		●		●		●		4
108	MONTGOMERY WARDS JANTZEN BEACH	Portand, OR		●	●		●			●			2
109	MORRISON OIL CO.	Portand, OR	●		●			●	●			●	3
110	GRAPHIC PACKAGING CORPORATION	Portand, OR	●		●			●	●			●	3
111	MILWAUKIE DUMPING AREA/ CANOE BAY/SCHOONER CREEK BOAT WORKS	Portand, OR	●		●			●	●			●	3
112	ISLAND CONSTRUCTION SHOP YARD/ HILLMAN PROPERTIES	Portand, OR	●			●	●		●		●		3
113	K MART #(3430)	Portand, OR	●			●	●						1

Exhibit 4-1. Ranked Database Hazardous Material Site Summary Table

Site ID	NAME	City / State	Location						Known or Suspected Release		Cleanup Complete		Rank
			API		0.5 mile Perimeter		1.0 mile Perimeter						
			Out	In	Out	In	Out	In	Yes	No	Yes	No	
114	LACAMAS LABORATORIES	Portand, OR	•		•			•	•			•	3
115	COMPUTER CITY	Portand, OR	•			•	•			•			1
116	CONOCOPHILLIPS COMPANY - 255953/ UNOCAL SS 5953	Portand, OR		•	•		•		•			•	5
117	JANTZEN BEACH SHELL/ SHELL OIL COMPANY	Portand, OR		•	•		•		•			•	5
118	CHEVRON STATION - 90706/ CHEVRON JANTZEN BEACH 90706	Portand, OR		•	•		•		•		•		4
119	ROD'S TRUCK STOP	Portand, OR	•			•	•		•		•		3
120	HOME DEPOT NO 4007	Portand, OR		•	•		•			•			2
121	ENGINE-17	Portand, OR		•	•		•			•			2
122	PAYLESS 1506	Portand, OR		•	•		•			•			2
123	SPILL	Portand, OR	•			•	•		•			•	3
124	MONTGOMERY WARD #2237	Portand, OR		•	•		•			•			2
125	COLUMBIA CROSSINGS L.L.C./ JANTZEN BEACH MOORAGE	Portand, OR		•	•		•		•		•		4
126	BLUE HERON LANDING	Portand, OR	•			•	•		•			•	3
127	WASTE MGMT FORMER MERIT TRUCK STOP	Portand, OR	•			•	•			•			1
128	SF PROPERTY INVESTMENTS LLC/ STOCKYARDS PROPERTY	Portand, OR	•			•	•		•		•		3
129	ASHLAND INC	Portand, OR	•			•	•			•			1
130	HAYDEN ISLAND CLEANERS	Portand, OR		•	•		•		•		•		4
131	WASTE MANAGEMENT OF OREGON INC./ MERIT USA, INC.	Portand, OR	•			•	•		•		•		3
132	OREGON WASTE SYSTEMS - PROPOSED TRANSFER STATION	Portand, OR	•			•	•		•			•	3
133	SPILL	Portand, OR		•	•		•		•				4
134	BULK TRANSPORTATION PORTLAND TERMINAL	Portand, OR	•			•	•			•			1
135	BULK TRANSPORTATION SPILL PENINSULA TERMINAL	Portand, OR	•			•	•		•			•	3
136	EXPO CENTER	Portand, OR		•	•		•		•			•	5
137	VANPORT PLANT	Portand, OR		•	•		•		•	•		•	2
138	DIVERSIFIED MARINE INC.	Portand, OR		•	•		•		•			•	5
139	PENINSULA TERMINAL RR	Portand, OR	•			•	•		•		•		3
140	COLUMBIA RIVER YACHT CLUB	Portand, OR	•			•	•		•		•		3
141	HARBOR OIL INC./ CHEMPRO OF OREGON INC	Portand, OR	•			•	•		•			•	5
142	SPILL	Portand, OR		•	•		•		•				4
143	SCHOONER CREEK BOAT WORKS (FORMER)/ 1610 N PIER 99	Portand, OR		•	•		•		•			•	5
144	NORTH HARBOUR RESIDENCE INN	Portand, OR		•	•		•			•			2
145	FAIRFIELD INN & SUITES - NORTH HARBOUR	Portand, OR		•	•		•			•			2
146	MARINELAND PIER 99	Portand, OR		•	•		•			•			2
147	THE RESIDENCE AT NORTH HARBOUR	Portand, OR	•			•	•			•			1
148	NATIONWIDE DISTRIBUTORS	Portand, OR		•	•		•			•			2
149	SPEED-BUGGY ENT.	Portand, OR		•	•		•			•			2
150	PRIMA DONNA DEVELOPMENT	Portand, OR		•	•		•			•			2
151	PLAID PANTRY #209/ POTTER WEBSTER CONVIENCE STORE	Portand, OR		•	•		•		•			•	5

Exhibit 4-1. Ranked Database Hazardous Material Site Summary Table

Site ID	NAME	City / State	Location						Known or Suspected Release		Cleanup Complete		Rank
			API		0.5 mile Perimeter		1.0 mile Perimeter						
			Out	In	Out	In	Out	In	Yes	No	Yes	No	
152	NORTH HARBOR COMMERCIAL 2 & 3	Portand, OR	●			●	●			●			1
153	NORTH HARBOUR EAST PARCEL	Portand, OR	●			●	●			●			1
154	WEST ALICE	Portand, OR	●			●	●		●		●		3
155	SPILL	Portand, OR	●			●	●		●			●	3
156	BROWN K AHOT	Portand, OR	●			●	●		●		●		3
157	MOORE JIM	Portand, OR	●			●	●		●		●		3
158	SPILL	Portand, OR	●			●	●		●		●		3
159	MARKET TRANSPORT LTD.	Portand, OR	●			●	●		●			●	3
160	MARQUEZ JOHN	Portand, OR	●			●	●		●		●		3
161	FAZIO PROPERTY	Portand, OR		●	●		●		●		●		4
162	EAST DELTA PARK	Portand, OR	●			●	●			●			1
163	PORTLAND INTERNATIONAL RACEWAY	Portand, OR	●			●	●			●			1
164	YELLOW TRANSPORTATION/ YELLOW FREIGHT SYSTEM INC.	Portand, OR		●	●		●		●		●		4
165	FRUEHAUF TRAILER SERVICES, INC/ NORTH AMERICAN TRAILER	Portand, OR	●		●		●		●		●		3
166	SHELL OIL PRODUCTS, US	Portand, OR		●	●		●			●			2
167	LYNCH COMPANY, THE	Portand, OR		●	●		●			●			2
168	TED LAMM DBA LAMM MOTOR CO.	Portand, OR		●	●		●			●			2
169	A-1 CONTAINER SERVICES	Portand, OR		●	●		●			●			2
170	OR ST HWY 1-2B JANTZEN BEACH	Portand, OR		●	●		●			●			2
171	U-HAUL CENTER OF UNION AVE	Portand, OR		●	●		●			●			2
172	HANEY TRUCK LINE INC.	Portand, OR	●			●	●		●		●		3
173	SULLIVAN BRUCE	Portand, OR	●		●			●	●		●		3
174	CITY OF PORTLAND PARKS	Portand, OR		●	●		●		●		●		4
175	QUALITY CARRIERS INC/ STAR-OILCO	Portand, OR	●			●	●		●		●		4
176	JUBITZ TRAVEL CENTER/ JUBITZ TRUCK STOP	Portand, OR	●			●	●		●			●	3
177	JUBITZ TRAVEL CENTER	Portand, OR	●			●	●			●			1
178	WILLIG FREIGHT LINES/ WATKINS MOTORLINE/ WATKINS MOTOR	Portand, OR	●			●	●		●		●		3
179	SPILL	Portand, OR	●			●	●		●			●	3
180	BRUCE SULLIVAN	Portand, OR	●			●	●		●			●	3
181	JUBITZ RETREAD PLANT	Portand, OR	●			●	●		●		●		3
182	JUBITZ	Portand, OR	●			●	●		●		●		3
183	SPILL	Portand, OR	●			●	●		●			●	3
184	BCB PROPERTIES	Portand, OR	●			●	●		●			●	3
185	KOGLE, FLOYD	Portand, OR	●			●	●			●			1
186	PUGET SOUND TRUCK LINES INC	Portand, OR	●			●	●			●			1
187	R & J METAL FABRICATORS	Portand, OR	●			●	●			●			1
188	ANDERSON JOHN	Portand, OR	●			●	●		●		●		3
189	R&J METAL FABRICATORS INC.	Portand, OR	●			●	●			●			1

Exhibit 4-1. Ranked Database Hazardous Material Site Summary Table

Site ID	NAME	City / State	Location						Known or Suspected Release		Cleanup Complete		Rank
			API		0.5 mile Perimeter		1.0 mile Perimeter						
			Out	In	Out	In	Out	In	Yes	No	Yes	No	
190	REDI-STRIP/PRUDEN PACIFIC/ SUPERIOR STRIPPING SERVICES	Portand, OR	•			•	•		•			•	3
191	UNOCAL SS 6407, DELTA PARK 76, UNOCAL SS 6407	Portand, OR		•	•	•	•		•		•		4
192	GI JOE'S	Portand, OR	•			•	•		•	•			1
193	SAM'S TOWING	Portand, OR	•			•	•		•			•	3
194	GALLUS INC/ DENNIS HARDING PAINTING	Portand, OR	•			•	•		•			•	3
195	PACIFIC MOLASSES CO.	Portand, OR	•		•			•		•			0
196	MULFLUR FAMILY LLC GERTZ RD. BLDG.	Portand, OR	•		•			•	•		•		3
197	EXPRESS CARE LUBRICATION SERVICES, LLC/ ERICS OILERY	Portand, OR	•			•	•			•			1
198	PACIFIC MEAT CO.	Portand, OR	•			•	•		•			•	3
199	BLUELINE TRANSPORTATION	Portand, OR	•			•	•		•		•		3
200	GROUNDWATER - N COLUMBIA BLVD	Portand, OR	•			•	•		•			•	3
201	DETZ TERRI	Portand, OR	•			•	•		•		•		3
202	CONTAINER CARE INTL INC	Portand, OR	•			•	•		•		•		3
203	MEC OREGON RACING INC.	Portand, OR	•			•	•		•		•		3
204	HERBERT MALARKEY ROOFING COMPANY	Portand, OR	•		•			•	•		•		3
205	NW CAST PARTS	Portand, OR	•		•			•	•			•	3
206	TIMBERLINE FOREST PRODUCT/ NICOLAI CO.	Portand, OR	•			•	•		•		•		3
207	FORMER PAY N' PAK	Portand, OR	•		•			•	•			•	3
208	DYNO OVERLAYS INC.	Portand, OR	•		•			•	•		•		3
209	GENERAL ELECTRIC INDUSTRIAL CO.	Portand, OR	•		•			•	•		•		3
210	GOODYEAR DISTRIBUTION CENTER #9000	Portand, OR	•		•			•	•			•	3
211	BLASEN BLASEN LUMBER	Portand, OR	•			•	•		•			•	3
212	FAMIILIAN NW - 2121 N COLUMBIA BLVD	Portand, OR	•			•	•		•			•	3
213	ROVALVE DIV. OF TECHNAFLOW INC	Portand, OR	•			•	•		•			•	3
214	ALLIED ROOFERS SUPPLY CORP	Portand, OR	•			•	•		•		•		3
215	WASTECH INC.	Portand, OR	•		•			•	•			•	3
216	NICOLAI-MORGAN	Portand, OR	•			•	•		•			•	3
217	METROPOLITAN DISPOSAL & RECYCLING CORP	Portand, OR	•		•			•	•			•	3
218	PRECISION EQUIPMENT INC	Portand, OR	•		•			•	•			•	3
219	NORSTAR BUSINESS CENTER	Portand, OR	•		•			•	•			•	3
220	BLASEN FAMILY LLC	Portand, OR	•		•			•	•			•	3
221	WAYMIRE DRUM CO.	Portand, OR	•		•			•	•			•	3
222	EVERGREEN STAGES LINES	Portand, OR	•		•			•	•	•		•	3
223	QWEST - PORTLAND ARGYLE SOC (R00710)	Portand, OR	•		•			•	•	•			0
224	BRUNDAGE-BONE CONCRETE PUMPING, INC.	Portand, OR	•		•			•	•	•			0
225	SPILL	Portand, OR	•		•			•	•			•	3
226	RB RECYCLING INC.	Portand, OR	•		•			•	•			•	3
227	P. C. DEVELOPMENT INC.	Portand, OR	•		•			•	•			•	3

Exhibit 4-1. Ranked Database Hazardous Material Site Summary Table

Site ID	NAME	City / State	Location						Known or Suspected Release		Cleanup Complete		Rank
			API		0.5 mile Perimeter		1.0 mile Perimeter						
			Out	In	Out	In	Out	In	Yes	No	Yes	No	
228	MACADAM ALUMINUM & BRONZE CO.	Portand, OR	●		●			●	●			●	3
229	COLUMBIA ALUMINUM RECYCLING CORP	Portand, OR	●		●			●	●			●	3
230	NELSON VIC PROPERTY/ CARL BUD HOFFMAN FACILITY	Portand, OR	●		●			●		●			0
231	AMERICAN AUTO RECYCLING WRECKING	Portand, OR	●		●			●	●			●	3
232	BRADFORD PROPERTY	Portand, OR	●		●			●	●			●	3
233	LORD BROTHERS CONTRACTORS	Portand, OR	●		●			●	●			●	3
234	FAIRMONT FINANCIAL PROPERTY	Portand, OR	●		●			●	●			●	3
235	ALLIED PLATING, INC.	Portand, OR	●		●			●	●			●	3
236	RYDER TRANSPORTATION RESOURCES	Portand, OR	●		●			●	●		●		3
237	CENTRAL MACHINE WORKS INC.	Portand, OR	●		●			●	●			●	3
238	SPILL	Portand, OR	●		●			●	●			●	3

4.2.1 State of Washington

Site ID# 3 WSDOT Retention Pond (Rank #5)

The WSDOT Retention pond site (I-5 at Mile Post 3, Vancouver, WA) is located approximately 300 feet northwest of the northern terminus of the project and east of I-5 within the right-of-way. The site is listed in the Confirmed and Suspected Contaminated Site List (CSCSL) maintained by Ecology (Facility Site ID# 2621289). The CSCSL indicates that petroleum products have been confirmed in soil at the site, and are suspected in surface water and groundwater. An initial investigation for the site was completed in May 2008. The site is currently awaiting cleanup. No other information in available.

Site ID# 36 City of Vancouver (Rank #4)

The City of Vancouver site (1912 Main Street, Vancouver, WA) is located approximately 380 feet north of McLoughlin Boulevard on Main Street.

The site is listed in the WA-LUST and WA-UST databases (Ecology Facility Site ID# 52841299). The site is also known as Abandoned Tank Site. The LUST database information indicates that petroleum impacts have occurred to soil. The UST database information indicates that the site has 5 heating fuel USTs with exempt status, 2 hazardous substance USTs with exempt status, 2 motor oil USTs that were removed, and 1 lead gasoline UST that was removed. The site has received a NFA Determination from Ecology.

Site ID# 39 Hoesly Auto Service Individual (Rank #4)

The Hoesly Auto Service Individual site (210 W McLoughlin Boulevard, Vancouver, WA) is located approximately 80 feet west of proposed project activities near the northwest corner of McLoughlin and Washington.

The site is listed in the WA-LUST and WA-UST databases (Ecology Facility Site ID# 95266254). The LUST database information indicates that impacts to soil have occurred. LUST clean up began on September 21, 2001 and was completed on October 23, 2001. The UST database information indicates that one waste oil UST (capacity of 1,000-gallons) was removed from the site.

Site ID# 49 Kyungshin Choi/Matthieu's Car Care (Rank #4)

Kyungshin Choi/Matthieu's Car Care site (1505 Broadway Street, Vancouver, WA) borders proposed project activities on the northeast corner of Broadway and E 15th Street. A transit platform is planned just west of the site. The property is currently vacant and does not contain any structures.

The site is listed in the WA-LUST and WA-UST databases (Ecology Facility Site ID# 75145467). The LUST database information indicates that impacts to soil have occurred. LUST cleanup began on September 15, 1996 and was completed on September 26, 1996. The UST database information indicates that one leaded UST and one unleaded UST were removed from the site.

Site ID# 52 Chuck's Tire & Auto Service (Rank #4)

The Chuck's Tire & Auto Service site (1416 Broadway Street, Vancouver, WA) borders proposed project activities on the southwest corner of Broadway and E 15th Street. The site is listed in the WA-LUST and WA-UST databases (Ecology Facility Site ID# 62198439). The LUST database indicates that impacts to soil have occurred. LUST clean up began on September 26, 1992 and was completed on March 8, 1993. The UST database information indicates that one waste oil UST was removed from the site (capacity range 110 to 1,100 gallons).

Site ID# 56 Special Events and Convention Center (Rank #4)

The Special Events and Convention Center site (between 4th and 6th Streets and Columbia and W Esther Streets, Vancouver, WA) borders proposed project activities along Columbia Street near W 5th Street and is approximately 400 feet northwest of proposed bridge structures. The site has been redeveloped into a multi-story building that contains the Hilton Hotel and Vancouver Convention Center. The site is located approximately 250 feet from the proposed transit bridge and the highway bridge. Bridge construction in this area may require a foundation below the water table to support the anticipated vertical loads.

The site is listed in the CSCSL-NFA database (Ecology Facility Site ID# 87668199). Several investigations were conducted at the site. In 1989, four USTs (two 10,000-gallon diesel USTs, one 6,100-gallon gas UST, and one 500-gallon waste oil UST), an oil water separator and a dry well were discovered on Block 25 south of 4th Street and west of Columbia Avenue. Sampling at the site detected petroleum and metals contamination in soil and groundwater. Low to moderate concentrations (390 to 3,200 mg/kg) of petroleum products, and moderate to high concentrations (150 to 3,100 mg/kg) of metals were detected in surface soils across the site. Petroleum was detected in groundwater at a concentration of 33 µg/L. In 2002, four additional USTs were discovered in the Convention Center area of the site (south of 6th Street). A total of eight USTs have been reportedly decommissioned at the site. The site received a NFA determination on August 31, 2005. The site is currently under a Restrictive Covenant and Institutional Control.

Site ID# 71 Metro Buick Olds Vancouver (Rank 4)

The Metro Buick Olds Vancouver site (904 Washington Street, Vancouver, WA) borders proposed project activities west of Washington Street between 9th Street and Evergreen Boulevard. A transit platform is planned for this area.

The site is listed in the WA-LUST and WA-UST databases (Ecology Facility Site ID# 95732758). The LUST database indicates that impacts to soil have occurred. LUST clean up began on June 11, 1990 and was completed on June 21, 1990. The UST database information indicates that one waste oil UST was removed from the site.

Site ID #80 Boise Cascade White Paper (Rank 4)

The Boise Cascade White Paper site (907 W 7th Street, Vancouver, WA) borders the main project area west of Columbia Street between 6th Street and the Columbia River. A surface road extension is planned for this area.

This site is listed in the DECISIONS, WA-CSCSL, RCRA-LQG, and WA-UST databases. The eastern portion of this site borders proposed construction areas for the transit bridge and the traffic bridge. Bridge construction in this area may require foundation below the water table to support the anticipated vertical loads.

According to Ecology's records, a site investigation and remedial action were conducted in 2005 (CH2M Hill 2006). The investigation identified three areas of the site where soil samples exceeded screening values for petroleum and metal contamination. These areas are located around the center of historical sawmill operations at the site. The main area for former operations is located approximately ¼ mile from anticipated construction areas. Soil in these areas of concern was excavated and removed from the site, and confirmation sampling indicated that levels of contaminates at the site were below cleanup levels.

Groundwater impacts from petroleum products were noted at the very western edge of the site. The report indicated the possibility of an off-site source of product encountered in groundwater to the Albina Fuel facility located more than 0.5 mile from proposed CRC construction activities.

The remedial activities at the site were completed in January 2010. The site is currently undergoing conformational monitoring.

Site ID# 95 Hannah Motor Company (Rank #4)

The Hannah Motor Company site (300 and 400 Washington Street, Vancouver, WA) is located in an area that is proposed for the transit bridge to enter Vancouver. Bridge construction in this area may require a foundation below the water table to support the anticipated vertical loads. The property is currently known as Eagle Street Automotive and is planned for full acquisition.

The site is listed in the LUST, UST, ICR, FINDS, and RCRA-NLR databases (Ecology Facility Site ID# 12126843). Ecology's records indicate that the 300 Washington Street site contained two USTs (one 300-gallon waste oil UST and one 2,000-gallon gasoline UST). The waste oil UST was decommissioned on October 20, 1993. During decommissioning, soil contamination was encountered and 12.9 tons of contaminated material were excavated and replaced with imported fill. Groundwater was reported to not be impacted by the waste oil release. A 2,000-gallon gasoline UST was removed from the site on May 14, 1990. A site assessment was conducted and contamination was not reported during the removal. A 2,000-gallon gasoline UST was removed from the 400 Washington Street property on August 27, 1990. A site assessment was conducted and no contamination was reported during removal. The location of this UST was not recorded in the Ecology documents reviewed.

In a letter to Hannah Dealerships, an investigation discovered that a vehicle wash rack at the site discharged into a drywell in the rear parking lot. Senior employees reported that in years past they used to dump used oil into the drywell. Soil sampling indicated that all the storm drains on the property and the drywell tested positive for contamination. The letter did not state which type of contaminants were encountered. Additional information on the current state of the drywell or if groundwater was impacted was not available in the file review.

4.2.2 State of Oregon

Site ID# 103 Hayden Island Landfill (Ranked #4)

The Hayden Island Landfill site (N Hayden Island Road, Portland, OR) is located within the project footprint at the current location of the Thunderbird Hotel, just west of the existing I-5 bridges and south of the Columbia River. This site is proposed for acquisition and is planned for the bridge departure from the Oregon side of the crossing. Bridge construction in this area may require a foundation below the water table to support the anticipated vertical loads.

The landfill site is listed in the OR-ECSI (DEQ Site ID# 1559). The site used a seasonal lake for an unregulated landfill. The landfill is thought to have operated between 1950 and 1970, when it was covered by a 7 to 8-foot layer of clean fill during construction of the Thunderbird Hotel in 1971. The lake was observed in the 1939, 1948, and 1955 historical aerial photographs (Appendix E). Currently, only a few remnants of the lake can be observed beneath the I-5 bridges.

An ARCO facility (Site ID 107) opened in 1971 at the eastern edge of the former landfill. The site is listed on the OR-LUST (File #26-89-0149) database. An investigation at the facility in 1989 indicated that groundwater was contaminated by gasoline and metals. Subsurface investigation revealed a layer of landfill debris beneath the clean fill with groundwater occurring at approximately 10 to 20 feet below ground surface. Metals contamination in groundwater is thought to be a result of leaching of landfill debris. A pump-and-treat remediation system operated between August 1990 and May 1991. The system was shut down due to fouling associated with metal in groundwater. An assessment of the remedial action was completed in January 2008 and an NFA was issued in March 2008.

Site ID# 106 Spill (Rank #4)

The site (1401 N Hayden Island Drive) is listed in the OR-HAZMAT database (Incident #: 880283). The exact location of the incident is not known. The incident occurred on April 19, 1988 when a 1.5- to 2-ton cargo truck with two saddle tanks was proceeding to drive beneath the Red Lion Inn to a loading dock to unload equipment for a Subaru dealer show. The pavement at one point had an abrupt rise. While driving across the rise, the left saddle tank high-centered on the pavement and buckled off a fitting connected to the fuel tank and fuel lines, allowing raw gasoline to drain from the tank. The driver immediately placed his thumb over the hole to stop the flow and then placed a wooden plug in it until it could be replaced with a metal plug. Gasoline from the rupture migrated into the storm drain in the parking lot.

Site ID# 107 Arco SS #4475/Atlantic Richfield Company (Rank #4)

The ARCO site (1305 N Hayden Island Drive) is located approximately 120 feet west of proposed project work. Significant subsurface construction may be encountered near this site due to the structures proposed for this vicinity.

The site is listed in the OR-LUST, UST DECOMOR, and RCRA ND databases. The LUST database (Log# 26-89-0149) indicates that soil and groundwater impacts from petroleum products have occurred. The LUST incident was discovered on July 6, 1989 and cleanup was completed by July 17, 1991.

The UST database (UST ID# 2298) indicates that five USTs have been decommissioned from the site.

Site ID# 116 Conoco Phillips Company/Unocal SS 5953 (Rank #5)

The Hayden Harbor Retail/Conoco Phillips Company - 255953/Unocal SS 5953 site (12205 N Center Avenue, Portland, OR) is located between the proposed Hayden Island structure and the transit bridge and platform on Hayden Island. It is west of I-5 on the southeast corner of Center and Main. The property is planned for full acquisition.

The site is listed in the OR-LUST, UST DECOMOR, and RCRA ND databases. The LUST database (Log# 26-90-0055 and 26-94-0063) information indicates that two incidents are reported for this property. The LUST incident (26-90-0055) was reported to DEQ in February 1990. Cleanup of miscellaneous gasoline impacted soil was completed on May 16, 1991. The LUST incident (26-94-0063) was reported to DEQ in April 1994. Cleanup of miscellaneous gasoline impacted groundwater is on-going.

The UST database (UST ID# 1102) information indicates that there are four active USTs and six decommissioned USTs at the site. The RCRA ND database (ID# OR0000361394) indicates that the site generated RCRA wastes between June 1994 and March 1997.

Site ID# 117 Jantzen Beach Shell/Shell Oil Company (Rank #5)

The Jantzen Beach Shell/Shell Oil Company site (12235 N Jantzen Drive, Portland, OR) is located east of the proposed Hayden Island structure on Jantzen Drive southwest of Hayden Island Drive and borders proposed project activities. The property is currently occupied by Taco Bell and is planned for a partial acquisition.

The site is listed in the OR-LUST, UST DECOMOR, and RCRA-CESQG databases. The LUST database (Log# 26-89-0267) information indicates that the incident was reported to DEQ in October 1989. The cleanup of miscellaneous gasoline and waste oil impacted soil and groundwater was started in January 1990 and is on-going.

The UST database (UST ID# 7585) information indicates that there are four decommissioned USTs at the site.

The RCRA CESQG database (ID# OR0000473017) indicates that the waste stream consists of spent carbon from the groundwater treatment system.

Site ID# 118 Chevron Station Jantzen Beach (Rank #4)

The Chevron Station - 90706/Chevron Jantzen Beach 90706 site (12105 N Jantzen Drive) is located east of the proposed Hayden Island structure on Jantzen Drive northwest of Tomahawk Island Drive and borders proposed project activities. The property is currently a Chevron Gas Station and is planned for a partial acquisition.

The site is listed in the OR-LUST, UST, UST DECOMOR, and RCRA-CESQG. The LUST database (Log# 26-93-0101 and 26-97-0505) information indicates that two LUST incidents have been reported at the site. The LUST (26-93-0101) incident was reported to DEQ on June 8, 1993. The cleanup of miscellaneous gasoline-impacted soil and groundwater was started on June 7, 1993 and was complete by May 22, 1995. The LUST (26-97-0505) incident was reported to DEQ on July 7, 1997. The cleanup of miscellaneous gasoline- and heating oil-impacted soil was started on June 7, 1997 and was complete by September 10, 2007.

The UST database (UST ID# 1332) information indicates that there are 3 active USTs and 7 decommissioned USTs for the site. The site is a RCRA CESQG (ID# ORD987187341) and has generated under Large Quantity Generator (LQG) and Small Quantity Generator (SQG) status in the past. The database information indicates that waste materials consisted of gasoline-contaminated rags, gasoline-contaminated water, and Waste Hazardous Liquid UN1203 Gasoline.

Site ID# 125 Columbia Crossings LLC/Jantzen Beach Moorage (Rank #4)

The Columbia Crossings LLC/Jantzen Beach Moorage site (1130 N Jantzen Avenue) is located west of I-5 and south of Jantzen Drive. The eastern portion of the site is planned for local traffic and transit structures from Marine Drive which will require partial property acquisition. The site is currently a parking area for the floating homes located in the North Portland Harbor.

The site is listed in the OR-LUST, UST, and UST DECOMOR databases. The LUST database (Log# 26-90-0258, 26-91-0219, 26-97-0017) information indicates that three LUST incidents have occurred on the site. The LUST (26-90-0258) incident was reported to DEQ on July 23,

1990. The cleanup of unknown compound impacted soil was started on November 1, 1990. Cleanup of the soil was complete by January 23, 1992. The LUST (26-91-0219) incident was reported to DEQ on June 6, 1991. The cleanup of miscellaneous gasoline-impacted soil and groundwater was started on June 6, 1991 was complete by January 23, 1992. The LUST (26-97-0017) incident was reported to DEQ on January 3, 1997. The cleanup of miscellaneous gasoline-impacted soil was started on January 3, 1997 was complete by February 28, 2002.

The UST database (UST ID# 22721) information lists that there are 3 decommissioned USTs and 2 active USTs (gas & diesel) for the site.

Site ID# 130 Hayden Island Cleaners (Rank #4)

The Hayden Island Cleaners site (1190 N Jantzen Drive) is located east of I-5 and south of Jantzen Drive. The site is also known as County Club Cleaners. The site borders proposed project activities and is planned for partial acquisition.

The site is listed in the OR-ECSI, and RCRA ND databases. The ECSI database (DEQ Site ID# 1865) indicates that dry-cleaning operations at the site have occurred since the 1970s. Four floor drains were identified in 1994 with a positive reading on a photoionization detector for volatile organic compounds. A subsurface investigation in August 1995 detected tetrachloroethene (PCE) in soil gas (up to 75 ppm) and groundwater (up to 780 µg/L). The site was accepted into DEQ's Dry Cleaner program in February 1997. Soil and groundwater at the site were determined to be contaminated with PCE, trichloroethene (TCE), and 1,2-dichloroethene (1,2-DCE). Cleanup was initiated in May 1999 and DEQ issued a NFA determination in December 2001.

The RCRA ND database (ID# ORQ000012062) indicates the site was listed as a CEG in the report years 1999, 2000, and 2001; however, it appears that no waste streams are listed. The database lists the common name of the site as ODEQ Cleanup Hayden Island Dry Cleaners.

Site ID# 133 Spill (Rank #4)

The site (2200 N Marine Drive) is located west of I-5 along N Marine Drive. The site is listed in the OR-HAZMAT database (Incident ID#: 940118).

The incident occurred on March 9, 1994 when a semi-truck involved in an accident with an automobile leaked approximately 60 gallons of diesel fuel into a storm drain that feeds into North Portland Harbor. Reportedly, approximately 1 cup of the fuel reached the surface water while the rest remained in the storm drain or released into the North Portland Harbor.

Site ID# 136 Expo Center (Rank #5)

The Expo Center site (2060 N Marine Drive) is located west of I-5 and south of Marine Drive and borders proposed project activities. This property is planned for partial acquisition.

The site is listed in the OR-ECSI, OR-LUST and UST DECOM. The ECSI database (DEQ Site ID# 4138) indicates the site was added to the DEQ Site Assessment database in May 2004. It is listed as a site that requires further investigation. No information regarding contaminants was available.

The LUST database (Log# 26-92-0100 and 26-92-0139) information indicates that two LUST incidents are reported at the site. The LUST (26-92-0100) incident was received by DEQ on April 13, 1992. The cleanup of miscellaneous gasoline-impacted soil and groundwater was started on April 13, 1992 and was complete November 1, 1993. The LUST (26-92-0139) incident was reported to DEQ on April 13, 1992. The cleanup of miscellaneous diesel-impacted soil and groundwater was started on April 13, 1992 and was complete August 12, 1996.

The UST database (UST ID# 6137) information lists 2 decommissioned USTs for the site.

Site ID# 138 Diversified Marine (Rank #5)

The Diversified Marine site (1801 N Marine Drive) is located west of I-5 and north of Marine Drive. The proposed transit bridge crossing over North Portland Harbor will be located near this facility and construction will require upland earthwork and soil stabilization, and in-water work for pile installation. The property is not planned for acquisition; however, future design changes have the potential for acquisition due to the proximity of the site to project activities.

The site is listed in the OR-ECSI, OR-HAZMAT, CERCLIS and RCRA CESQG databases. The ECSI database (DEQ Site ID# 3759) indicates that the site is also known as Portmarco, Inc., and Whitecap Cove, Inc.; the company has conducted tug boat and barge building, repair, sandblasting, painting, machine shop, bilge removal, and boat and equipment refueling activities at the site since approximately the mid-1980s. Between 1990 and 2001, DEQ received 9 pollution complaints, 6 spill reports associated with the facility's sandblasting and painting operations, and releases of paint chips to the river. Additional complaints have been received for petroleum flowing southward from the site, and for petroleum sheens on the river from unknown sources near the facility. Sandblasting at the site may have released paint chips and toxic metals that could accumulate in the river sediments. The several pollution complaints and spill reports suggests that on-site activities could have resulted in contamination of uplands soils and in-water sediments. Contaminants of potential concern include metals such as copper oxide, organo tins, lead, cadmium, chromium, mercury, and zinc; petroleum constituents such as BTEX (benzene, toluene, ethylbenzene, toluene) and PAHs; and other potential organic contaminants such as, phthalates, pentachlorophenol (PCP), chlorinated solvents, and PCBs. EPA reportedly completed a preliminary assessment of the site. Communications with the DEQ project manager indicated that the EPA sampled river sediments at a distance of 200 to 250 feet from shore. Findings included elevated metals 200 feet downstream from the site.

The HAZMAT database (Incident ID# 010336) information indicates drug lab waste and supplies were dumped in a parking area near a roadway and aboard a nearby yacht where a strong chemical odor was observed coming from the boat. Samples were collected and the boat was decontaminated.

The CERCLIS database (Federal ID# ORN001002703) indicates that the site was added to the list as discovery on July 16, 2007. The database contains no additional relevant information.

The site is a RCRA CESQG (ID# ORQ000021675) with reported violations. The database information indicates that the site generated “Hazardous waste, N.O.S. 9, NA 3077, PG III (Solid)” in 2002 as a LQG. This waste stream consists of mercury containing fluorescent light bulbs.

Site ID# 141 Harbor Oil (Rank #5)

The Harbor Oil site (11535 N Force Avenue) is located west of I-5 on Force Avenue south of Marine Drive. The proposed design calls for the construction of new road that runs east to west along the southern boundary of the Expo Center. The new road would join N Expo Road to N Force Avenue. The Harbor Oil site is a used oil recovery and recycling and biofuels production facility that is directly adjacent to the intersection of the new road and Force Avenue. The property is not planned for acquisition; however, the proximity of the site to project activities is a concern. Compounds known to be present at the site include total petroleum hydrocarbons, PAHs, petroleum-associated VOCs, PCBs, metals, (DDTs), and chlorinated solvents. Cleanup at the site is currently active.

Site ID# 142 Spill (Rank #4)

The spill site (1600 N Marine Drive) is located west of I-5 along Marine Drive. The exact location of the spill is not described.

The site is listed in the OR-HAZMAT database (Incident# 880224). The HAZMAT incident occurred on March 7, 1988 when an unknown substance contained in two 55-gallon drums apparently fell off of the back of a commercial vehicle onto the roadway. The substance appeared to be innocuous. The responsible person was unknown and not present at scene. The unknown substance was then contained in two 55-gallon drums and removed from the site.

This spill site is ranked #4 based on the potential location of the spill site and unknown cleanup status. However, a review of supplementary information in the HAZMAT database maintained by the Oregon State Fire Marshal, appears to reduce the significance of this site as a major contributor to potential project impacts.

Site ID# 143 Schooner Creek Boat Works (a.k.a. Pier 99) (Rank #5)

The Schooner Creek Boat Works (Former) site (1610 N Pier 99 Street) is located north of Marine Drive beneath and directly west of the southbound lanes of I-5. Proposed project activities in this area include a bridge structure over North Portland Harbor for local traffic from Hayden Island to Marine Drive. This property is planned for full acquisition.

The site is listed in the OR-ECSI (DEQ Site ID# 3526) and CERCLIS (Federal ID# ORN001002699) databases. The databases indicate that the site has conducted boat building, repair, and machine shop activities since about 1937. Schooner Creek Boat Works began operating at the site in 1989. DEQ received four pollution complaints between 1991 and 1999. Two other pollution complaints, received in May 1990 and March 1999, described oil sheens and petroleum odors from unknown sources on the Columbia River near the Former Schooner Creek Boat Works. Initial inquiry to the site was conducted by EPA on June 7, 2007. In October 2008, EPA conducted a preliminary assessment of the site. The assessment indicated that on-site soils and sediments in North Portland Harbor had elevated concentrations of metals, SVOCs, organo-chlorine pesticides, phthalates, PCBs, and tributyltin. Observed concentrations of metals, PAHs, PCBs, DDT, and tributyltin in soil may represent a potential risk to human health (on-site workers and off-site residents), and to the environment (plants, aquatic organisms and wildlife). In addition, sediments in the boat dock area are contaminated with metals, PAHs, and DDT at elevated concentrations, and may represent potential acute and bioaccumulative threats to aquatic life.

Site ID# 151 Plaid Pantry/Webster Family Convenience (Rank #5)

The Plaid Pantry #209/Potter Webster Company/Webster Family Convenience Store site (1014-1020 N Marine Drive) is located east of I-5 and south of Marine Drive and north of Vancouver Avenue. It is on the east corner where Marine Drive and Vancouver Avenue intersect. The property is planned for partial acquisition.

The site is listed in the OR-ECSI, OR-UST, UST DECOMOR, and RCRA ND databases. The ECSI database (DEQ Site ID# 4134) information indicates that as the site is part of the Columbia Slough Area-wide Discovery (CSD) Project. The database indicates the site has suspected petroleum releases and is listed as requiring further investigation. Investigation work that was initiated in 2000 focused on areas away from the main building.

The LUST (Log# 26-92-0348) incident was reported to DEQ on December 15, 1992. The cleanup of diesel-impacted soil began on December 15, 1992 and was complete on January 14, 1997. Details on this LUST incident appears to be conflicting with the ESCI database description.

The UST database (UST ID# 89648) information lists 2 active gasoline USTs and 1 active diesel UST are located at the site.

The RCRA database (ID# ORD987200458) information indicates that the site was listed as a CEG in the report years 1993 to 2000; however, it appears no waste streams are listed and the site has been inactive since 2000.

Site ID# 161 Fazio Property (Rank #4)

The Fazio Property site (10365 N Vancouver Way) is located east of I-5 and south of Marine Drive between Vancouver Avenue and Martin Luther King Boulevard from approximately 500 feet southeast of the intersection of Vancouver Avenue and Marine Way to an unnamed street that connects Martin Luther King Boulevard to Vancouver Avenue approximately 2,800 feet southeast from the intersection. The property is planned for a partial acquisition.

The site is listed in the OR-LUST and UST DECOMOR databases. The LUST database (Log# 26-93-0011) information indicates that the incident was received by DEQ on January 19, 1993. The cleanup of unknown compound impacted soil and groundwater began on January 18, 1993 and was complete on July 24, 1997.

The UST DECOMOR database (ID#11174) information lists 5 decommissioned USTs for the site.

Site ID# 164 Yellow Freight Systems (Rank #4)

The Yellow Transportation/Yellow Freight System Inc. site (10510 N Vancouver Way) is located east of I-5 and south of Marine Drive approximately 1,300 feet southeast of the intersection of Vancouver Avenue and Marine Way. The site is currently not planned for any project acquisition.

The site is listed in the OR-ECSI, OR-HAZMAT, OR-LUST, OR-UST, UST DECOMOR, HMIRS, and RCRA CESQG databases. The ECSI database (DEQ Site ID# 1437) information indicates that a diesel release of up to 10,000 gallons occurred in late July 1993 from an underground line. The release resulted in soil and groundwater contamination. The site was entered into the Voluntary Cleanup Program (VCP) in January 1999 and received an NFA letter from DEQ in January 2000.

The HAZMAT incident (Incident ID# 930126) occurred on April 5, 1993 because an employee of Yellow Freight was concerned about a 55-gallon drum of resin (Astrocure®) that had spilled in a loading dock and trailer and the resin in the loading dock had dirt covering it with a few tire tracks through it. Astrocure® is a low profile (low shrink), medium viscosity resin containing diluent monomer (styrene) and is used in various coating applications such as wood sealers, magazines, and electronics.

The LUST database (Log# 26-88-0056) information indicates that the incident was reported to DEQ on September 9, 1988. The cleanup of diesel-impacted groundwater began on September 9, 1988 and was complete January 10, 2000.

The UST database information lists 1 active 10,000-gallon motor oil UST and 1 active 6,000-gallon waste oil UST for the site. The UST DECOMOR database (ID# 4475) indicates that 9 decommissioned USTs are listed for the site.

The HMIRS database (Site ID# 131) information indicates that during the unloading process a paint spill was discovered by the unloading employee. Further investigation determined that 3 cases of paint had been stacked on top of each other and were starting to leak.

The site is listed as a RCRA-CESQG (ID# ORD093480804) with reported violations. The database information indicates that the site has generated petroleum naphtha, waste oil, brake solution, paint thinners or other petroleum distillates, dichloromethane, sodium hydroxide solution, pesticide poison, vinyl chloride, vinylindene chloride, dimethylaniline, and isopropanol (waste codes D001, D002, D006, D008, D018, D039, D043, F001, F002, ORX001, U012) as a result of cleanup of spill residues and wastes, cleaning or degreasing, or flush rinsing.

Site ID# 174 City of Portland Parks (Rank #4)

The City of Portland Parks site (10850 N Denver Avenue) is located approximately 50 feet east of I-5 and approximately 1,500 feet south of Marine Drive. The site borders proposed project activities and is planned for partial acquisition.

The site is listed in the OR-LUST database. The LUST database (Log# 26-01-5308) information indicates that the incident was reported to DEQ on February 22, 2001. The cleanup of heating oil-impacted soil began on February 22, 2001 and was complete on August 16, 2001.

Site ID# 175 Quality Carriers, Inc./Star-Oil Co. (Rank #4)

The Quality Carriers, Inc./Star Oil Co. site (10360 N Vancouver Way) is located 50 feet east of Vancouver Way and approximately 1,200 feet north of Middlefield Road. The site borders proposed project activities and is planned for partial acquisition.

The site is listed in the OR-LUST database. The LUST database (Log# 26-91-0129) information indicates that the incident was reported to DEQ on February 15, 1991. The cleanup of diesel- and waste oil-impacted soil began on February 7, 1991 and was complete on June 13, 1994.

Site ID# 191 Unocal SS 6407, Delta Park 76, Unocal Ss 6407 (Rank #4)

The UNOCAL SS 6407, Delta Park 76, UNOCAL SS 6407 site (9950 N Whitaker Rd) is located near the southern terminus of the proposed project activities. The site is east of I-5 and north of Victory Boulevard.

The site is listed in the OR-LUST, OR-HAZMAT, OR-UST, UST DECOMOR, and RCRA ND databases. The LUST database (Log# 26-93-0136 and 26-94-0069) indicates that two LUST incidents are reported at the site. The LUST (26-93-0136) incident was reported to DEQ on August 18, 1993. The cleanup of unknown compound (media not reported) began on August 18, 1993 and was complete on April 22, 1994. The LUST (26-94-0069) incident was received by DEQ on April 14, 1994. The cleanup of miscellaneous gasoline-impacted groundwater began on April 14, 1994 and was complete on November 21, 2007.

The HAZMAT incident (Incident# 990368) occurred on December 3, 1999 when drug lab material was observed in an abandoned pickup truck. Miscellaneous small containers, glassware, pump, and a silver soda pop container with approximately 2.5 gallons of unknown chemical were encountered. Samples were collected and all materials were cleaned up.

The UST database (UST ID# 4018) lists 2 active 12,000-gallon gasoline USTs for the site. The UST DECOMOR database (ID# 1133) indicates that 5 decommissioned USTs are listed for the site.

The RCRA database (ID# OR0000382283) indicates the site generated petroleum sludge from a service station in 1994. The sludge originates from vehicle motor oil changes. This sludge also apparently contained benzene. The database lists the site as inactive since 1996.

4.2.3 Mapping of Proposed Improvements and Hazardous Material Sites

Exhibits 4-2a through 4-2c display the locations of the eight proposed bridge structures, stormwater treatment facilities, water supply stations, 29 identified priority database sites, and 85 priority Sanborn sites. A majority of the database sites are located on the western side of downtown Vancouver, with the number of sites decreasing to the north.

4.3 Evaluation of Results

Potential effects to the environment were evaluated for the eight proposed bridge structures: Victory to Marine Drive bridges, North Portland Harbor bridge, Hayden Island bridges, the Columbia River bridges, the SR 14 bridges, the Evergreen bridge, the Mill Plain and 33rd Street bridges, the SR 500 and 39th Street bridges and Vancouver Transit corridor. Results of the evaluation are presented in Exhibit 4-3. The exhibit displays a rating for each bridge type based on construction attributes (number and depth of piers, and size of structure), depth to groundwater, and higher priority hazardous materials sites.

Based on this information a moderate rating for potential adverse effects to the environment was determined for the Marine Drive bridge, North Portland Harbor bridge, Hayden Island bridge, Columbia River Crossing, SR 14 interchange, Mill Plain and 33rd Street bridges, and Vancouver Transit corridor; and a low rating was determined for the Evergreen bridge and the SR 500 and 39th Street bridges. These determinations were made because: 1) there is no known or recognized source of contamination in proximity to the proposed bridge structures that would be exacerbated through construction activities, and 2) construction activities would not hinder any ongoing remedial investigations or cleanups.

A moderate rating for the Marine Drive bridge, North Portland Harbor bridge, Hayden Island bridge, Columbia River bridge, the SR 14 bridge, the Mill Plain to 33rd Street bridges, and Vancouver Transit corridor is based on:

- Numerous permanent and temporary piles are to be installed,
- The piles' installation depths are deep relative to groundwater depth,
- A high occurrence of excavations, and
- Higher priority hazardous materials sites are within 500 feet of the structures.

A low rating for the Evergreen bridge and the SR 500 and 39th Street bridge is based on:

- The number of piling installations are low,
- The pile installation depths are shallow relative to the depth of groundwater,
- A moderate occurrence of excavations, and
- No higher priority hazardous materials sites are with 500 feet of the structures.

Exhibits 4-2a through 4-2c indicate that stormwater treatment facilities at Mill Plain interchange, SR 14 interchange, Hayden Island interchange, and the Marine Drive interchange are co-located near priority hazardous material sites. These facilities have a potential to encounter impacted soil and/or infiltrate into impacted soil.

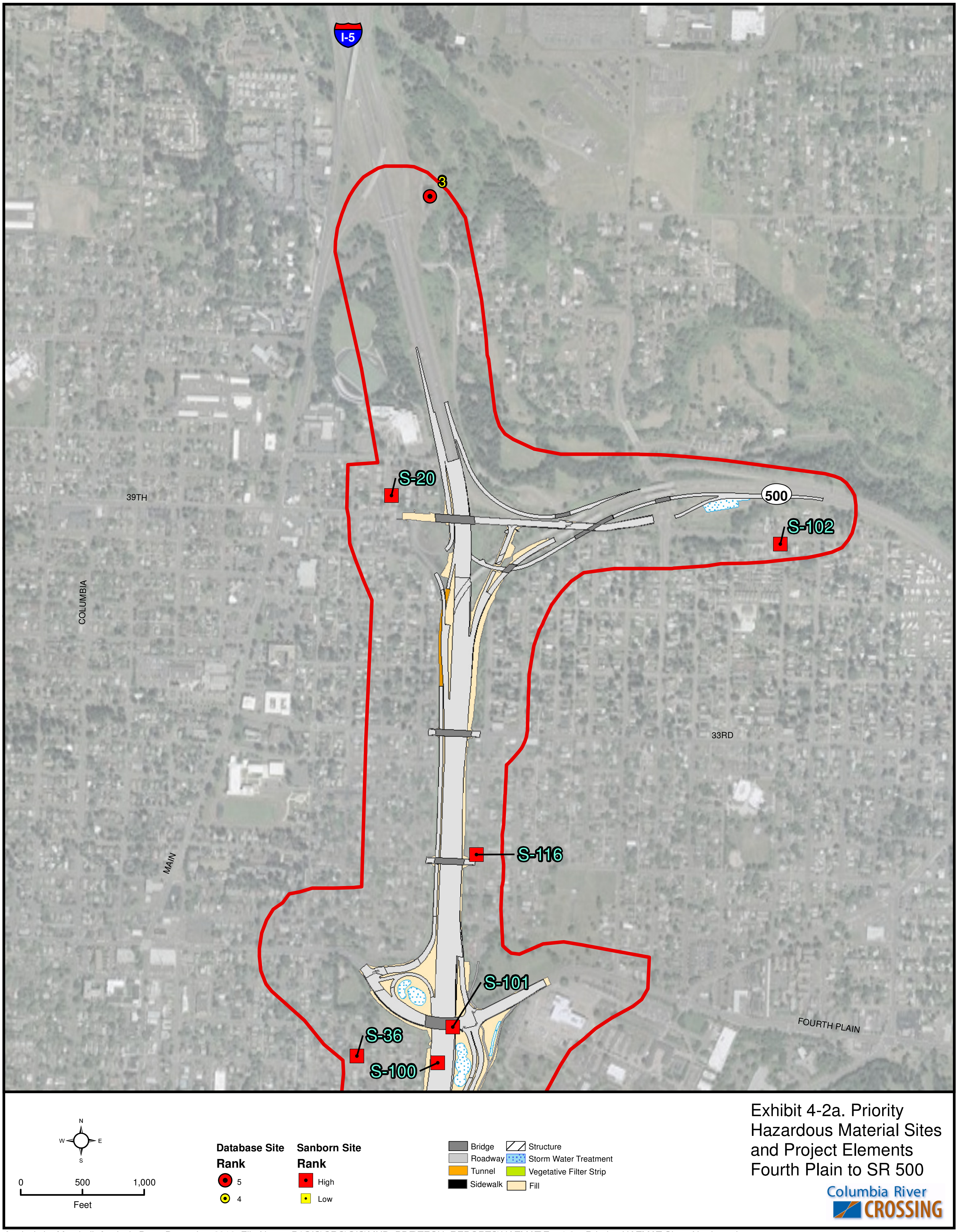

Exhibit 4-2a. Priority Hazardous Material Sites and Project Elements Fourth Plain to SR 500

Columbia River CROSSING

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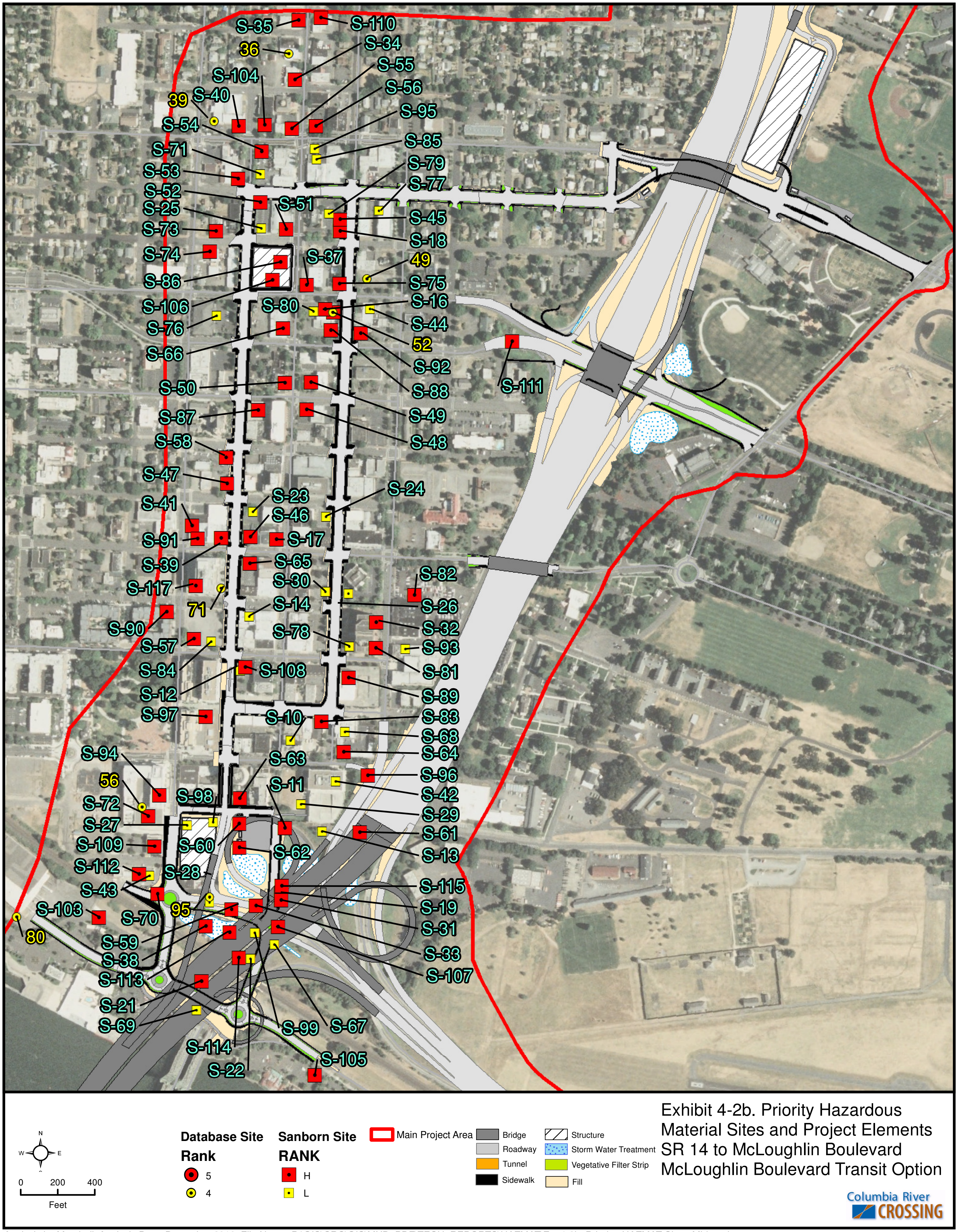

Exhibit 4-2b. Priority Hazardous Material Sites and Project Elements SR 14 to McLoughlin Boulevard McLoughlin Boulevard Transit Option

Analysis by Marshall; Analysis Date: December 2010; File Name: P:\GIS\CRC\GIS\MXD_PDF\TECH_REPORTS\HAZMAT\Ex_4-2b_Priority_HAZMAT-Sites_Mid.mxd

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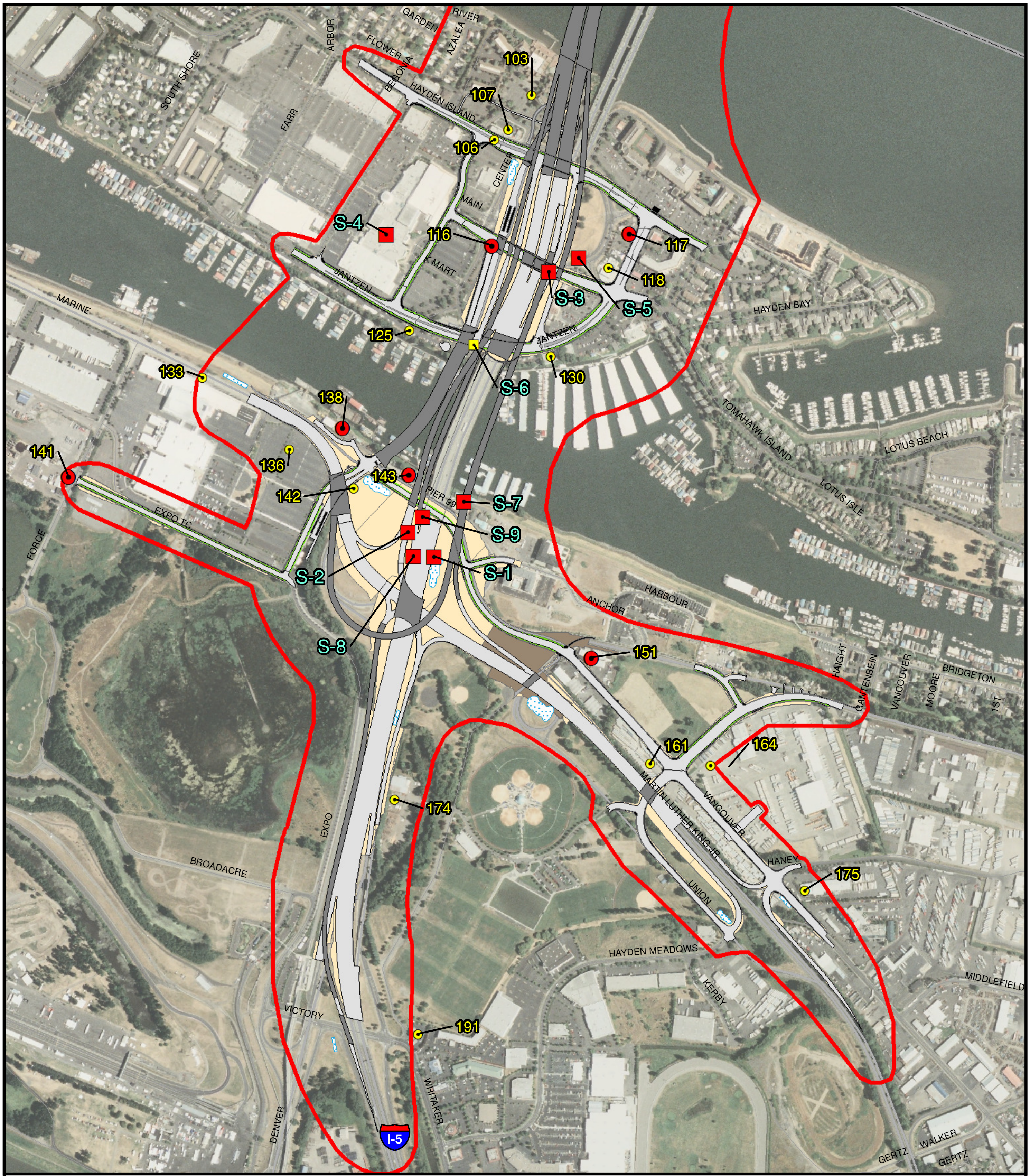

N W E S

0 500 1,000 Feet

Database Site Rank
- 5
- 4

Sanborn Site Rank
- High
- Low

Primary API

Bridge
Roadway
Tunnel
Sidewalk
Structure
Storm Water Treatment
Vegetative Filter Strip
Fill

Exhibit 4-2c. Priority Hazardous Material Sites and Project Elements Marine Drive and Hayden Island

Columbia River CROSSING

Analysis by Marshall; Analysis Date: December 2010; File Name: P:\GIS\CRC\GIS\MXD_PDF\TECH_REPORTS\HAZMAT\Ex_4-2c_Priority_HAZMAT-Sites_South.mxd

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Exhibit 4-3. Rating of Potential Affects from Construction Activities

Infastructure Name	Area of Stucture	Foundation Type and Estimated Number	Estimated Pile Tip Depth Below Existing Ground/Mudline	Occurance of Excavations	Approximate Depth to Groundwater	Radial Distance to City of Vancouver Water Station (feet)		Radial Distance of Improvement to Priority Hazardous Material Sites		Rating of Potential Affect
	(sq. feet) (x 1000)		(feet bgs)		(feet bgs)	WS-1	WS-3	(100 feet)	(500 feet)	
Victory to Marine Drive Bridges	430	140 to 240 shafts 1,000 to 2,000 piles	125 to 160	high	25	NA	NA	138, 142, 143, 151, 161, 174, S-1, S-2, S-7, S-8, S-9	133, 136, 164, 191	**MODERATE**
North Portland Harbor Bridge	460	90 to 130 shafts 900 to 1,500 piles	130 to 160	high	10	NA	NA	138 ,143, S-6, S-7	125, 130	**MODERATE**
Hayden Island Bridge	310	220 to 310 shafts 1,900 to 2,500 piles	180 to 260	high	10	NA	NA	106, 107, 116, 117, 118, 125, 130, S-3, S-5, S-6	S-4	**MODERATE**
Columbia River Crossing [1]	1,030	60 to 120 piles 50 to 100 shafts	110 to 260	high	10	8,650	11,300	S-21, S-22, S-38, S-67, S-69, S-105, S-113, S-114	--	**MODERATE**
SR-14 Bridges [2]	530	170 to 210 shafts	120 to 130	high	10	7,800	10,675	95, S-11, S-13, S-19, S-28, S-31, S-33,S-38, S-59, S-60, S-61, S-62, S-63, S-67, S-99, S-113, S-115, S-96,	S-29, S-42, S-64, S-68	**MODERATE**
Evergreen Bridge [2]	30	90 to 160 piles 10 to 30 shafts	50 to 70	moderate	90	5,900	8,900	--	--	**LOW**
Mill Plain to 33rd Street Bridges [2]	180	130 to 240 shafts 440 to 740 piles	80 to 90	high	150	3,600	2,800	S-100, S-101, S-111, S-116	S-36	**MODERATE**
SR-500 Interchange & 39th Street Bridges [2]	130	20 to 40 shafts 150 to 260 piles	50 to 80	moderate	150	5,600	3,000	--	3, S-20, S-102	**LOW**

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5. Temporary Effects

Temporary effects are those that could result from the construction of the LPA to the construction activities and/or the physical environment from hazardous materials. Three general categories of temporary effects are thought to occur:

1. Liability to the purchaser in acquiring property with RECs.
2. Effects on the environment and resources from construction in areas where hazardous materials exist.
3. Effects on construction from hazardous materials.

These potential effects are assessed qualitatively, based on the project team's current understanding of the natural and built environments. The potential of an identified effect is stated for the LPA. The significance of the effect to occur without mitigation measures is also provided. Where noted, mitigation measures can be applied to the adverse effect. A summary of mitigation measures by category is provided in Section 7.

5.1 Property Acquisition Liability

Tax lots have been listed for acquisition for fee for the project as discussed in the Acquisition Report. Acquisition of property where RECs have been identified can result in potential liability for the purchaser (i.e., ODOT, WSDOT, or TriMet). Liability issues for acquired property in fee are addressed in different ways under Oregon and Washington State laws.

In Oregon, the standard for liability for remedial actions (cleanup) of a property is pursuant to Oregon Revised Statute (ORS) 465.255. This statute states that "the owner/operator is strictly liable for those remedial action costs incurred by the state or any other person that are attributable to or associated with a facility and for damages for injury to or destruction of any natural resources caused by a release". This statute extends to limit the State's legal liability of an acquired facility or property through condemnation.

In Washington, the standard of liability is pursuant to the Revised Code of Washington (RCW) 70 105D. The code states that "the owner/operator of the facility is liable for remedial cost." Provisions in the code thus allow for the State to inherit legal liability when acquiring the property/facility.

Liability issues can include: 1) restriction in current or future property use; 2) incurring costs for cleanup; 3) schedule delays; 4) worker and public safety; and/or 5) increased resource agency oversight. Conducting all appropriate inquiry (AAI) into the previous ownership and uses of the property prior to property transaction is a means of safeguarding and managing potential liability issues. In this way RECs are disclosed prior to the sale of the property and potential issues can be mitigated prior to construction activities. Inquiry may result in responsibility for cleanup by the owner/operator and/or reduction in the property's value. Further discussion of mitigation measures for property acquisition is provided in Section 7.

Acquisition of Staging Areas

One or more of the three staging areas sites (Red Lion, Port of Vancouver, and Thunderbird) could be temporarily acquired or leased for the construction of the LPA. The site may be obtained by the respective state DOT, or, if a contractor chooses to use a different site, they would become responsible for obtaining the site and conducting all environmental evaluation and permitting necessary to use the site.

Acquisition of Casting Areas

One or more of the two casting sites (Alcoa/Evergreen and Sundial) have been identified as possible major staging areas, one of which could be temporarily acquired or leased for the construction of the LPA. The site may be obtained by the respective state DOT, or, if a contractor chooses to use a different site, they would become responsible for obtaining the site and conducting all environmental evaluation and permitting necessary to use the site.

Findings

The LPA has a potential for adverse effects from property acquisition liability if not correctly mitigated. Of the sites listed for acquisition in fee, approximately 55 have been identified as hazardous material sites for LPA Option A and 52 for LPA Option B (Exhibit 5-1).

5.1.2 Permanent and Temporary Easements

Permanent and temporary easements will be used to support the project. Types of easements include, but are not limited to subsurface easement, airspace easements, and property easements. Permanent easements are necessary to construct subsurface utility lines (storm drain, telephone, electrical), roadways, sidewalks, or access. In acquiring permanent easements, the State owns a limited interest in a property. Temporary easements allow the State the right to the property for short-term ground improvements or staging purposes. After fulfilling its intended purpose, the easement is typically returned back to the landowner.

Easements where RECs have been identified can result in potential liability for the operator. Liability issues can come in the form of: 1) incurring cleanup costs; 2) schedule delays; and 3) worker and public safety.

Findings

The LPA has a potential for adverse effects from gaining permanent and temporary easements. Twenty easements have been identified as being priority hazardous material sites. Of the 20 easements, 17 are temporary construction easements, and 3 are permanent easements (Exhibit 5-1).

Exhibit 5-1. Summary of Acquired Properties Identified as Hazardous Material Sites

Exhibit #	Tax ID	Ownership	Site Address	State	Type of Impact	Depth to Ground water (feet)	HAZMAT sites associated with this property	Observation[1]
42c	016775-000	ZAMBRANO-TRUJILLO ANA C	2900 K ST, VANCOUVER, 98663	WA	TCE	180-200	**S-116**	Service Station (1949)
68 Army/Village	038279-906	USA WAR ASSETS ADMIN	610 E 5TH ST, VANCOUVER, 98661	WA	P, TCE, PE-AIR	180-200	25, 26	RCRA, LUST, UST
78	038840-000	LAEROC C STREET VANCOUVER	801 C ST, VANCOUVER, 98660	WA	P, TCE, PE-SUB	60-80	**S-93**	Truck Sales & Service (1966)
356	039000-000	RS HOLDINGS LLC	805 BROADWAY ST, VANCOUVER, 98660	WA	TCE	60-80	73, **S-32**, S-78, **S-81**	CSCSL-NFA, Auto Repair & Sales (1949, 1966)
354b	039140-000	CITY OF VANCOUVER	104 E 9TH ST, VANCOUVER, 98660	WA	P, TCE	60-80	S-30	Auto Sales (1949, 1966)
353	039290-000	CITY OF VANCOUVER	NO SITUS,VANCOUVER, 98660	WA	TCE	70-90	S-24	Auto Sales (1949)
348a	040170-000	FISCHER EDWARD A ETUX TRST	202 E MILL PLAIN BL, VANCOUVER, 98660	WA	TCE	75-95	**S-92**	Service Station (1966)
348	040190-000	PIO CHARLES LEE	1416 BROADWAY ST, VANCOUVER, 98663	WA	TCE	75-95	**52, S-15, S-16**	LUST, Planning Mill and Cleaners (1911)
349	040230-000	RIDER EDWIN H JR ETAL	NO SITUS,VANCOUVER, 98660	WA	TCE	75-95	**S-88**	Service Station (1966)
346a	040290-000	CASCADE LEASE COMPANY	1500 BROADWAY ST, VANCOUVER, 98663	WA	PAC	75-95	**S-75**	Auto Repair (1966)
347	040330-000	ANGELO BROTHERS IV LLC	1505 BROADWAY ST, VANCOUVER, 98663	WA	TCE	75-95	**49**	LUST
215	040990-000	US BANK NATIONAL ASSN	NO SITUS,VANCOUVER, 98663	WA	P, TCE	75-95	S-79	Auto Sales (1966)
213	041050-000	US BANK	NO SITUS,VANCOUVER, 98663	WA	TCE	75-95	**S-18, S-45**	Auto Repair & Oil Warehouse (1949)
216	046390-000	CENTRAL WOOD PRODUCTS CO	1514 MAIN ST, VANCOUVER, 98660	WA	F	75-95	**S-86, S-106**	Planning Mill and Manufacturing Facility (1911, 1949, 1966)
217	046485-000	CENTRAL WOOD PRODUCTS CO	1506 MAIN ST, VANCOUVER, 98660	WA	F	75-95	**S-86, S-106**	Planning Mill & Manufacturing Facility (1911, 1949, 1966)
327	046850-000	HOLLAND INC	109 W 17TH ST, VANCOUVER, 98660	WA	P, TCE	75-95	S-25, **S-51, S-52**	Auto Sales & Service Stations (1949)
230	047080-000	PIONEER BLDG CO LLC	1400 WASHINGTON ST, VANCOUVER, 98660	WA	TCE	75-95	S-76	Auto Sales (1966)
221	047272-000	CENTRAL WOOD PRODUCTS CO	NO SITUS,VANCOUVER, 98660	WA	F	75-95	**S-86, S-106**	Planning Mill and Manufacturing Facility (1911, 1949, 1966)
220	047277-000	CENTRAL WOOD PRODUCTS CO	NO SITUS,VANCOUVER, 98660	WA	F	75-95	**S-86, S-106**	Planning Mill and Manufacturing Facility (1911, 1949, 1966)
219	047280-000	CENTRAL WOOD PRODUCTS CO	NO SITUS,VANCOUVER, 98660	WA	F	75-95	**S-86, S-106**	Planning Mill and Manufacturing Facility (1911, 1949, 1966)
218	047283-000	CENTRAL WOOD PRODUCTS CO	NO SITUS,VANCOUVER, 98660	WA	F	75-95	**S-86, S-106**	Planning Mill and Manufacturing Facility (1911, 1949, 1966)
222	047291-000	OLD AUTOMOTIVE LLC	1500 WASHINGTON ST, VANCOUVER, 98660	WA	TCE	70-90	48	UST
343a	047960-000	ANGELO PROPERTY CO LP ETAL	714 MAIN ST, VANCOUVER, 98660	WA	P, TCE	40-60	S-12, **S-108**	Paint/ Hardware Store (1911) & Service Station (1949)
342a	048080-000	IMPERIAL CAPITAL BANK	109 W 9TH ST, VANCOUVER, 98660	WA	PAC	50-70	S-14	Paint/ Wallpaper Store (1911)
342	048120-000	CITY OF VANCOUVER	109 E 13TH ST, VANCOUVER, 98660	WA	P, TCE	45-65	**S-57, S-84**	Service Station (1949) & Auto Service (1966)
345	048170-004	CITY OF VANCOUVER	NO SITUS,VANCOUVER, 98660	WA	P, TCE	40-60	79, 83, **S-97**	UST, RCRA, Machine Shop (1911)
242	048320-000	AMCO VANCOUVER LLC	412 WASHINGTON ST, VANCOUVER, 98660	WA	P, TCE	20-40	S-27, S-98	Auto Sales (1949), Boiler (1911, 1949)
243	048370-000	AMCO VANCOUVER LLC	400 WASHINGTON ST, VANCOUVER, 98660	WA	P, TCE	20-40	94	UST
245	048380-000	AMCO VANCOUVER LLC	NO SITUS,VANCOUVER, 98660	WA	F	15-35	S-28	Auto Sales (1949)
249	048430-000	AMCO VANCOUVER LLC	300 WASHINGTON ST, VANCOUVER, 98660	WA	F	15-35	**95**	LUST, UST, RCRA

Exhibit 5-1. Summary of Acquired Properties Identified as Hazardous Material Sites

Exhibit #	Tax ID	Ownership	Site Address	State	Type of Impact	Depth to Ground water (feet)	HAZMAT sites associated with this property	Observation[1]
251	048440-000	AMCO VANCOUVER LLC	NO SITUS,VANCOUVER, 98660	WA	F	15-35	**S-38**	Auto Wrecking Yard (1949)
81	048475-000	RED LION PROPERTIES INC	NO SITUS,VANCOUVER, 98660	WA	F	5-25	S-69	Furniture Factory (1949)
255d	048841-000	PORT OF VANCOUVER	NO SITUS,VANCOUVER, 98661	WA	P	10-20	**S-103**	Asphalt Paving Plant (1949, 1966)
335	051550-000	INDEPENDENT INV CO INC	215 W 12TH ST, VANCOUVER, 98660	WA	TCE	70-90	**S-58**	Service Station (1949)
231a	051600-000	JBB LLC	1220 MAIN ST, VANCOUVER, 98660	WA	F	75-95	**S-87**	Service Station (1966)
339	051630-000	ANDERSON G A & NANCY ETAL	NO SITUS,VANCOUVER, 98660	WA	TCE	60-80	**S-65**	Service Station (1949)
341	051680-000	MC INVESTMENTS INC	900 WASHINGTON ST, VANCOUVER, 98660	WA	TCE	60-80	**71, S-117**	LUST, Auto Repair (1949)
337	051780-000	WA MU	NO SITUS,VANCOUVER, 98660	WA	TCE	65-85	S-23	Auto Sales (1949)
338	051790-000	WA MU	1014 MAIN ST, VANCOUVER, 98660	WA	TCE	65-85	**S-46**	Service Station (1949)
336	051840-000	HUTTON GEORGE & HUTTON ROBT	NO SITUS,VANCOUVER, 98660	WA	TCE	70-90	64, **S-47**	UST, Service Station (1949, 1966)
325	056880-000	HOLLAND INC	NO SITUS,VANCOUVER, 98660	WA	TCE	75-95	S-71	Auto Sales (1949)
326	056920-000	HOLLAND INC	1615 WASHINGTON ST, VANCOUVER, 98660	WA	TCE	75-95	**S-52**	Service Station (1949)
267	R426800050	COLUMBIA CROSSING LLC ET AL	NO SITUS,N JANTZEN DR, PORTLAND, 97217	OR	P, PE-SUB	5-25	121	UST
268	R426800150	COLUMBIA CROSSINGS LLC	12050 N JANTZEN DR, PORTLAND, 97217	OR	P, TCE, PE-SUB	5-25	**130**	ECSI, RCRA
268a	R426800200	ZUPAN PROPERTIES LLC	900 N TOMAHAWK IS DR, PORTLAND, OR 97217	OR	P	5-25	122	RCRA
299	R426950030	COLUMBIA CROSSING LLC ET AL	NO SITUS,N CENTER AVE, PORTLAND, 97217	OR	P	5-25	S-6	Boiler House (1950)
283	R426950120	JANTZEN BEACH MOORAGE INC	1521-1523 N JANTZEN AVE, PORTLAND, 97217	OR	P, PE-SUB	5-25	**125**	LUST
288	R649755760	FAZIO JACK F ET AL	10365 N VANCOUVER WAY, PORTLAND, 97217	OR	P, PE-SUB	5-25	**161**	LUST
12Gr	R895001670	R J TASH CO	1825-1843 NW ELEVEN MILE AVE, GRESHAM, 97030	OR	F	5-25	**Coachman**	LUST
317	R941030450	PORTLAND CITY OF(BUREAU OF	10850 N DENVER AVE, PORTLAND, 97217	OR	TCE	5-25	**174**	LUST
286j	R941030510	CHIU MICHAEL TR ET AL	NO SITUS,N MARINE DR, PORTLAND, 97217	OR	P	5-25	152	Stormwater Permit
286k	R941030620	FAIRVIEW CORPORATION	915-925 N ANCHOR WAY, PORTLAND, 97217	OR	P	5-25	150	RCRA
286g	R941031530	JUBITZ CORPORATION	10350 N VANCOUVER WAY, PORTLAND, 97217	OR	P	5-25	177	UST
288b	R941031540	FLEET LEASING INC	10205 N VANCOUVER WAY, PORTLAND, 97217	OR	P	5-25	176	UST, HAZMAT
286a	R941031570	THE WEBSTER FAMILY LTD PRTNRSH	1014 N MARINE DR, PORTLAND, 97217	OR	P, TCE	5-25	**151**	ECSI, UST, RCRA
287b	R941031580	GEORGIA 01 LLC	11051 N VANCOUVER WAY, PORTLAND, 97217	OR	P	5-25	R-1	Speed Tech Garage
286f	R941031840	D THOMPSON PROPERTIES LLC	10360 N VANCOUVER WAY, PORTLAND, 97217	OR	P	5-25	**175**	LUST
308	R951330050	METRO	2060 N MARINE DR, PORTLAND, 97217	OR	P, TCE, PE-SUB	5-25	**136**	ECSI, LUST, UST
284	R951330090	LARSON OLIVER C TR ET AL	1610 N PIER 99 ST, PORTLAND, 97217	OR	F	5-25	**143**	CERCLIS, ECSI
306	R951330240	ROSS ISLAND SAND & GRAVEL CO	1835 N MARINE DR, PORTLAND, 97217	OR	P	5-25	137	UST

Exhibit 5-1. Summary of Acquired Properties Identified as Hazardous Material Sites

Exhibit #	Tax ID	Ownership	Site Address	State	Type of Impact	Depth to Ground water (feet)	HAZMAT sites associated with this property	Observation[1]
297	R951330520	JANTZEN DYNAMIC CORP	1500 N HAYDEN IS DR, PORTLAND, 97217	OR	P	5-25	108, 112, 113, 115, 120, 124	LUST, UST, RCRA
309	R951330930	TRI-COUNTY METROPOLITAN	2060 E/ N EXPO RD, PORTLAND, 97217	OR	PE	5-25	**136**	ECSI, LUST, UST
275	R951340130	A & E ADLER LLC-37.04% &	12229 N CENTER AVE, PORTLAND, 97217	OR	F	5-25	**116**	LUST, UST, RCRA
272	R951340140	THUNDERBIRD HOTEL LLC	1401 N HAYDEN IS DR, PORTLAND, 97217	OR	F	5-25	**103**	ECSI
264	R951340150	CHEVRON USA INC	12105 WI/ N JANTZEN DR, PORTLAND, 97217	OR	P, TCE	5-25	**118**	LUST, UST, RCRA
259	R951340160	WEBER COASTAL BELLS	12237 N JANTZEN DR, PORTLAND, 97217	OR	P, TCE	5-25	**117**	LUST, UST, RCRA
295	R951340190	HAYDEN'S CORNER LLC	1321-1337 N HAYDEN IS DR, PORTLAND, 97217	OR	F	5-25	**107**	LUST, UST, RCRA
281	R951340380	A & E ADLER LLC-37.04% &	11915 N CENTER AVE, PORTLAND, 97217	OR	F	5-25	**S-106**	Central Manufaturing (1911, 1949)
285	R951340820	NORTH WATERFRONT PROPERTIES	1415 N MARINE DR, PORTLAND, 97217	OR	P	5-25	**S-7**, 146	Boat Construction and Repair (1950), RCRA

Total number of Acquisitions with an Identified RECs = 69

Number of Acquisitions Sites with an Identified Higher Priority Hazardous Material Site = 46

McLoughlin Boulevard Option

167	056800-000	1800 MAIN ST, VANCOUVER, WA	First Interstate Bank	WA	P, TCE	80-100	S-55	Service Station (1949)
166	056810-000	NO SITUS, VANCOUVER, WA	First Interstate Bank	WA	P, TCE	80-100	**S-104**	Service Station (1949)

Acronym

P = Partial in fee

F = Full in fee

TCE = Temporary Construction Easement

PE = Permanent Easement and Type

PAC = Permanent Access Change

Air = Airspace

Sub = Subsurface

NO SITUS = No site address

Bold = a priority hazardous material site (#4 ranked sites and higher potential Sanborn sites

Bold = #5 ranked hazardous material site

Footnote

1 Details on database acronyms included as Appendix B

5.2 Effects on the Environment from Construction

Environmental media – soils, sediments, surface water, stormwater, and groundwater – can be adversely affected by the exacerbation of existing contamination or the release of hazardous substances during construction activities. Effects from hazardous materials may cause a risk to human health or the environment, raise liability issues, increased project costs, and/or cause schedule delays.

The degree to which existing contamination can migrate into the environment depends on the type, intensity and duration of construction activities and the nature and extent of the contamination. Types of construction activities include, but are not limited to: excavation, grading, dewatering, drilling, dredging, utility line trenching, and installation of stormwater conveyance and retention systems and retaining walls; installation of piles and shafts for bridge and interchange foundations; soil stabilization; and demolition. The type, intensity, and duration of these activities will be further defined during the design phase and contractor procurement.

Documented contaminants at identified hazardous materials sites include chlorinated solvents, petroleum hydrocarbons, pollutant metals, pesticides, and PCBs. However, unidentified contamination from historical land use likely exists within the main project area. Impacts are most likely associated with commercial and industrial properties that may have generated or improperly disposed of hazardous materials (Exhibit 3-14). The nature and extent of contamination in areas where below-grade construction will be conducted will be evaluated on a site-by-site basis prior to preparing PS&E. Site-by-site evaluation may take the form of physical investigation, sampling, and analysis.

Contaminants that are encountered during construction can migrate into the environment along a variety of pathways (Section 4). Shallow soil contamination can migrate downward into subsurface soils and/or groundwater through drag down from excavation, utility work and drilling, and/or infiltration of stormwater. Groundwater impacts can be exacerbated from dewatering activities. Impacted stormwater can migrate to surface water and sediments. Impacted sediments can be re-suspended into the water column and/or re-deposited from scour or dredging activities.

Alternatively, hazardous substances or petroleum products have the potential to be released into the environment during construction activities. Construction equipment can release petroleum products into the environment from the improper transfer of fuel or from spills. Other pollutants such as paints, acids for cleaning masonry, solvents, raw concrete, paving, striping products, and concrete-curing compounds are present at construction sites and may enter the environment if not managed correctly.

Adverse effects to the environment from contamination is most critical in areas sensitive to human and ecological health, such as wetlands, floodplains, residential areas, and/or in well head protection zones. Within the main project area these include, but are not limited to, the Columbia Slough, Vanport Wetlands, North Portland Harbor, Hayden Island, Columbia River, City of Vancouver, and the Burnt Bridge Creek drainage. Outside the main project area these include the Alcoa/Evergreen and Sundial Casting sites.

The following summarizes potential effects from temporary construction by media type.

5.2.1 Surface and Subsurface Soils

Surface and subsurface soils often are the most likely media to be affected by an initial contaminant release(s). Common contaminant release mechanisms include spills, below-ground disposal, LUSTs (leaking underground storage tanks), and soil leaching. Contaminated soil can migrate to other environmental media such as sediments, surface water and groundwater from secondary release mechanisms during construction activities (e.g., excavation, grading, and drilling). Secondary release mechanisms include, but are not limited to, drag down, smearing, groundwater leaching, stormwater runoff and erosion.

Findings

The LPA has the potential for adverse effects to the environment from exacerbation of existing contaminated soils or accidental releases during construction. These adverse effects are expected to be significant if not mitigated correctly. Construction activities for the LPA are relatively intensive and complex, with a higher occurrence of excavation and grading activities on properties in the expanded right-of-way to support the installation of bridge abutments, interchanges, roadway grading, cut and cover tunnels, retaining walls, and utility corridors (Exhibits 4-2a through 4-2c). It is likely that construction activities will encounter existing contamination (Exhibit 3-14). A portion of the construction activities occur within the Columbia River floodplain, which is considered a sensitive area for aquatic organisms. Of particular concern is the exacerbation of potential existing soil contamination from sites ranked #4 and #5 along the North Portland Harbor and Hayden Island from the construction of Marine Drive and along the Columbia River from construction of the SR 14 interchanges.

However, it is recognized that beneficial effects to the environment can be partially realized by the cleanup of residual soil contamination during construction. This potential cleanup of contaminated soil would not otherwise be realized within the timeline of the LPA.

5.2.2 Stormwater

Precipitation events can generate stormwater runoff at construction sites. Without adequate stormwater management and treatment, stormwater quality can be diminished and soil erosion can occur. Stormwater quality can also be affected by a direct release/spill of a hazardous substance to stormwater lines during construction. Impacts to stormwater quality can further degrade surface water, groundwater and sediment quality.

In addition, priority hazardous material sites have been identified in the proximity of stormwater treatment facilities located at the Mill Plain interchange, the SR 14 interchange, Hayden Island interchange, and Marine Drive interchange (Exhibits 4-2a through 4-2c).Adverse effects to groundwater could occur in these areas if stormwater is infiltrated into contaminated subsurface soils to the water table.

Findings

The LPA has a potential for adverse effects to stormwater quality during construction activities. This may result from erosion of exposed contaminated soil surfaces during precipitation events where stormwater is not controlled or adequately treated, and/or release to stormwater during construction. Adverse effects from diminished stormwater quality are expected to be significant if not correctly mitigated.

5.2.3 Surface Water

Surface water quality can be adversely affected by near-water or in-water construction activities. Near-water activities such as embankment modifications have the potential to allow contaminated soils to migrate to surface water. In-water activities such as barge support, pier installation, temporary pile installation and removal, dredging, and scour have the potential to re-suspend contaminated sediments into the water column. Over-water activities such as bridge demolition and construction, and lead abatement could also adversely affect surface water quality. Surface water features that could be impacted by construction include the Vanport wetlands, North Portland Harbor, and the Columbia River.

Findings

The LPA has a potential for adverse effects to the environment from impacts to surface water quality. These impacts are expected to be significant if not correctly mitigated. Surface water quality can be diminished from the exacerbation of soils and sediments during construction of the LPA. These effects are of most concern in the areas of Marine Drive, North Portland Harbor, and Hayden Island where modifications to the embankments and pile installation and removal are proposed (Exhibits 4-2a through 4-2c). These construction activities are in proximity to priority hazardous materials sites Nos. 138 (Diversified Marine) and 142 (Schooner Creek Boat Works/Pier 99), where known or suspected releases of contamination have occurred in soil, sediment and/or groundwater. Unidentified contamination may also be present in these areas due to historical land use (Sanborn sites S-2, S-7, and S-9).

Installation of pier structures within the main channel of the Columbia River is not thought to have adverse effects on surface water quality outside of potential turbidity issues associated with the placement of coffer dams (see Water Quality Technical Report). Analysis of sediment samples collected downriver of the I-5 bridges either did not detect chemicals of concern and/or detected these in concentrations below Sediment Evaluation Framework (SEF) screening levels (USACE 2009). However, a supplemental sediment evaluation should occur within the footprint of the pier structures to confirm that sediment quality is acceptable. This is particularly the case near City of Vancouver outfalls, where stormwater discharge from PGIS may have locally impacted sediments near proposed near-shore bents.

Potential adverse surface water quality effects to the Columbia Slough and Burnt Bridge Creek from the construction of the LPA are not significant. Construction activities in the area of the Columbia Slough and Burnt Bridge Creek are minimal in extent and intensity (Exhibits 4-2a through 4-2c).

Surface water quality effects to the Vanport wetlands from construction can be significant if not correctly mitigated. Construction activities near the wetlands would include soil excavation and grading, and installation of the Marine Drive interchange. The wetlands is also considered sensitive habitat.

5.2.4 Sediment

Sediment quality can be adversely affected by the exacerbation of existing sediment contamination through construction activities. These activities include pier installation, pile installation and removal, dredging, and barge support. Scour from cofferdams and/or piers could also exacerbate contaminated sediment. Exacerbation can occur from re-depositing contaminated sediments or exposing residual contaminated surfaces. Exacerbation of sediment contamination can also lead to impacts to surface water quality through re-suspension into the water column.

Sediment quality within North Portland Harbor is suspected of being impacted from historical industrial, commercial and residential activities. These activities include boat moorage, boat maintenance and fueling, freight hauling, and miscellaneous activities associated with floating homes. Contaminants including PCBs, TBT, and pollutant metals are suspected in sediments at hazardous materials sites Nos. 138 (Diversified Marine) and 142 (Schooner Creek Boat Works/Pier 99). In addition, stormwater from upland sources and the I-5 bridges might contribute to sediment contamination. See Appendix G site-specific sediment characterization results.

Shallow water environment occurs in the North Portland Harbor and in proximity to Hayden Island. This environment has a higher likelihood of retaining contaminants due to prevalence of fine-grained materials (sands and silts) and the low-energy fluvial setting. Shallow water environments of North Portland Harbor and Hayden Island have been identified as sensitive environments for fish habitat, migration, and rearing.

Sediments within the main channel of the Columbia River are not thought to be impacted by contaminants. This is based on sediment samples collected downgradient of the I-5 bridges. However, localized impacts to near-shore sediment may have potentially occurred from stormwater discharge (Exhibit 3-4).

No in-water construction activities will occur within the Columbia Slough, Vanport wetlands, and/or Burnt Bridge Creek.

Findings

The LPA has a potential for adverse effects to the environment from the exacerbation of sediment contamination. These effects are expected to be significant if not correctly mitigated. Exacerbation of existing sediment contamination is of most concern in near-shore environments (water column less than 20 feet) along the North Portland Harbor, Hayden Island, and the Columbia River where pier installation, pile installation and removal, dredging, and barge support could occur (Exhibit 4-2a through 4-2c). These construction activities can re-suspend contaminants into the water column, re-deposit contaminated sediments, or expose residual sediment contamination. Construction activities are in proximity to priority hazardous materials sites Nos. 138 (Diversified Marine) and 142 (Schooner Creek Boat Works/Pier 99), where known and/or suspected releases of contamination occur in soil, sediment and/or groundwater. Impacts to sediments may have also occurred from discharge of stormwater affected by point and non-point pollutant sources. Near-shore environments are typically more sensitive for aquatic organisms and fish due to their importance in habitat, migration, and rearing.

Potential adverse effects associated with pier installation within the deeper water environment of the Columbia River is thought to be minimal. This is due to the likelihood that contaminated sediments within the deeper water environment are not present due to the high-energy fluvial environment and presence of coarse-grain sediments that tend not to retain contaminants.

5.2.5 Groundwater

The Troutdale Aquifer extends throughout the Portland Basin and is used as a municipal water source. It is designated by the EPA as a sole source aquifer in Clark County, Washington. The City of Vancouver recognized its dependence on the aquifer and the importance of protecting it as a resource by designating the area within its boundaries as a Critical Aquifer Recharge Area.

The Troutdale Aquifer can be adversely affected by the exacerbation of existing contamination during construction. Construction activities include, but are not limited to: 1) excavation to accommodate roadway grade changes, tunneling, utility lines, stormwater conveyance systems and retaining walls; 2) installation of piles and shafts for bridge and interchange foundations; 3) earth stabilization techniques such as placement of stone columns; and 4) dewatering activities for the placement or retaining walls and tunnels.

Mechanisms that could cause existing contamination to migrate to or below the water table during project construction are: 1) drag down of surficial contamination; 2) downward or lateral migration of mobile contamination along conduits or preferential pathways; 3) leaching of exposed contamination; 4) migration of contamination from dewatering activities; 5) infiltration of impacted stormwater and/or infiltration of stormwater into impacted subsurface materials; and 6) accidental release of hazardous substances or petroleum products.

The most significant effects to groundwater quality during construction could occur in areas where: 1) abundant or gross contamination is present in saturated or unsaturated soils; 2) contaminants are soluble in water and/or are in a dense non-aqueous form; 3) the depth to water table is shallow; and/or 4) construction activities extend to or below the water table. These conditions or a combination of these conditions could allow contamination to migrate downward and adversely affect groundwater quality if not mitigated correctly.

Areas most sensitive to adverse effects to groundwater quality are those where beneficial use of groundwater occurs (Exhibit 3-10). Drinking water, irrigation and process water are generally derived from zones approximately 100 to 300 feet below ground surface (Exhibit 4-10). As such, proposed construction activities that extend into these zones from which water is derived have a higher potential to cause adverse effects to the well head. This is particularly the case for municipal wells at water stations WS-1 and WS-3, which hydraulically influence the direction of groundwater flow within the City of Vancouver. Groundwater within these wells' zone of influence is thought to be captured by water stations WS-1 and WS-3 (Exhibit 3-9). Municipal wells at these stations are currently tested and treated to meet state and federal primary and secondary water quality standards. For WS-1, this includes treatment of groundwater using an air stripping system to remove low-level solvent contamination.

Existing groundwater contamination from legacy hazardous materials sites is present within the main project area (Exhibit 3-11). The nature and extent of these impacts are not fully understood, but likely consist of low-concentration dissolved phase solvents and metals and petroleum products within the USA and TGA. Construction activities that encounter dissolved phase groundwater contamination at depth will not likely exacerbate these impacts. Conditions that help limit this type of impact are:

- The USA and TGA are hydraulically connected and are not separated by confining units within the main project area. Therefore, the formation of conduits or preferential pathways from construction activities is limited, as existing dissolved phase contamination can migrate advectively throughout the saturated zone.
- The presence of sand material in the USA will limit drag down of contaminants from driven pile and drilled shaft techniques. Friction between steel conductor casings and sand or fine material along the borehole wall will limit contaminant drag down.
- Drilled or driven steel casing will remain in the subsurface for a majority of foundation elements. This will limit the potential of these installations to serve as conduits or preferential pathways.

Groundwater quality can be adversely affected by the infiltration of stormwater that is not adequately managed and/or treated, that infiltrates into contaminated subsurface soils, or that migrates laterally along utility corridors. Potential adverse effects from stormwater infiltration would be the greatest in areas where the water table is shallow (less than 20 feet) and/or subsurface soil contamination exists.

Findings

The LPA has a potential for adverse effects to groundwater quality from the exacerbation of existing contamination during construction activities. These effects are expected to be significant if not correctly mitigated. Construction activities for the LPA are greater in intensity and complexity, with a higher occurrence of activities that extend to or below the water table in areas where hazardous materials sites were identified and/or where unidentified contamination may exist.

Migration of contamination to groundwater is of concern at the Mill Plain interchange, the SR 14 interchange, the Hayden Island bridges, the North Portland Harbor interchange, and the Marine Drive interchange (Exhibit 4-3). The construction of these project elements requires a high degree of excavation work, the deep installation of piles and shafts, and dewatering. Construction will occur in areas where the water table is fairly shallow, and contamination may be present from historical land use. Groundwater in this area is beneficially used for drinking water, process water, and/or irrigation.

Construction activities that encounter dissolved phase groundwater contamination at depth during deep foundation construction will not likely result in adverse effects. The drag down of dissolved phase contaminants during drilled shaft or driven pile construction is thought to be minimal, if any. The potential of downward migration due to the creation of preferential pathways would only be significant if dense non-aqueous phase liquids are encountered.

5.3 Potential Effects on Construction Activities

5.3.1 Worker Safety and Public Health

Adverse effects to worker safety and public health from hazardous materials during construction can occur if not correctly mitigated. Potential exposure routes include dermal contact and ingestion of contaminated soil and water, and inhalation of contaminated vapors or particulates. Exposure is thought to be greatest during excavation work, demolition, or application of materials that contain hazardous substances. Potential receptors include construction workers, excavation workers, the traveling public, transients, and residents (adult/child). Health effects are dependent on the type of contaminants, duration, dosage, exposure route, and age of those exposed.

Identified contaminants such as chlorinated solvents, metals, petroleum hydrocarbons, PAHs, pesticides, asbestos, and PCBs are mainly associated with long-term chronic effects to human health. However, these contaminants and/or other, unidentified contaminants have the potential to cause acute effects to human health. EPA, DEQ and Ecology provide generic health-based screening concentrations to define acceptable exposure concentrations.

Findings

The LPA has a potential for adverse effects to worker safety and public health from construction activities. These effects are expected to be significant if not mitigated correctly. The potential for adverse effects to worker safety and public health from the LPA is high compared to the No-Build Alternative with regards to construction. Construction activities are relatively intensive and complex. Under the LPA a number of exposure pathways could be potentially complete.

5.3.2 Hazardous and Non Hazardous Wastes

Waste can be generated during construction activities when contaminated materials are encountered or generated by construction and demolition. Waste can consist of contaminated soils, sediments, water, and/or building material.

Non-hazardous wastes are those categorized as not hazardous waste and are exempted from or do not apply to Resource Conservation Recovery Act (RCRA) Subtitle C regulations. They are typically called “solid waste.” Non-hazardous wastes likely to be encountered are fill, debris, soil, and wood, and lead-based paint associated with bridge structures. Non-hazardous wastes require management in accordance with applicable federal and state regulations. Characterizing, managing, storing, and disposing of hazardous waste will likely be a common component of project construction.

A solid waste that is dangerous and/or potentially harmful to human health is considered a hazardous waste. Hazardous waste can have characteristics of toxicity, corrosivity, reactivity, and/or ignitability that are governed by RCRA Subtitle C regulations. Universal wastes include batteries, pesticides, and mercury-containing light bulbs. In addition, wastes that contain PCBs are managed under the Toxic Substance Control Act (TSCA) and under 40 CFR Part 761.

Hazardous wastes and universal wastes require management in accordance with applicable federal and state regulations. Hazardous wastes likely to be encountered are treated timbers, impacted soil, sediment and groundwater, transformers, and abandoned waste. Characterizing, managing, storing, and disposing of hazardous waste will likely be a small component of project construction. However, if not mitigated correctly, hazardous wastes can increase project costs and cause schedule delays, and are a source of liability to the project.

Findings

Under the LPA, construction activities will be relatively intensive and complex, and will generate significant quantities of materials that will need to be managed, stored, and characterized for the presence of contamination. The LPA has a high potential to manage, characterize and dispose of non-hazardous wastes. Adverse effects from non-hazardous waste are thought to be significant if not correctly mitigated.

If any material is determined to be a hazardous waste, the material will need to be properly disposed of at a registered facility according to state and federal guidelines. The LPA has a low potential of managing, characterizing and disposing of hazardous waste. However, adverse effects from the hazardous waste are expected to be significant for the LPA if not mitigated correctly.

5.3.3 Underground Storage Tanks (USTs)

USTs are used to store petroleum products and are regulated in Washington and Oregon to prevent releases of petroleum and related contamination to soil and/or groundwater. Many USTs installed before 1980 consisted of bare steel pipes, which corrode over time, and may eventually result in leakage. Faulty installation and inadequate handling may also cause leaks. Leaking USTs are referred to as LUSTs.

Findings

Twenty-five active USTs sites and 53 LUSTs have been identified in the main project area. The LPA has a potential to encounter identified or unidentified USTs and LUSTs. If a UST is encountered, it will need to be decommissioned properly following state rules and guidelines, pursuant to WAC 173.360 and OAR 340-150. The LPA has a potential for significant adverse effects to the project in terms of financial liability and schedule delays during construction, if UST conditions are not correctly mitigated. Mitigation would include proper due diligence prior to property acquisition.

5.3.4 Lead and Asbestos-Containing Materials

Wastes that contain lead and asbestos-containing materials (ACMs) are managed and disposed of as non-hazardous wastes under 40 CFR Part 261. Lead has the potential to be a hazardous waste if it fails toxic characteristic leaching procedures. Asbestos is treated as an industrial waste and requires special packaging and handling pursuant OAR 340-248, WAC 269-65, and 40 CFR Part 61 Subpart M.

The existing I-5 bridges, buildings, and other structures that contain lead and/or ACMs will need to have proper abatement conducted prior to any demolition, renovation, or repair activities. Abatement must follow state guidelines and be conducted by licensed abatement firms. Abatement materials must be properly disposed of at authorized solid waste facilities. In general, building and structures that were built prior to 1980 have a higher likelihood of containing asbestos. EPA issued a ban and phase out of asbestos in 1989.

Findings

The LPA has a potential for adverse effects to the project from the disturbance of lead and asbestos-containing materials during construction. These effects are expected to be significant if not mitigated correctly. However, it is recognized that the proper removal of lead and ACMs is beneficial to human health and the environment.

Approximately 45 of the properties being acquired include structures built before 1980 that are to be demolished. Structures on these properties have a higher likelihood of containing RECs such as lead and ACM (however, it should be noted that any structures, regardless of age, may have lead or ACM in its construction materials and are suspect until otherwise determined). These properties are listed in Exhibit 5-2.

5.4 Other Areas to Address for the LPA

5.4.1 Ruby Junction Maintenance Facility

The LPA includes expansion of the light rail maintenance facility at Ruby Junction. Expansion will require 15 properties to be acquired, as well as modifications to the existing building structure. Review of the DEQ facility profiler indicates that a number of RECs exist at or near the facility. Expansion may result in significant adverse effects if not correctly mitigated. These potential effects include liability issues in property acquisition, and site investigation and cleanup to accommodate modifications to building structures. These potential adverse effects will be more fully realized as further details on facility expansion become available. However, acquisition and construction may result in the removal of contamination that may not have been remediated.

Exhibit 5-2. Acquired Properties with Structures that May Contain Lead and/or Asbestos

Exhibit #	Tax ID	Ownership	SiteAddress	Year Built
20	014763-000	SNYDER	3601 I ST, VANCOUVER	1974
19	014765-000	JONES	3605 I ST, VANCOUVER	1955
18	014766-000	GILLIAM	3609 I ST, VANCOUVER	1920
23	015080-000	SCHAUB	904 E 35TH ST, VANCOUVER	1930
21	015105-000	WALTERS	3515 I ST, VANCOUVER	1942
24	015250-000	DUROVCHIC	3415 I ST, VANCOUVER	1925
59	038279-909	WASHINGTON STATE	NO SITUS, VANCOUVER	NA
351	039560-000	VANCOUVER FUNERAL CHPL INC	110 E 12TH ST, VANCOUVER	1909
208	041000-000	US BANK NATIONAL ASSN	1607 MAIN ST, VANCOUVER	1978
321a	041410-000	JWMEDCO LLC	701 E MCLOUGHLIN BL, VANCOUVER	1910
390	041440-000	SPINGER	702 E 17TH ST, VANCOUVER	1925
391	041450-000	SCHAEFFER	704 E 17TH ST, VANCOUVER	1901
392	041460-000	NORTON	712 E 17TH ST, VANCOUVER	1901
393	041470-000	HOME ALLY LLC	714 E 17TH ST, VANCOUVER	1901
248	048420-000	AMCO VANCOUVER LLC	210 W 3RD ST, VANCOUVER	1926
249	048430-000	AMCO VANCOUVER LLC	300 WASHINGTON ST, VANCOUVER	1930
255	048844-000	PORT OF VANCOUVER	NO SITUS, VANCOUVER	NA
231a	051600-000	JBB LLC	1220 MAIN ST, VANCOUVER	1972
82	502250-000	PORT OF VANCOUVER	NO SITUS, VANCOUVER	1968
269	R426800100	DKOOP PROPETIES LLC	11875 N JANTZEN DR, PORTLAND	1946
268	R426800150	COLUMBIA CROSSING LLC	12050 N JANTZEN DR, PORTLAND	1973
283	R426950120	JANTZEN BEACH MOORAGE INC	1521-1523 N JANTZEN AVE, PORTLAND	1974
301	R426950140	A & E ADLER LLC	11950 N CENTER AVE, PORTLAND	1980
3Gr	R895001270	SONG TUK QUINTANA TR	1722 NW ELEVEN MILE AVE, GRESHAM	1960
14Gr	R895001550	MICHAEL HUGHES	1717 NW ELEVEN MILE AVE, GRESHAM	1951
13Gr	R895001590	TIMOTHY HAMMACK	1753 NW ELEVEN MILE AVE, GRESHAM	1973
12Gr	R895001670	RJ TASH CO.	1825-1843 NW ELEVEN MILE AVE, GRESHAM	1979
11Gr	R895001750	CLARK	1851 NW ELEVEN MILE AVE, GRESHAM	1956
9Gr	R895001790	ROSSOMONDO	1919 NW ELEVEN MILE AVE, GRESHAM	1921
7Gr	R895001910	FUGMAN-PEERY	2019 NW ELEVEN MILE AVE, GRESHAM	1964
8Gr	R895001920	KIRKPATRICK	2005 NW ELEVEN MILE AVE, GRESHAM	1951
6Gr	R895001930	FUGMAN-PEERY	2103 NW ELEVEN MILE AVE, GRESHAM	1954
5Gr	R895001950	DARREL FUGMAN	2127 NW ELEVEN MILE AVE, GRESHAM	1979
284	R951330090	LARSON OLIVER C TR	1610 N PIER 99 ST, PORTLAND	1936
297	R951330520	JANTZEN DYNAMIC CORP	1500 N HAYDEN IS DR, PORTLAND	1972
309	R951330930	TRI-MET	2060 E/ N EXPO RD, PORTLAND	NA

Exhibit 5-2. Acquired Properties with Structures that May Contain Lead and/or Asbestos

Exhibit #	Tax ID	Ownership	SiteAddress	Year Built
276	R951340120	A & E ADLER LLC	12125 N CENTER AVE, PORTLAND	1968
272	R951340140	THUNDERBIRD HOTEL LLC	1401 N HAYDEN IS DR, PORTLAND	1971
296	R951340260	PORTARTHUR LLC	1500 WI/ N HAYDEN IS DR, PORTLAND	1973
280	R951340300	A & E ADLER LLC	12005 N CENTER AVE, PORTLAND	1977
278	R951340310	A & E ADLER LLC	12105 N CENTER AVE, PORTLAND	1976
281	R951340380	A & E ADLER LLC	11915 N CENTER AVE, PORTLAND	1980
302	R951340410	CITY OF PORTLAND	NO SITUS, N CENTER AVE, PORTLAND	1970
271	R951340770	STATE OF OREGON	NO SITUS, PORTLAND	NA
285	R951340820	NORTH WATERFRONT PROPERTIES LLC	1415 N MARINE DR, PORTLAND	1961

NA = Building Age Not Available

5.4.2 Staging Areas

The LPA will consider three staging areas to support construction. These sites are the Port of Vancouver, Red Lion, and the former Thunderbird Hotel. Staging areas will be used for, but not limited to, material lay down yards, equipment storage, fabrication, and office trailers. Activities at the staging areas that could result in ground disturbances include regrading, updates to stormwater management and treatment systems, soil stabilization, and installation of underground utility lines.

Preliminary review of the staging areas indicates that the former Thunderbird Hotel and Red Lion sites have existing environmental issues likely to affect their immediate use as staging areas. The Thunderbird Hotel site was formerly a landfill (Site ID 103) and service station (Site ID 107), and these uses may have resulted in impacts to subsurface soils and groundwater. The Red Lion is located on the site of the former Boise Cascade asphalt plant.

Adverse effects to the project from acquisition of the former Thunderbird Hotel and/or the Red Lion are significant if not mitigated correctly. The significance of these impacts is dependent on the activities that will be conducted at the staging area. The eastern portion of the Thunderbird Hotel property will be permanently acquired for the bridge, and the western half is planned for staging. Prior to the use of the site for staging and bridge construction, the structures currently on-site will require demolition. In addition, soil stability techniques maybe employed. Removal of the debris and fill material may be necessary for the use of the site for bridge construction and as a work area. These impacts are thought to be significant if not correctly mitigated.

5.4.3 Casting Areas

The LPA will consider two areas to pre-cast concrete forms used in bridge and interchange construction. These areas are the Sundial Site and the Alcoa/Evergreen Site.

Preliminary review of the two proposed casting areas indicates that both sites have existing environmental issues that will likely affect their immediate use as a casting area. This is based on the understanding that staging areas may have ground disturbances and would require stormwater management to establish the areas for casting activities.

Adverse effects to the project from acquisition of the Sundial Site and/or Alcoa/Evergreen Site are significant if not mitigated correctly. Of the two sites, the Sundial site appears to be more suitable for future site activities with regard to hazardous material issues. Environmental impacts to soil, sediment and groundwater appear at the Sundial Site to be relatively less significant than those associated with the Alcoa Site. This is particularly the case for in-water sediments at the Alcoa Site, which have known PCB impacts above generic-risk based levels. These impacts are upriver from the proposed staging area.

6. Long-term Effects

Long-term effects are future effects from the operation and maintenance of the No-Build Alternative or the LPA on environmental resources, or future effects to the operation and maintenance of the No-Build Alternative or LPA from hazardous materials sites. Long-term effects are thought to occur in three general categories: 1) property acquisition, 2) effects to the environment from operation, and 3) effects to operation from hazardous materials. These potential effects are assessed qualitatively based on the project team's current understanding of the natural and built environments.

6.1 Property Acquisition Liability

Long-term liability can result from ownership or from becoming legally and/or financially obligated to a property that is undergoing or will be requiring investigation, cleanup, and/or actions associated with long-term monitoring and maintenance.[16]

6.1.1 No-Build Alternative

The potential for adverse effects from property acquisition liability is low for the No-Build Alternative. Limited acquisitions and displacements will occur. As such, the potential for adverse effects from property acquisition liability is low for the No-Build Alternative compared to the LPA.

6.1.2 LPA

Compared to the No-Build Alternative, the LPA has a higher potential for long-term effects from property acquisition. The LPA will acquire properties within the main project area and at Ruby Junction. Of these sites, 55 have been identified as hazardous materials sites for LPA Option A and 52 for LPA Option B. Long-term adverse effects from property acquisitions are thought to be significant because environmental actions on the acquired properties may continue after construction is completed.

6.2 Adverse Effects on the Environment from Operation and Maintenance

6.2.1 Spills and Releases

Operation of roadway and transit may result in the release of hazardous substances or petroleum products into the environment from accidental spills. These releases can migrate to surface water or groundwater, and can affect properties outside of the right-of-way. Adverse effects include road closures and delays, cleanup costs, and regulatory fines applied to the responsible party.

[16] Under Oregon law ORS 465.255, the owner/operator is liable for remedial costs incurred by the State. The statute limits the State from being legally liable through property acquisition or condemnation.

6.2.1.1 No-Build Alternative

The potential for adverse effects from spills or releases of hazardous substances or petroleum products are high for the No-Build Alternative. These effects are expected to be significant. The No-Build Alternative will have limited updates to the roadway and bridge designs. Without these updates, limited controls are in place to contain spills or releases which could migrate to environmental media. For example, an accidental spill of gasoline from a fueling truck on the I-5 bridges could result in impacts to surface water through release via stormwater scuppers. As such, the potential for adverse effects from spills or accidental releases is high for the No-Build Alternative compared to the LPA.

6.2.1.2 LPA

The LPA has a potential for adverse effects from spills or releases of hazardous substances or petroleum products from operation. These effects are expected to be less significant compared to the No-Build Alternative. The LPA will be constructed with updated road and bridge designs. Updates will include controls associated with the stormwater system to contain and/or manage releases on roadways and bridges. In addition, emergency response to such accidents will likely be quicker due to updates in roadway access and traffic safety. As such, the potential for adverse effects from spills or releases is lower for the LPA compared to the No-Build Alternative.

6.2.2 Stormwater Conveyance System and Treatment Facilities

Stormwater quality can be diminished by runoff over PGIS (i.e., roadways and bridges carrying automobiles) and by runoff and erosion of contaminated soils exposed during excavation and grading. Typical stormwater pollutants include petroleum products, metals (copper, cadmium, and lead), salts, fecal coliforms, and suspended solids. Contaminants in stormwater can migrate to surface water, groundwater and sediments.

Long-term operation and maintenance of the stormwater conveyance system and treatment facilities is necessary to meet discharge and water quality regulatory standards. Treatment technologies rely on reduction of stormwater flow velocity to allow for the settling out of suspended solids and pollutant uptake by plants. Pollutant uptake by plants and accumulation of pollutant loading at soil horizons may be limited or diminished over time. Long-term evaluation of the effectiveness and performance of the treatment systems would be conducted to ensure that the systems are functioning as intended.

6.2.2.1 No-Build Alternative

Adverse effects to the environment from the operation and maintenance of the existing stormwater conveyance and treatment facilities are significant for the No-Build Alternative. Since no or limited upgrades to the system will occur, stormwater discharge quality will likely continue to diminish over time. Diminished stormwater quality will likely degrade the quality of local soils, sediments, surface water and groundwater. As such, the potential for adverse effects from the operation and maintenance of the existing stormwater conveyance system is higher for the No-Build Alternative compared to the LPA.

6.2.2.2 LPA

Compared to the No-Build Alternative, the LPA has a lower potential for adverse effects from impacted stormwater. The LPA is thought to have significant beneficial effects to the environment in regards to stormwater. The LPA will provide management and treatment of stormwater generated from PGIS (Exhibits 1-8a through 1-8c). Updates and enhancement of the stormwater conveyance system and treatment facilities are expected to result in locally improved surface water, sediment and groundwater quality (see Water Quality Technical Report). This is considered significant due to the beneficial uses of the Columbia River and Troutdale Aquifer. In addition, groundwater recharge to the Troutdale Aquifer should increase due to direct infiltration of stormwater into bioswales and the management and storage of overflow volumes in retention ponds. The LPA stormwater conveyance system and treatment facilities would be monitored and maintained to ensure they are performing as intended. Stormwater that is not adequately managed or treated is expected to have significant adverse effects to the environment.

6.3 Adverse Effects on Operation and Maintenance from Hazardous Materials

6.3.1 Legacy Hazardous Material Sites

Legacy sites are hazardous materials sites that are or should be undergoing long-term cleanup actions by the owner, where additional investigation and cleanup may be required but where the responsible party has not yet complied, or are orphan sites which are being managed by regulatory agencies. In special cases, site cleanup activities may coincide with the operation and maintenance of the No-Build Alternative or LPA. These activities could potentially interfere with the long-term operation and maintenance of the alternative and result in financial liability or access restrictions.

6.3.1.1 No-Build Alternative

No legacy hazardous materials sites coincide with the operation and maintenance of the No-Build Alternative. As such, the potential for adverse effects to the operation and maintenance of the No-Build Alternative is low compared to the LPA.

6.3.1.2 LPA

The LPA has a potential for adverse effects from legacy sites during operation. These effects are expected to be significant if not mitigated correctly. A number of priority hazardous materials sites occur within the project area. Of particular concern are the Site ID 138 (Diversified Marine), Site ID 143 (Pier 99), Site ID 103 (the former Hayden Island Landfill/Thunderbird Hotel), and Site ID 151 (the Plaid Pantry Site). These sites have not been fully characterized, and cleanup actions have not been determined. Potential legacy issues associated with Diversified Marine and Pier 99 include cleanup actions for soil and sediment along the North Portland Harbor embankment and/or for in-water sediments. Potential future remedial activities that could affect the operation and maintenance of the LPA include soil removal, sediment dredging, and capping. Potential environmental issues associated with the Plaid Pantry site include subsurface soil and groundwater contamination. Potential future remedial actions that could affect the operation and maintenance of the LPA include soil removal and groundwater treatment and long-term monitoring. In addition, other potential legacy sites could be discovered during project construction activities.

Adverse effects from legacy sites to operation and maintenance of the LPA are significant if not mitigated correctly. As such the potential for adverse effects from legacy contamination to the operation and maintenance of the LPA is high compared to the No-Build Alternative.

6.4 Other Areas to Address for the LPA

6.4.1 TriMet Ruby Junction Maintenance Facility

Adverse effects to the environment could result from the long-term operation and maintenance of the Ruby Junction Maintenance Facility if not correctly mitigated. Operation and maintenance of the facility requires the use of hazardous substances and the generation and disposal of hazardous waste. Poor management practices or an accidental spill could result in a release to the environment. Benefits of the expansion of the facility may include updates in spill prevention and containment systems through new construction.

7. Proposed Mitigation Measures for the LPA Alternative

The following section presents mitigation measures for identified adverse effects for the LPA. Measures are described for the three general categories used to describe temporary and long-term effects: 1) property acquisition, 2) effects to the environment from construction activities, and 3) effects to construction from hazardous materials. There are no significant adverse effects that cannot be mitigated as part of project activities or other identified actions. However, analysis would be conducted during the design-build phase of the project to determine costs and schedule impacts.

7.1 Property Acquisition and Cleanup Liability

Environmental due diligence is recommended for properties to be acquired and/or for properties that have significant associated construction activities. Environmental due diligence can take many forms. However, typical environmental due diligence includes the completion of Phase I and/or Phase II ESAs. These can be completed on a site-by-site basis or completed for blocks of properties, adjacent properties, or within focused areas. The focus of environmental due diligence is to determine the potential for environmental liability (existing contamination, current operational practices, construction worker health and safety, etc.) associated with a particular property. The following sections describe the completion of Phase I and II ESAs.

7.1.1 Phase I Environmental Site Assessments

Phase I ESAs may be necessary to help identify liability issues associated with purchasing a facility or property in fee or for construction purposes. An adequately completed Phase I ESA through good commercial and customary practice to establish the baseline condition of the property is the first step in the due diligence process. This allows the purchaser to be in a legally defensible position if financial and legal liabilities are incurred. Under ASTM E 1527-05 parameters are set forth that define how Phase I ESAs are to be performed. A Phase I ESA can also be used to assist in establishing fair market value of a property.

It is recommended that all properties to be acquired or have significant associated construction activities be subject to minimum due diligence in the form of a Phase I ESA. These can be completed on a site-by-site basis or completed for blocks of properties, adjacent properties, or within focused areas.

7.1.2 Phase II Environmental Site Assessment

A Phase II ESA may be necessary for property acquisition or for construction purposes if the Phase I ESA determines that the property has a likelihood of contamination. The Phase II ESA would be conducted in a manner that is consistent with the Model Toxics Control Act (MTCA), Oregon Administrative Rules (OAR) for Hazardous Materials, ASTM, and AASHTO. The Phase II ESA is an intrusive investigation which can collect samples of soil, groundwater and/or building materials. The substances most frequently tested for are petroleum hydrocarbons, metals, pesticides, solvents, asbestos and/or lead-based paint. A Phase II ESA can be simple, such as investigating a UST, or complex in cases where the site has a long, intensive history and multiple environmental issues. Ecology and DEQ may be notified if unknown contamination is encountered during the assessment. Findings would be used to support avoidance strategies or to help guide appropriate cleanup actions or construction management options.

At this time it is not possible to ascertain all properties that may require a Phase II ESA to ensure that potential liability is identified. In general, a Phase II ESA is conducted based on the results of the Phase I ESA or other known or existing information. However, based on the evaluation work completed as part of this report, it is recommended that at a minimum, Phase II ESAs would be completed for the acquired properties which were identified as priority hazardous material sites (Exhibit 5-1). Supplemental Phase II ESAs will likely be required as additional information is obtained during the environmental due diligence process.

7.2 Effects on Environmental Resources from Construction Activities

7.2.1 Focused Environmental Assessments

Focused assessments may be conducted to assess and characterize existing contamination, if any, in areas where significant subsurface construction activities occur and/or where stormwater infiltration facilities will be placed. Focused assessments may be coordinated with regulatory agencies, if warranted, and may be conducted prior to construction activity, if necessary.

Focused assessments may require an approved “Work Plan” specifying data quality objectives. Data collection and analysis may consist of surface and subsurface soils, sediments, and/or groundwater samples. Results from the focused assessments will be used to document existing conditions and to evaluate the potential for contaminant exacerbation. If a contaminant source is encountered, findings will be used to support avoidance or mitigation strategies or to help guide appropriate cleanup actions and worker health and safety requirements.

Focused environmental site assessments are recommended for the Marine Drive interchange, the North Portland Harbor bridges, Hayden Island bridges, SR 14 interchange, Mill Plain interchange, and for selected staging and casting areas. Assessments would evaluate potential soil, sediment and groundwater contamination that could be exacerbated through excavation and drilling, and/or adversely affect human health or the environment. Each focused assessment would be conducted under a DOT-approved “Work Plan.”

7.2.2 Construction Stormwater Pollution Prevention Plans (SWPPPs)

Control plans would be prepared to prevent or minimize soil and sediment from being carried into surface water by stormwater runoff. Plans would be required for all permitted construction sites, subject to approval by regulatory agencies, and must comply with CPC Title 10 and Vancouver Municipal Code (VMC) Chapter 14.24. Plans would be prepared in a manner that is consistent with the Stormwater Manual for Western Washington and/or WSDOT Highway Runoff Manual. Plans would be put in place prior to clearing, grading, or construction.

7.2.3 NPDES Construction General Stormwater Permits

1200-C and/or 1200-CA permits would be prepared to cover all ODOT and WSDOT construction activities disturbing more than 1 acre. Under the conditions of this permit, ODOT and WSDOT must submit to the regulatory agencies a Notice of Intent to discharge stormwater associated with construction activities and to meet stormwater pollution prevention requirements. Permits are subject to approval by the DEQ pursuant to OAR 340-045 and by Ecology pursuant to WAC 173-220.

7.2.4 Stormwater Conveyance System and Treatment Facilities Monitoring Plan

A stormwater monitoring plan would be prepared to evaluate the long-term performance and effectiveness of the updated stormwater conveyance and treatment systems. Based on the findings, modifications and/or enhancements to the system(s) would be conducted to meet discharge performance criteria.

7.2.5 Drinking Water Supply and Treatment

In the event that contaminant exacerbation occurred, groundwater at WS-1 and WS-3 is currently treated for microbiological constituents by chlorination, and groundwater at WS-1 is treated for volatile organic compounds by aeration. Groundwater at these stations is routinely monitored to detect any changes in contaminant levels, and to ensure that water quality meets drinking water standards. Note that treatment at WS-3 would not mitigate for volatile organic contaminants, if present.

7.3 Effects on Construction from Hazardous Materials

7.3.1 Health and Safety Plans (HASPs)

Site-wide construction HASPs would be prepared to minimize exposure of construction and excavation workers to hazardous materials and to reduce the risk to human health and the environment. Construction would be conducted under an approved site-specific HASP prepared by the contractors. The HASP would conform to OSHA requirements.

7.3.2 Spill Control and Prevention Plans (SCPPs)

SCPPs address three areas: 1) operating procedures the facility implements to prevent oil spills; 2) control measures installed to prevent oil from entering navigable waters or adjoining shorelines; and 3) countermeasures to contain, clean up, and mitigate the effects of an oil spill that has an impact on navigable waters or adjoining shorelines.

SPCCs would be used to limit the generation and exacerbation of hazardous substances or petroleum products, and outline best management practices (BMPs) to be used by contractors. Plans would be required for all permitted construction sites and would be prepared by the construction contractor. ODOT projects administer SPCCs pursuant to OAR 340.142. WSDOT projects require SPCC plans in accordance with WSDOT Standard Specification 1-07.15(1).

7.3.3 Contaminated Media Management Plans (CMMPs)

CMMPs would be prepared to properly characterize, manage, store, and dispose of contaminated materials encountered during construction activities. The CMMP would outline roles and responsibilities of personnel; health and safety requirements; methods and procedures for characterizing, managing, storing, and disposing of waste; and reporting requirements.

7.3.4 Hazardous Building Material Surveys and Abatement Program

A hazardous building material survey of buildings and/or structures may be conducted prior to acquisition, if possible and depending on building age and/or suspicion of hazardous building materials. Surveys should be consistent with OAR 248 and WAC 296-65. The survey would inventory lead-based paint, ACM, mercury and PCB-containing equipment, and/or abandoned waste. Based on survey results, abatement would be conducted prior to demolition, renovation and/or repair. Disposal of lead and ACM would be conducted at applicable Subtitle C or D solid waste facilities.

7.3.5 Well Decommissioning

Two City of Portland process wells located on Hayden Island are within the footprint of the proposed roadway. One well (east of I-5) is abandoned. The other well is not in use and planned for decommissioning prior to construction, pursuant to OAR 690-220 prior to the start of project construction. Other wells, where encountered, would be decommissioned pursuant to OAR 690-220 or WAC 173-160 where necessary. Where applicable, dry wells would be decommissioned pursuant OAR 340 Division 44 or WAC 173-218.

8. Permits and Approvals

This section provides a summary of potential permits and approvals needed for the LPA in regard to hazardous materials. Permit and/or approvals may overlap between federal, state and local requirements.

8.1 Federal

Federal acts that may pertain to the approval process include:

- The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980. 42 USC 9601 et seq.
- The Superfund Amendments and Reauthorization Act (SARA) of 1986. 42 USC 9601 et seq.
- The Resource Conservation and Recovery Act (RCRA) of 1976. 42 USC 6901 et seq.
- The Toxics Substance Control Act (TSCA) of 1976. 15 USC 2601 et seq.

In addition, the U.S. Environmental Protection Agency (EPA) requires a National Pollutant Discharge Elimination System (NPDES) permit for stormwater discharge.

8.2 State of Oregon

Oregon Revised Statues (ORS) and Oregon Administrative Rules (OARs) that may apply to the approval process include:

- Hazardous Waste and Hazardous Materials I and Hazardous Waste and Hazardous Materials II. 2003 Oregon Revised Statutes (ORS) 465 and 466, as amended.
- Underground Storage Tank Rules. 1990. Oregon Administrative Rules (OAR) 340-150.
- Asbestos Requirements. 2002. OAR 340-248.
- Groundwater Quality Protection. 1998. OAR 340-040.
- Construction and Use of Waste Disposal Wells. OAR 340-044.
- Environmental Hazards Notice. 1998. OAR 340-130.
- Hazardous Waste Management System. 2003. OAR 340-100 to 110, 120, 124 and 142.
- Hazardous Substance Remedial Action Rules. 1997. OAR 340-122.
- Water Resource Department. OAR 690-220.

8.3 State of Washington

Washington Administrative Codes (WACs) that may apply to the approval process include:

- Underground Injection Program. WAC 173-218.
- Model Toxics Control Act. WAC 173-340 and RCW 70.105D, as amended.
- Underground Storage Tank Regulations. 1998. WAC 173.360.

- Dangerous waste regulations. 2007. WAC 173–303.
- Water Quality Standards for Groundwater. 1990. WAC 173-200.
- Asbestos Removal and Encapsulation Standards. 1997. WAC 296-65.
- Safety Standards for Construction Workers. WAC 296-65.

8.4 City of Portland

The City of Portland requires that all projects conduct permit applications following CPC Title 24.10.070, Application for Permits.

The City of Portland requires that grading, cut, fill and stockpiling be conducted under CPC Title 24.10 Grading Permit Fees and CPC Title 24.70, Clearing Grading and Erosion Control.

The City of Portland requires that erosion prevention and sediment control be conducted under CPC Title 10, Erosion and Sediment Control Regulations.

The City of Portland requires that stormwater be controlled under CPC Title 17.38, Drainage and Water Quality.

The City of Portland requires that groundwater resources be protected under CPC Title 21.35, Well Head Protection.

The City of Portland requires that the handling, storage, use and transportation of hazardous waste be conducted under CPC Title 21.35.

8.5 City of Vancouver

The City of Vancouver requires a pre-application conference for all projects subject to Vancouver Municipal Code (VMC) Chapter 20.740, Decision Making Procedures, unless waived by the planning office.

The City of Vancouver requires a permit for grading, cut, fill and stockpiling under VMC Chapter 20.210.090, Decision Making Procedures.

The City of Vancouver requires that construction must conform to VMC Chapter 14.26.135, Water Resources Protection – Well Head Protection.

The City of Vancouver requires that construction must conform to VMC Chapter 20.740.120, Critical Areas Protection - Frequently Flooded Areas.

The City of Vancouver requires that erosion prevention and sediment control be conducted under (VMC) Chapter 14.24, Water and Sewers – Erosion Control.

The City of Vancouver requires that stormwater control be conducted under VMC Chapter 14.25, Water and Sewers – Stormwater Control.

The City of Vancouver requires that groundwater resources be protected under VMC Chapter 14.26, Water and Sewers – Water Resource Protection.

9. References

Beeson, M.H., T.L. Tolan, and I.P Madin. 1991 Geologic Map of the Portland Quadrangle, Multnomah and Washington Counties, Oregon, and Clark County, Washington. Oregon Department of Geology and Mineral Industries, Geologic Map Series 75.

Bretz, H.J., H.T. Smith, and G.E. Neff. 1956. Channeled Scablands of Washington: New data and interpretations. Geological Society of America Bulletin, v. 67, no. 8.

CH2M Hill. 1990. Letter to Dick Walker (Dept. of Ecology) from Jeff Barry (CH2M Hill). April 27, 1990.

CH2M Hill. 2006. Site Investigation and Remedial Action Report for Boise Cascade. By CH2M Hill, January 2006.

Clark County. 2005. Online maps accessed September 2005 at: http://gis.clark.wa.gov/ccgis/mol/property.htm.

DEA (David Evans and Associates). 2006. Columbia River Crossing, Hydrographic and Geophysical Investigation. High Resolution Bathymetric Mapping, River Bed Imaging, and Subbottom Investigation. Prepared for Washington State Department of Transportation by David Evans and Associates, Inc., Portland, Oregon. February 2006.

EPA. 2006. Final Support Document for Sole Source Aquifer Designation of the Troutdale Aquifer System. EPA 910-R-06-006. Prepared by the Region 10 U.S. Environmental Protection Agency, Seattle Washington. July 2006.

Gray & Osborne, Inc. 1996. Water System Comprehensive Plan. City of Vancouver. November 1996.

HDR Engineering, Inc. 2006. Draft Water System Comprehensive Plan – 2006, City of Vancouver, Washington. March 2006.

Hoiland, Richard. City of Vancouver personnel communication with Eric Roth, Parametrix, April 14, 2010.

Madin, I.P. 1994. Geologic Map of the Damascus Quadrangle, Clackamas and Multnomah Counties, Oregon. Oregon Department of Geology and Mineral Industries Geologic Map Series 60.

McFarland, W.D. and D.S. Morgan. 1996. Description of the Groundwater Flow System in the Portland Basin, Oregon and Washington. U.S. Geological Survey, Water Supply, Paper 2470-A.

Mundorff, M.J. 1964. Geology and Ground-Water Conditions of Clark County, Washington, With a Description of a Major Alluvial Aquifer along the Columbia River. U.S. Geological Survey, Paper 1600. Washington D. C.

ODOT (Oregon Department of Transportation). 2004. ODOT Hazmat Program Procedures Guidebook. Prepared by the Oregon Department of Transportation. Revised November 11, 2004.

Parametrix. 2007. CRC Methods and Data Report for Hazardous Material Sites. January 2007.

Parametrix, S.S. Papadopulos, Pacific Groundwater Group, and Keta Waters. 2008. Vancouver Lake Lowlands Groundwater Model Summary Report, prepared for Port of Vancouver and Clark Public Utilities by Parametrix, S.S. Papadopulos & Associates, Pacific Groundwater Group, and Keta Waters. February 2008.

Parametrix. 2009. Interstate 5 Columbia River Crossing – Draft Troutdale Sole Source Aquifer Report, prepared for the Washington Department of Transportation and the Oregon Department of Transportation. August 2009.

PGG (Pacific Groundwater Group). 2002. Evaluation of Clark Public Utilities Proposed South Lake Wellfield. Prepared for Clark Public Utilities. Draft October 9, 2002.

Phillips, W.M. 1987. Geologic map of the Vancouver Quadrangle, Washington and Oregon. Washington Division of Geology and Earth Resources. Open File Report 87-10.

Pratt, T.L., J. Odum, W. Stephenson, R. Williams, S. Dadisman, M. Holmes, and B. Haug. 2001. Late Pleistocene and Holocene Tectonics of the Portland Basin, Oregon and Washington, from High-Resolution Seismic Profiling. Bulletin of the Seismological Society of America. Vol. 4, No. 9.

Riley, Mike, S.S. Papadopulos. 2010. Personal communication with Eric Roth. Parametrix. April 14, 2010.

Robinson, Noble and Carr, Inc. 1980. City of Vancouver, Ground Water Source and Use Study: Volumes I and II. July 1980.

Robinson and Noble, Inc. 1992. Investigation of the Sandy River Mudstone Aquifer. City of Vancouver. April 1992.

Shannon & Wilson. 2008. Geotechnical Report Columbia River Crossing Project – Interstate 5. Preliminary Foundation Evaluation Main Span (In-Water Piers) Vancouver, WA, Portland, OR. August 2008.

Siipola, Mark D. 2009. Personal communication email of February 3, 2009. Ocean Dumping Coordinator United States Army Corps of Engineers, Portland, Oregon.

Snyder, D.T., D.S. Morgan, and T.S. McGrath. 1994. Estimation of Ground-water Recharge from Precipitation, runoff into Drywells, and On-site Waste-Disposal Systems in the Portland Basin, Oregon and Washington. U. S. Geological Survey Water Resources Investigation Report 92-4010. Portland, Oregon.

Snyder, D.T. 2008. Estimated depth to ground water and configuration of the water table in the Portland, Oregon area: U.S. Geological Survey Scientific Investigations Report 2008–5059, 40 p.

Swanson, R.D., J.B. McFarland, J.B. Gonthier, and J.M. Wilkinson. 1993. A description of hydrogeologic units in the Portland basin, Oregon and Washington. U.S. Geological Survey, Water Resources Investigative Report 90-4196.

Tetra Tech. 1992-1993. Reconnaissance Surveys of the Lower Columbia River – Tasks 1-7. Prepared for Columbia River Bi-State Committee. Tetra Tech, Inc., Bellevue, Washington. Available at http://www.lcrep.org/lower-columbia-river-bi-state-water-quality-studies. Accessed January 14, 2011.

USACE (U. S. Army Corps of Engineers). 2006. Bathymetric Charts. Columbia River and Lower Willamette Rivers below Vancouver, Washington and Portland, Oregon. U. S. Army Engineer District Portland.

USACE. 2009 (Accessed). River Sediment Quality Evaluation for the Columbia River Channel Deepening Feasibility Report. Available from https://www.nwp.usace.army.mil/ec/docs/Planning/crcd/main.pdf.

USACE. 2009. Columbia River Mainstem Federal Navigation Channel Sediment Quality Evaluation Report. Portland District Corps of Engineers. CENWP-EC-HR. September 2009.

USACE. 2008. Dredge Material Evaluation and Disposal Procedures. Prepared by the Dredge Material Management Office, U.S. Army Corps of Engineers. July 2008.

Usley, Pat. 2009. Personal communication phone call of October 14, 2009. City of Portland Groundwater Protection Manager, Portland, Oregon.

WSDOT (Washington Department of Transportation). 2009. Guidance on Standard Methodology for WSDOT Hazardous Material Discipline Report. Prepared by the Washington Department of Transportation, Environmental Services Office, Olympia, Washington. January, 2009.

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