Portland Harbor Upland Source Control Summary Report

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DEQ is a leader in restoring, maintaining and enhancing the quality of Oregon's air, land and water.

State of Oregon
Department of Environmental Quality

Table of Contents

List of Tables

List of Figures

Acronym List

AOPC – Sediment Area of Potential Concern

BMPs – Best Management Practices

BTEX - benzene, toluene, ethylbenzene, and xylenes

CERCLA – Comprehensive Environmental Response, Compensation and Liability Act

CSO – Combined Sewer Overflow

DDE – dichlorodiphenyldichloroethylene (DDT breakdown product)

DDT – dichlorodiphenyltrichloroethane (pesticide)

DDx – multiple components of DDT and breakdown products

DEQ – Oregon Department of Environmental Quality

DNAPL – dense non-aqueous phase liquids

ECSI – DEQ's Environmental Cleanup Site Information database

EPA – US Environmental Protection Agency

GIS – Geographic Information Systems

JSCS – 2005 EPA/DEQ Portland Harbor Joint Source Control Strategy

LNAPL – light non-aqueous phase liquids

MOU – Memorandum of Understanding

MS-4 – Municipal Separate Storm Sewer System permit

MTBE - methyl tert-butyl ether

NEC – No Exposure Certification

NFA – No Further Action determination

NPDES – National Pollutant Discharge Elimination System

ODOT – Oregon Department of Transportation

OU – Operable Unit

PAHs – polycyclic aromatic hydrocarbons

PBOT – Portland Bureau of Transportation

PCBs – polychlorinated biphenyls

PCE – perchloroethylene or tetrachloroethene

RCRA – Resource Conservation and Recovery Act

RI/FS – Remedial Investigation/Feasibility Study

SCD – Source Control Decision

SLV – screening level values

SDU – Sediment Decision Unit

SVOCs – semi-volatile organic compounds

TCE – trichloroethylene

TPH – total petroleum hydrocarbons

VOCs – volatile organic compounds

1.0 Introduction

On December 1, 2000, a section of the lower Willamette River within the City of Portland, named the Portland Harbor, was added to the Superfund National Priority List. At the time, the Oregon Department of Environmental Quality was actively working on cleaning up 16 sites in the Portland Harbor area and had identified 44 additional upland sites as potential sources to the river.

DEQ began working to clean up sources to this area of the Willamette River in the late 1980s. In 1997, DEQ asked EPA for assistance in identifying potential sources of elevated chemical concentrations detected at sites within the lowest reach of the Willamette River, known as Portland Harbor. In response, EPA initiated a sediment investigation within a six mile reach considered likely to have the highest chemical concentrations based on the presence of a number of long-standing industrial sources. The findings of this study, documented in EPA's 1998 Portland Harbor Sediment Investigation Report, suggested that there were several areas of elevated chemical concentrations in river sediments within the Harbor and that these were mostly near known sources of upland pollution. In addition, the study indicated that contaminant migration and resuspension were limited and pointed to other areas of high chemical concentrations in river sediments that were not near known upland pollution sources. This suggested that, in addition to known upland sources, there were also sources yet to be identified.

In consideration of these findings, DEQ initiated a proactive eight-step site discovery process to identify likely sources of upland contamination threatening the river. The eight steps summarized below are described in detail in DEQ's June 1999 Portland Harbor Sediment Management Plan.

Step 1: Identify contaminants of interest – DEQ used the 1998 EPA report results to define a list of representative contaminants present in the Harbor at levels that could threaten human health and the environment, which included metals, polycyclic aromatic hydrocarbons, polychlorinated biphenyls, chlorinated pesticides, chlorinated herbicides, dioxin and tributyl tin.

Step 2: Identify elevated concentrations – There was no clear definition of background contaminant concentrations or ambient conditions in the Portland Harbor area to make determinations of what levels of contaminants should be considered to be elevated. DEQ evaluated the EPA sediment data from the Harbor with a graphical method previously used by the U.S. Geological Survey Water Resources Division (Rinella 1998) to define baseline and elevated contaminant concentrations for Portland Harbor sediment.

Step 3: Identify locations where baseline concentrations are exceeded **–** DEQ prepared maps showing locations of samples with elevated contaminant concentrations throughout the Harbor and evaluated whether these areas were associated with upland sources DEQ was actively working to clean up, or if the potential presence of unidentified sources were indicated.

Step 4: Identify potential sources **–** By analyzing area and site drainage patterns, evaluating historical activities and conducting field reconnaissance work, DEQ was able to identify other potential sources. Some were unrelated to sites that DEQ was already investigating and some

were adjacent to active cleanup sites where data suggested the potential presence of another source.

Step 5: Request information from property owners – In January 1999, DEQ sent letters to approximately 90 properties located within 1,500 feet of Portland Harbor requesting historical and current information about activities at the sites. Follow-up letters and questionnaires were sent to a subset of the property owners or lessees that were potentially responsible for sources of sediment contamination in the Harbor.

Step 6: Document likely sources of contamination – Forty-four likely potential sources of sediment contamination above baseline levels were identified, added to DEQ's Environmental Cleanup Site Information (ECSI) database and site assessment was initiated.

Step 7: Site screening and prioritization – Highest priority was given to sites with associated sediment concentrations more than three times the baseline level, with several different contaminants that exceeded baseline, and in consideration of EPA's water quality rankings on toxicity of the elevated chemicals. Lower priority was given to sites with few contaminants above baseline levels and where the magnitude of the exceedance was less than a factor of three for all constituents. Professional judgment using: evidence of an on-going release, field observations, releases below baseline levels, historical releases, the quality of information, the presence of iron, magnesium, thallium, cobalt, vanadium, and titanium that are not of primary concern, and an evaluation of the individual compounds within contaminant groups, such as individual PAHs or phthalates also helped determine the priority for follow-up.

Step 8: Strategy recommendations – DEQ summarized available information on file and from questionnaires and completed Sanborne Insurance Map reviews to make recommendations as to investigation and cleanup actions to appropriately address potential sources and threats posed by the sources.

DEQ's initial effort of completing strategy recommendations for all likely Portland Harbor sources was curtailed with EPA's December 2000 listing of the Harbor. However, DEQ's site discovery and assessment efforts continued and expanded as the initial study area grew. The above described process became the backbone of the upland source control process for Portland Harbor, greatly benefitting DEQ's ability to promptly discover and assess sites.

1.1 Background and Purpose

In response to the 2000 Superfund listing, a Memorandum of Understanding was signed in February 2001, to provide a framework for cooperation in the investigation and cleanup of the Portland Harbor Superfund Site that would optimize federal, state, tribal and trustee expertise and available resources. DEQ signed the agreement along with United States Environmental Protection Agency, Confederated Tribes and Bands of the Yakama Nation, Confederated Tribes of the Grand Ronde Community of Oregon, Confederated Tribes of Siletz Indians, Confederated Tribes of the Umatilla Indian Reservation, Confederated Tribes of the Warm Springs Reservation of Oregon, Nez Perce Tribe, National Oceanic and Atmospheric Administration, Oregon Department of Fish and Wildlife, and U.S. Department of the Interior. The Tribes and Services are collectively referred to as "the partners" throughout this report.

Under the 2001 MOU, EPA was designated as the lead agency for investigating and cleaning up contamination in the river sediment, using federal Superfund authorities. DEQ, using state

cleanup authority, was designated as the lead agency for identifying and controlling upland sources of pollution adjacent to or near the river that may be contaminating river water or sediments. To coordinate in-water cleanup and upland source control work, the MOU specifies that DEQ and EPA will jointly develop a mutually acceptable source control strategy that defines a process for identifying and controlling all potential sources of contamination threats to the river. That strategy, called the PH Joint Source Control Strategy was finalized in December of 2005 and is available at: http://www.oregon.gov/deq/FilterDocs/ph-JSCSFinal.pdf.

DEQ has consistently applied the Joint Source Control Strategy, commonly referred to as the JSCS, to all source control projects in the Harbor. Now, in preparation for the drafting of EPA's Proposed Remedial Action Plan, DEQ prepared this report to summarize the progress of upland source control and status of completion at each site for evaluation of the potential for recontamination of the river sediment and risk to human health or ecological receptors.

1.2 Joint Source Control Strategy and Guidance Overview

The overarching goal of the JSCS is to identify, evaluate and control sources of contamination that may affect the Willamette River in a manner that is consistent with the objectives and schedule for the Portland Harbor remedial investigation and feasibility study, commonly known as an RI/FS. The underlying principles for achieving this goal include:

- The JSCS provides the framework for site-specific upland source control decision-making, briefly summarized as:
  - Thorough assessments of potential sources for all potential pathways to the river using a standardized investigation process, based on CERCLA remedial investigation guidance, to determine whether the potential for adverse impacts to the river currently exist;
  - Data collection for characterization and evaluation of sources in uplands by potentially responsible parties and off shore by the Lower Willamette Group;
  - Developing and applying comprehensive screening level values, which are concentrations of contaminants in water, soil or sediment, for use in prioritizing contamination threats to the river;
  - Prioritizing work on potential upland threats by the following scheme:
    - Excluded – no source or current pathway;
    - Low-priority – does not exceed screening level values, so no source controls likely necessary;
    - Medium-priority – screening level values exceeded at interface with the river – weight of evidence evaluation, that may include in-river data, to determine if source controls are needed;
    - High-priority – on-going source that exceeds screening level values at interface with the river or otherwise represents an imminent and substantial threat to human health or the environment – move forward aggressively with source control evaluation, pathway specific measures and other controls deemed necessary;
- Completion of upland source control evaluations prior to issuance of the in-water record of decision and all necessary source controls implemented prior to in-water remedy implementation;

- Implementation of source control actions, where needed, using DEQ's removal and cleanup authorities as specified in Oregon Administrative Rule 340-122-0070;
- Integration of upland and in-water remedies, where appropriate;
- Maintain awareness that protection of human health and the environment, including potential for recontamination, is the standard for upland source control and any uncontrolled upland sources of contamination may be considered for CERCLA cleanup in the EPA record of decision.

During the implementation of the source control program, DEQ identified the need for a distinct category for some groundwater plumes within the medium priority for the JSCS contaminant prioritization scheme described above. In this category, the groundwater pathway is complete and contaminant concentrations exceed risk-based values, which will require implementation of a groundwater remedy or source control measure. However, because of the low potential for the plume to recontaminate river sediment and the low risk exceedance ratios or uncertainty about integration of the upland and in-water remedy, DEQ is not utilizing removal authority to require the immediate design and implementation of a source control measure. Instead, the groundwater remedy or source control measure will be integrated into the upland site remedy as evaluated in a site specific upland feasibility study and selected in the upland site record of decision. These groundwater plumes, or portions of plumes, will be identified to EPA and partners as medium priority along with a schedule for the selection of the source control measure. Because the risk of sediment recontamination is low for these medium priority plumes, a later selection and implementation of source control measures should not delay the implementation of in-water remedial measures. Appendices to the JSCS provide details on the regulatory framework for jointly accomplishing upland source control, as well as identifying and characterizing potential upland sources and a framework specific to stormwater pathway evaluations. DEQ developed, in coordination with EPA and the City of Portland, the Guidance for Evaluating the Stormwater Pathway at Upland Sites in 2009, updated in 2010 and 2015, to standardize stormwater assessments. This guidance is available at: http://www.oregon.gov/deq/Hazards-and-Cleanup/env-cleanup/Pages/Stormwater-Guidance.aspx and includes a tool for evaluating stormwater data. This tool was created by using contaminant concentration data from many of the stormwater and stormwater solids samples collected at Portland Harbor-area heavy industrial sites. This data was used to create a series of charts that plot rank-order samples against contaminant concentrations, and are used to identify contaminant concentrations in samples that are atypically elevated. Concentrations falling within the upper/steeper portion of the curve are an indication that uncontrolled contaminant sources may be present at the site and that additional evaluation or source control measures may be needed. Concentrations that fall on the lower/flatter portion of the curve suggest that stormwater is not being unusually impacted by contaminants at the site, and while concentrations may exceed the risk-based screening level values, they are within the range found in stormwater from active industrial sites in Portland Harbor. In 2015, DEQ completed the addition of data collected between 2010 and 2014 to the charts and additional quality assurance and quality control was performed, both of which improve confidence in the reliability of the screening tool.

As required by the JSCS, DEQ tracked and reported detailed upland source control progress by prioritized pathways at all sites through regular Milestone Reports from 2006 through 2013. These reports are available on DEQ's website at: http://www.oregon.gov/deq/FilterDocs/ph-JSCSFinal.pdf.

In addition to the JSCS, DEQ referred to the 2005 EPA Contaminated Sediment Remediation Guidance for Hazardous Waste Sites, and 2002 EPA Office of Solid Waste and Emergency

Response Directive 9285.6-08 Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites (specifically w/PCBs), in crafting the approach to demonstrating prevention of recontamination presented in this report. DEQ discussed this approach with EPA Region 10 staff beginning in December 2011 and, by January 2013, a joint framework and plan was agreed to by both agencies (EPA 2013a). Finally, EPA Region 10 requested DEQ consider the Proposed Plans for the CERCLA sediment sites at the Lower Duwamish Waterway in Washington and the Gowanus Canal in New York in preparing this report. DEQ reviewed these Proposed Plans and the state-prepared documents supporting them, as well as the 2013 memo on the evolution of source control in the Lower Duwamish Waterway by EPA and Washington Department of Ecology.

1.3 Report Organization and Evolution

In accordance with DEQ's role under the 2001 MOU, the 2005 JSCS and additional direction by EPA Region 10, DEQ prepared this Upland Source Control Summary Report to summarize Portland Harbor upland investigations, source control evaluations and source control measures performed under DEQ's state cleanup authorities.

Prioritization of pathways at each site were determined in accord with the JSCS, as summarized above in Section 1.2, and were reported in each Milestone Report submitted by DEQ to EPA in 2006 through 2013. Building from Step 7 of DEQ's site-discovery strategy, as summarized in Section 1.0, DEQ assigned high priority to sites with highly elevated contaminant concentrations, several contaminants with elevated concentrations, high toxicity contaminants, or large areas of impact or multiple pathways. Once determined, pathway prioritizations do not change. Rather, based on additional investigation and implementation of effective source control measures, lines of evidence were evaluated to determine each complete pathway's potential for recontamination of river sediment.

This report presents DEQ's evaluation of the potential for sediment recontamination and unacceptable risk to Willamette River receptors in the study area from upland contaminant transport pathways. The focus of this evaluation is on the potential for sediment recontamination due to on-going and future stormwater discharges, groundwater discharges and soil erosion, as well as risk related to exposure to surface water. Site by site information is presented in this report by sub-areas, called geographic regions, of the study area and conclusions are drawn on a georegional and harbor-wide basis. The evaluation considers multiple lines of evidence, including: contaminants found in sediment off shore of sites; contaminants found on sites and the behavior of these contaminants in and at the interfaces of the media present; sufficiency of source control work completed; the geography and climate; density, distribution and type of development present; regulatory programs in place; and adaptive management opportunities. Modeled on information prepared for proposed plans at other national sediment Superfund Sites, particularly the Lower Duwamish Waterway in Washington and the Gowanus Canal in New York, the report is intended to inform the EPA Region 10 Proposed Plan for Sediment Remediation in Portland Harbor.

At the request of EPA Region 10, the report categorizes potential contaminant transport pathways at 171 sites as either:

- Excluded (no source or incomplete pathway);
- Sources identified and removed and when;
- Sources identified and controlled, how and when; or

- Sources that are yet uncontrolled with a plan and schedule for control to be implemented.

Facilities where upland source control has not been implemented at the time of the EPA in-water record of decision may be included in the decision or EPA may require further action at these sites to be protective of the river (EPA & DEQ 2005).

For purposes of obtaining input from EPA and partners on DEQ's direction in the initial report, DEQ prepared geographic region information on two regions, one simple and one complex, in an initial partial draft report. This initial partial draft was shared with EPA and partners in March 2014 and input received was incorporated into the November 2014 summary report. EPA also submitted a memorandum on DEQ's November 2014 report that included recommendations to EPA management and assessment of DEQ's source control efforts to date (EPA 2015b). As discussed with EPA, DEQ updated the status of source control efforts with progress made since November 2014, for use by EPA in development of the Proposed Plan for Remedial Action in Portland Harbor, anticipated in April 2016. DEQ also integrated unsolicited comments received by various responsible parties and stakeholders on the November 2014 version of the report, into the March 2016 update. Finally, DEQ shared draft language on updates with EPA and integrated requested edits, following a discussion of the draft language on March 15, 2016.

2.0 Site Description and Upland Land Use

The Willamette River is the 13th largest (Hulse et al. 2002) river in the United States, stretching approximately 187 miles between the mountains of the Cascade Range and the Coast Range (Wikipedia 2012). With its tributaries, the Willamette basin drains about 12% of the state of Oregon or 11,460 square miles (OWEB 2005). Nearly all of Oregon's large cities are situated in the Willamette Valley, such that the watershed supports 70% of Oregon's population (OWEB 2005, Kulongoski 2005). The Lower Willamette subbasin drains 408 square miles and includes seven major tributaries (DEQ 2006). The Lower Willamette River begins below Willamette Falls, a natural plunge of approximately 40 feet, after which the remaining 45 miles of the mainstem channel is low-gradient, wide, relatively stable and river stage is affected by backwater from the Columbia River, to which it discharges (Hulse et al. 2002). The Lower-Lower Willamette River comprises the final 17 miles and is contained by the Tualatin Mountains (or West Hills) to the west and a high bluff with lowlands to the east peppered with remnant volcanoes, like Mt. Tabor and Rocky Butte (OWEB 2005). This final reach wends through Portland, Oregon's most populous and industrial city, to meet the Columbia River approximately 100 miles from the Columbia's confluence with the Pacific Ocean (Wikipedia 2012).

EPA's website indicates that the current Portland Harbor study area extends from the Columbia Slough to the Broadway Bridge. This translates approximately to river mile 1.0 to 11.8 of the lowest reach of the Willamette River, which is just north of Portland's downtown center to about a mile before the river's confluence with the Columbia River. With this approximately ten mile stretch of river at its center, the drainage area boundary extends upland to both the east and the west, incorporating a total of approximately 21.7 square miles or about 13,785 acres. The river surface itself comprises approximately 3.7 square miles or about 2,350 acres. More than half of the remaining acreage is undeveloped open space. While parks and natural areas occur on both sides of the river, the vast majority (approximately 10.9 square miles or about 6,970 acres) makes up a portion of the heavily wooded hill slopes of Forest Park, from the ridge of the Tualatin Mountains down to the west side of the river. Multiple tributaries make their way to the river down through Forest Park and into pipes, culverts and man-made channels through or

under the industrially developed west side floodplain within the study area. All east side tributaries have been diverted and no longer contribute discharge to the river within the study area. Highway transportation makes up approximately 0.5 square miles or about 300 acres of the uplands in the study area. Land uses on the remaining approximately 4,165 acres or about 6.5 square miles are an interspersed mix of industrial, commercial, vacant lots, residential areas, and roadways connecting them all.

3.0 Potential Upland Source Contaminant Transport Pathways

Using the full extent of state authorities, DEQ investigated or directed source control work at 171 upland sites in Portland Harbor. Preliminary investigation activities at these sites were designed to determine whether the site posed a potential or ongoing source of contamination to the river. Per the JSCS, these source control evaluations considered all potential, current and historical contaminant sources and current or reasonably likely future contaminant migration pathways for the contaminants to be transported to the river. Each potential pathway is summarized below.

3.1 Direct Discharge

Levels of contaminants in historical direct discharge streams were much greater than current loads, as environmental awareness, regulatory controls, and industrial practices have evolved over the past five decades. Current allowable discharges are regulated under individual or general permits issued in accordance with the Clean Water Act National Pollutant Discharge Elimination System legislation and guidance. City, state and federal illicit discharge programs are also in place to prevent direct discharges of pollution into streams.

3.1.1 Waste and Wastewater

Historically, waste and wastewater from industrial processes and private and municipal sewage were disposed of by dumping it untreated into the Willamette River. Current discharges are limited to permitted discharges of wastewater treated to the maximum extent practicable.

3.1.2 Stormwater

Pollutants in stormwater runoff, combined sewer overflows and intercepted groundwater discharge directly to the Portland Harbor Superfund Site through both private and public outfalls. In addition, runoff may flow overland and down the banks from a site to the river. When uncontrolled, overland runoff can transport sediment, debris and contaminants to the river.

3.1.3 Overwater Activities

Activities such as sandblasting, painting, loading and unloading, maintenance, repair and general operations that occur at riverside docks, wharves, or piers can deliver sediment, debris and contaminants directly to the river. In addition, discharges from vessels such as gray, bilge, and ballast waters; fuel releases; and spills may negatively impact the river.

3.2 Soil and Bank Erosion

Erosion of upland soil and riverbanks by stormwater and river action may release contaminants to the river. Potential sources of contamination include past uses such as contaminated fill, waste piles, landfills and surface impoundments.

3.3 Groundwater

Contaminated groundwater may enter the river directly via discharge through sediments or bank seeps and may also infiltrate into stormwater pipes, ditches or creeks that discharge to the river. Contaminant migration may occur as non-aqueous phase liquids or as chemicals dissolved in the groundwater itself.

3.4 Air Deposition

Contaminants transported in the air can fall onto the river surface directly or onto land within the study area that can then be transported in stormwater runoff. Air deposition can happen during both dry and wet conditions. Air contaminants are generated though a combination of point (such as industrial smokestacks, painting, shredding/grinding, sandblasting, materials loading/unloading) and nonpoint (such as vehicle/vessel/aircraft emissions and plastics off-gassing) sources and can be wind-driven over long distances (including globally) before depositing.

3.5 Upstream Sediment Impacted by Upland Activities

Transport of contaminated sediment into the study area is noted in the JSCS as a potential concern for recontamination of the in-river remedy. Contaminants in upstream sediment can be transported downstream by hydrodynamic processes, like river currents, as well as being influenced by dredging, vessel traffic, propeller wash or other waterway activities.

4.0 Potential for Sediment Recontamination and Unacceptable In-Stream Risk

Sediment Recontamination Potential - When remediated sediment sites become recontaminated, the environmental, economic and political consequences are significant. Therefore, several studies have been conducted, which evaluate cases where recontamination of remediated sediment have occurred and highlight lessons that can be applied to improve outcomes at sites under consideration for sediment remediation. Review of case studies indicates that the primary causes of sediment recontamination have been uninvestigated pathways, both in-stream and from uplands (ASTSWMO 2013, Nadeau & Skaggs 2007). Incomplete in-stream sediment removal or unidentified upstream or adjacent sediment contamination is the most frequent cause of recontamination by post-remedial river actions resulting in scour and residual resuspension (ASTSWMO 2013). Upland factors contributing to sediment recontamination have included uninvestigated bank and groundwater contamination and uncontrolled combined sewage and industrially impacted waste water and stormwater discharges (ASTSWMO 2013). DEQ anticipates that EPA's approach to preventing sediment recontamination following implementation of the in-water sediment remedy will focus on the more significant potential in-water factors, as highlighted by the studies referenced, and also

include consideration of potential upland factors. As DEQ's responsibility is for upland source control, the focus of this report is to demonstrate the potential upland sources have been sufficiently investigated and controlled to prevent sediment recontamination from potential upland factors. The fact that DEQ comprehensively investigated and controlled sources found in bank, groundwater and stormwater pathways within and upstream of the study area gives confidence that control of the primary potential upland causes of sediment recontamination, as defined by recontamination at other sites, will have been achieved in Portland Harbor prior to implementation of the remedy. This confidence is further enhanced by the following facts, which are unprecedented at other sediment sites, that: industrial waste water and stormwater discharges into Portland Harbor were separated in the 1950s; combined sewage overflows to the river were controlled in stages between 2000-2011; and, DEQ has undertaken upland and in-water cleanup actions at all of identified upstream areas with contamination at levels necessitating action. Details on these topics are provided in the appropriate sections that follow in this report.

Consistent with the JSCS, EPA Contaminated Sediment Remediation Guidance (2005), and EPA OSWER Directive 9285.6-08, DEQ and EPA agreed that a lines and weight of evidence approach be utilized to evaluate the potential for recontamination of river sediment (EPA 2013a). EPA and DEQ further agreed that such an evaluation should be based on qualitative information, as well as quantitative data analyses, as necessary and appropriate for identifying recontamination risks (EPA 2013a). Per EPA's national guidance (2005) and the Portland Harbor JSCS, completion of the evaluation of the potential for recontamination from upland sources prior to implementation of in-water sediment actions informs EPA's selection of appropriate remedial techniques and timelines. If significant sediment recontamination potential is found at an individual upland site, especially where total control is not attainable, additional EPA-led source control measures may be needed as part of their response action. However, if sediment cleanup actions will result in significant benefits to human health or the environment, these actions should go forward despite on-going source risks. In addition, a recontamination evaluation during design of selected remedies should include thoughtful design of effectiveness monitoring and a management strategy that responds to the monitoring so that targeted action can be taken to prevent recontamination.

As defined by EPA Region 10 Environmental Cleanup, sediment recontamination means "anything above a cleanup level" (Blocker 2014), but such deposits on remediated sediment may not require action beyond monitoring. Appropriately then, evaluation of the potential for post-cleanup sediment recontamination will be limited to only the contaminants for which sediment cleanup levels have been set in the EPA record of decision. At the time of this report, specific cleanup levels in Portland Harbor have not been finalized, but are anticipated be drawn from preliminary remediation goals that have been developed and are currently being refined. Because the proposed in-water remedy will rely on both initial construction elements and also longer term monitored natural recovery processes, DEQ anticipates determination of cleanup level exceedances to also be conducted on immediate and longer term time scales. And because EPA's nine remedial action objectives are associated with varying spatial scales, DEQ anticipates assessment of recontamination to also reflect these varying spatial scales. Finally, because it will be difficult to design post-remedy sediment monitoring that will allow differentiation between in-water and upland contributions to any re-deposition of contaminants on remediated sediment areas, DEQ anticipates coordination with EPA on a case-by-case basis to determine appropriate response measures to any indication of recontamination.

Unacceptable In-Water Risk Potential - EPA states in working drafts on revised sections of the RI/FS that "It is the responsibility of the EPA risk manager to ultimately define the unacceptable ecological risks," that these will be "based on the contaminants posing potentially unacceptable risk at the end of the baseline ecological risk assessment," and that "these risks may become a basis for remedial actions." Remedial alternatives presented in the draft Portland Harbor FS, propose sediment remedial actions, but do not directly address cleanup of the water column. Therefore, water column-specific remedial goals are most appropriately applied as measures of progress toward meeting sediment remedial action objectives, rather than non-sediment cleanup levels intended to be met as a result of implementation of the sediment remedy. This is consistent with the record of decision on the Lower Duwamish Waterway that EPA recommended DEQ look to as an example of what to expect in Portland Harbor. Because EPA will not define contaminant cleanup levels in Portland Harbor until the record of decision, there is some uncertainty as to implications for upland source control actions to achieve compliance with the JSCS objectives. However, using EPA guidance and information developed at other CERCLA sediment sites already at the record of decision stage, such as the Lower Duwamish Waterway in Washington and the Gowanus Canal in New York, DEQ developed an approach to achieving acceptable levels of water column risk. DEQ's approach is consistent with the post-ROD Lower Duwamish Source Control Sufficiency Review Process and with EPA CERCLA and Clean Water Act guidance on source control, in that once direct sources are controlled, subsequent contaminants in media like floodplain soils, stormwater discharges, and groundwater seeps, may be best handled under CWA or state authorities (WDOE 2016, EPA 2005, EPA 2007, EPA 1998, EPA 2015a, EPA 2015c). DEQ's approach has three main elements, as described below.

First, using DEQ's promulgated rules and statutes for cleanup (Oregon Administrative Rules 340-122-0205 through 340-122-0360 and Oregon Revised Statutes 465 and 466) and on-going programs for water quality protection (OAR 340 Divisions 40, 41, 42, 45, 48 and 54 and ORS 468b), DEQ's source control work is intended to eliminate, control or minimize all sources of contaminants directly discharging from upland sites to the river. These programs and DEQ's work under them are elucidated in the sections that follow. Second, DEQ's source control evaluations conservatively use the lists of contaminants found at elevated concentrations in each sediment area of potential concern first drafted in the Remedial Investigation by the Lower Willamette Group (LWG 2010). Because many of these contaminants were not retained when the risk assessment was finalized, DEQ's approach results in a more conservative evaluation of resultant contaminant concentrations investigated and following control measure implementation. And third, on-going discharges that are permitted under Oregon's EPA delegated and approved Clean Water Act Section 402 National Pollutant Discharge Elimination System program are intended to meet water quality standards in-stream and fulfill total maximum daily load goals in order to support all designated and potential beneficial uses. Thus watershed-wide implementation of NPDES permits (inclusive of on-going monitoring), TMDL development and implementation and other water quality programs, as described in Sections 4.1 and 4.2 of this report, coupled with conservatively targeted source control work at upland sites in Portland Harbor, eliminates or reduces contaminant concentrations in alignment with anticipated remediation goals designed to be protective of river receptors.

Per the intent of the CERCLA process, DEQ's source control efforts support EPA's in-water remedial efforts and both are focused on addressing legacy contamination. Following investigation and removal or control of these legacy sources, water quality in the river will be improved by remediation of contaminated river sediment and current regulations and controls of on-going discharges will be sufficient to protect the Willamette River from recontamination.

In the following Sections 4.1 through 4.7 of this report, DEQ summarizes information on all potential sediment recontamination pathways on a harbor-wide basis, using information developed at the individual site level and in focused geographic regions. Considerations with Harbor-wide implications are presented first and include direct discharges from both stormwater and wastewater outfalls throughout the Harbor, linear transportation features that traverse the entire length of the project area on both sides of the river, contaminated riverbank or beach areas with the potential to be eroded from multiple locations within the study area, and groundwater plumes that interface with the river at locations throughout the Harbor. Elements of each pathway as to potential for sediment recontamination and unacceptable risk to river receptors are discussed further in the context of nine geographic regions. These georegions are grouped by historical or current districts or land uses, are associated with specific in-water sediment areas of potential concern and include tables and discussion of site specific information. Finally, a section on upland and in-stream remediation at locations upstream of the study area is presented.

4.1 Direct Discharges

Direct discharges to the Portland Harbor study area can occur over banks and from ships or docks and other over-water structures, but predominantly occur through up to approximately 450 outfalls. These are pictured on Figure 4.1, along with the status of stormwater source control evaluations at 171 upland sites in the Portland Harbor study area. While up to 525 individual outfalls were identified during surveys by the Lower Willamette Group, many have since been confirmed not to discharge. Figures in this report depict approximately 400 private outfalls and 50+ publicly-owned (City of Portland, Port of Portland, Oregon Department of Transportation and Multnomah County) outfalls. These outfalls were identified by City of Portland Industrial Stormwater staff investigations of existing records, site-specific knowledge, GIS mapping and ground-truthing and coordination with sites, as described in the City's 2008 memorandum titled: ISW Metadata Non-City Outfalls. During the course of investigations of upland sites and municipal stormwater, additional outfalls were formally abandoned or confirmed not to discharge. Therefore, not all the outfalls depicted in the figures in this report are currently active. Formerly active outfalls may have historical significance and elimination of discharge through outfall abandonment is an important consideration for source control. Therefore, all identified outfalls remain in figures throughout this report, even when they no longer convey discharge to the river.

4.1.1 National Pollutant Discharge Elimination System Permits

NPDES 1200Z and 1200A Industrial Stormwater General Permits - An inventory of individual and general permits allowing monitored waste water and stormwater discharges is included in each georegion section. The majority of permitted stormwater discharges are covered under general stormwater permits, triggered by the Standard Industrial Code of the operation and the fact that stormwater contacts industrial activities and then discharges to a water of the state. DEQ's Water Quality division implements regulations and issues National Pollutant Discharge Elimination System permits under Section 402 of the federal Clean Water Act, as an EPA-approved state program. NPDES permits undergo regular review and revision to iteratively improve discharges and reverse stream impairments. DEQ first issued a series of general stormwater permits in 1991, which expired in five years and have been evaluated for renewal, consolidation or additions since then on a five-year cycle. DEQ's Water Quality division embarked on a process for renewal of the 2007 1200Z and 1200A Industrial Stormwater general

permits, per the regular five-year cycle, and also in response to a legal challenge to the validity of the 2007 1200Z permit and terms of a subsequent settlement agreement. At the time of the 2012 renewal, there were approximately 90 registered industrial stormwater dischargers under the statewide, 1200Z general industrial stormwater permit within the Portland Harbor study area.

DEQ based the 2012 1200Z permit on the 2008 EPA Multi-Sector General Permit and made significant changes to the new permit, including: added narrative technology-based and water quality-based effluent requirements; lower metals benchmarks; required professionally engineered corrective actions at facilities that consistently exceed benchmarks; added pollutant monitoring – pollutants listed as impaired in the receiving stream (303(d) listed), additional industrial-related metals (cadmium, chromium and nickel), and sector-specific; more precise sample collection; and prioritized reporting. As a result, the majority of pollutants of concern for Portland Harbor sediment are now monitored in stormwater discharges under the 1200Z permit. These include: copper, lead, zinc, cadmium, nickel, chromium, chlordane, cyanide, hexachlorobenzene, PCBs, iron, aldrin, DDT, DDE, dieldrin, pentachlorophenol, and PAHs. At the time of this report, in Portland Harbor, there are 74 registered industrial stormwater discharges and 83 industrial sites confirmed with no exposure certification under the terms of the general permit. As such, approximately 175, or 35% of the approximately 495 industrial and commercial properties within the study area uplands apply stormwater management practices and are regularly inspected for compliance with industrial stormwater permits or no exposure requirements. In addition, City of Portland inspects and offers technical assistance to another 15% of the non-permitted facilities and still others apply stormwater management practices in compliance with City development requirements or corporate environmental goals. By area, these sizeable permitted facilities span approximately 70% to 90% of the non-open space and residential areas of nearly all the geographic regions, as discussed in Section 4.6 of this report. Taken together, these facts significantly increase confidence that permit compliance protects against unacceptable risk to Willamette River receptors in Portland Harbor.

DEQ is currently evaluating Portland Harbor specific data gathered since the 2012 renewal for consideration in the 2017 renewal process, as well as for updating the Integrated Report on waterbody impairment listings and the on-going Lower Willamette Total Maximum Daily Load development process. Data reported between 2012 and 2014 indicate detections of PCBs, at method detection limits comparable to Portland Harbor screening level values, at only eight of the 74 permitted sites in the study area uplands. In applying the DEQ guidance tool discussed in Section 1.2 above, PCB concentrations at five of these eight sites fall below the flat portion of the rank-order curve for PCB concentrations at heavily industrialized Portland Harbor sites (DEQ 2015). The three sites with PCB concentrations in the knee of the curve or above, have applied enhanced treatment or management practices with resultant decreases in concentrations by an order of magnitude and source control efforts to further reduce the PCB concentrations are ongoing. Engineered controls are required by mid-2016 at approximately 23 of the 74 permitted sites within the study area uplands, to reduce concentrations of one or more exceeding benchmark pollutant parameters, which include: copper, lead, zinc and total suspended solids, in order to maintain compliance with the permit. DEQ anticipates that implementation of engineered controls at these 23 sites will also reduce concentrations of impairment pollutants without compliance requirements, including: PCBs, DDx and PAHs, if detected.

NPDES Municipal Separate Storm Sewer System Permits - Another aspect of general permits for some discharges into Portland Harbor is the NPDES Municipal Separate Storm Sewer System or MS4 permits. These permits are also issued by DEQ on five-year cycles, but to

governmental entities for coverage of broader conveyance systems than just site-specific discharges. The permits require system-wide stormwater management planning, iterative improvements and annual reporting. In Portland Harbor, MS4 permits control discharges from conveyance systems owned by the City of Portland, Port of Portland, Oregon Department of Transportation and Multnomah County. Specifics of these systems are discussed in Sections 4.1.2 through 4.1.5 below.

NPDES Individual Wastewater Permits - The last category of permitted discharges in Portland Harbor is of industrial wastewater. Individual permits are issued specific to site process discharges. In a few cases, stormwater discharges are also covered under individual permits in Portland Harbor. Individual permits consider the operation-specific pollutants and reasonable potential analysis, per national guidance, as to how allowable effluent limits and mixing zones are set. At the time of this report there are 11 individual wastewater permits active and in compliance in various geographic regions of the Portland Harbor area.

For all permit types, compliance requirements must consider impairment pollutants and any Total Maximum Daily Load waste load allocations that have been set. Permit compliance is limited to water column considerations for beneficial uses and not river sediment, because Oregon does not have water quality criteria for sediment and the correlation between water column concentrations and sediment concentrations is not well understood, such that standardized method for establishing the appropriate correlation is not yet available.

Because DEQ's NPDES program is iteratively improved on five year cycles, compliance is regularly inspected and corrective actions are required, DEQ is confident that regulated discharges demonstrate sufficient source control for EPA's in-water remedy to go forward. This confidence is supported by EPA Region 10 statements to the National Remedy Review Board in November 2015 and at multiple 2016 community meetings preparing the public for release of the EPA Proposed Plan. Both agencies are confident that current regulatory controls, coupled with DEQ's source control efforts and the City of Portland's control of combined sewage overflows, has produced good water quality in the river, which will be further improved by EPA's remediation of contaminated river sediment.

4.1.2 City of Portland Stormwater Outfalls

Outfalls Investigation - The City of Portland started investigating discharges from City-owned outfalls into Portland Harbor prior to the 2000 listing as a Superfund Site. By 2000, the City had published a two-volume preliminary evaluation of the 20 outfalls in the initial study area. The City also began documenting investigative work in two pilot basins, M-1 on Swan Island and 18 in the heart of the Westside industrial district, in reports through 2004. The pilot study work prompted a 2003 intergovernmental agreement between DEQ and the City of Portland for a cooperative approach to evaluating and controlling potential upland sources to the City conveyance system that might adversely affect sediment and surface water quality in Portland Harbor. A programmatic work plan for remedial investigation of all City outfalls discharging to the harbor was developed in 2004. Because the study area expanded, 39 outfalls (as shown on Figure 4.1) were investigated, 35 of which currently discharge separated stormwater. These outfalls are located on both sides of the river along nearly the entire ~10 mile reach of the project area and were ranked as a high priority for source control evaluation. City outfalls drain more than 5,000 acres, or about half of the land that drains to the study area. Open space is

the predominant land use in areas served by City outfalls, followed by industrial, residential, major transportation, and commercial uses throughout the project area uplands.

Work was conducted with DEQ oversight and EPA input and included: 1) in-river sediment investigation at many outfalls; 2) source tracing up the pipes to identify sources; 3) discovery of sites that were subsequently asked to join DEQ's voluntary cleanup program for source control; and 4) implementation of control measures, primarily at identified sources and also through on-going refinement of DEQ and City programs.

Extensive data collection, analysis and reporting for the 39 basins is documented in 64 reports and technical memoranda, along with 17 multi-basin or harbor-wide reports and quarterly progress reports. As a result of the City's work, more than a dozen sites were identified as potential sources and brought into DEQ's cleanup program to conduct source control investigations. In consideration of the extensive information collected and evaluated, the City made changes to a variety of on-going programs to improve stormwater quality conveyed to Portland Harbor through City-owned infrastructure. Because these programs are applied comprehensively throughout the Portland Harbor study area uplands, they also significantly improve stormwater discharges from non-City-owned conveyances. Examples of these City programs are: the illicit discharge program; industrial site stormwater inspections and technical assistance. A compilation of the City's findings and conclusions on the outfalls project source control investigation and information on City programs that address stormwater discharges are summarized in the December 2013 Municipal Stormwater Source Control Report for Portland Harbor.

Combined Sewer Overflow Abatement - Under an order issued by DEQ, the City planned, funded and implemented a long term Combined Sewer Overflow, or CSO, abatement project from 1991 through 2011. Completion of the project reduced the annual volume of sewage overflow discharges to the Willamette River by 94%. As shown in the City of Portland 2011 inset map below, this reduction includes outfalls to Portland Harbor, as well as upstream outfalls. Of the 16 CSO outfalls in the Portland Harbor study area, seven were controlled before the 2000 listing of Portland Harbor as a Superfund site and the remaining CSOs were controlled with the 2011 completion of the "Big Pipe" tunnel system. These CSOs consisted of mostly commercial and residential drainage. Because most of the industrial areas within Portland Harbor did not historically drain to the City conveyance system, they did not contribute to CSO events. Industrial areas that did drain to City conveyances were separated when interceptors were installed in the 1950s.

As shown in the City of Portland 2011 inset map below, there are now only eight points within the Portland Harbor study area (between the red bars) where overflows of combined sewerage and stormwater could occur (OF-24, OF-53, OF-52, OF-17, OF-47, OF-15, OF-46, and OF-43), as well as from four outfalls upstream of Portland Harbor. OF-23 does not appear in the inset map because it was abandoned and no longer discharges.

In the Harbor, OF-24 and OF-17 are not anticipated to overflow, as these are west side contingency relief points for either pump failure or in-pipe transient waves, respectively. OF-53 and OF-52 were controlled in 1995 and support the St. John's interceptor pipe on the river's east side, rather than the interconnected "Big Pipe" tunnel system. Currently, St. John's interceptor overflows occur only during very high precipitation events. Over the past 13 years, only one 25-minute overflow event has occurred there (CoP 2012). Between 2006 and 2011, the "Big Pipe" tunnel system overflowed an average of 2.5 times per year (CoP 2012). With completion in 2011 of additional storage in the eastside tunnel, the average frequency of overflows has decreased to about twice per year (CoP 2012). These minimal overflows release stormwater stored in the big pipes that was collected from approximately 10,300 acres of impervious surfaces, on both sides of the river and both inside and outside of the Portland Harbor study area (CoP 2013a). Given the comingling of stored stormwater and the operational variability of the tunnel system, tracing a pollutant load from a specific source area to a discharge point is no longer possible. If all four allowable overflow events occur in one year, the City estimates the total possible annual discharge to the river (both in and upstream of Portland

Harbor) at up to 300 million gallons (CoP 2013a). For perspective, this amounts to approximately 3.8% of total runoff entering the interconnected stormwater collection and storage system or approximately 1.3% of the average annual flow of the Willamette River (CoP 2013a). Further, only a portion of these estimated volumes is discharged to the Portland Harbor study area and only during extreme precipitation events. In consideration of these volumes and variations, even if individual site source tracing were possible, dilution must be considered in any pollutant loading analysis of the discharges.

Current Municipal Discharges in Portland Harbor - While wet-weather combined discharges have been significantly abated, separated stormwater still discharges through 35 City outfalls into the Portland Harbor. These remaining separated stormwater discharges have also been reduced in volume and improved in quality by diversions, rerouting, infiltration and other site-specific or regional treatment improvements. Separated stormwater from outfall basins 15, 44A (before abandonment in 2015) and 46 was diverted almost entirely to the wastewater treatment plant on the Columbia River (CoP 2013b). More than half of the separated stormwater from outfall basins 17 and 43 was also diverted to the wastewater treatment plant (CoP 2013b). The City has installed swales, ponds and other facilities for treatment and detention of stormwater within basins 18, 22C, 42, 47, 48, 49, 50, S2, S5 and S6, many of which treat the entirety of basin runoff prior to discharge, as well as conveyance system treatment features in additional basins (CoP 2012b). Stormwater runoff from impervious areas in all basins draining to the Portland Harbor study area continues to be reduced through new development or redevelopment requirements, which require onsite infiltration to the extent possible. Stormwater quality has been improved through implementation of site-specific source control measures, treatment improvements and municipal and state programs.

The City's extensive work in the Portland Harbor Outfalls Investigation adequately characterized potential sources to and discharges from the City stormwater conveyance system to Portland Harbor. EPA agreed with DEQ's assessment that evaluation of all outfalls was adequate and additional monitoring should be implemented (EPA 2015b). The City's on-going programmatic stormwater approach and source control measures implemented in most basins evaluated are adequate to demonstrate that source control has effectively been achieved.

The City prepared a Source Control Measures Effectiveness Demonstration Report in September 2015. DEQ requested additional basin-scale monitoring to support the assumptions that: 1) identification of site-level sources and their control; 2) implementation of site-specific and area-wide source control measures and 3) regional implementation of on-going stormwater programs, are sufficient to prevent future stormwater discharges from recontaminating sediment or posing unacceptable risk to in-water receptors in Portland Harbor. In response, the City prepared technical memo that highlighted basin-scale data already collected at 30 of the 35 outfalls that continue to discharge into Portland Harbor, provided a rationale in line with DEQ's request for selecting additional outfalls to monitor that are representative of several criteria and a sampling and analysis plan for additional basin-scale monitoring at eight outfalls into the Harbor. Monitoring is intended to be completed in 2016 and 2017 with reporting of results beginning in 2017. Stormwater from the 39 City outfalls investigated is considered controlled, pending effectiveness demonstration and the potential for sediment recontamination is considered low.

4.1.3 Oregon Department of Transportation Stormwater Outfalls

Oregon Department of Transportation entered into an agreement with DEQ in August 2011 to undertake a source control evaluation of ODOT facilities that contribute stormwater runoff to Portland Harbor. These facilities include portions of Highway 26, Highway 30, I-5 and I-405, including the St. Johns Bridge and the Fremont Bridge and cover approximately 17 miles or 194 acres of impervious area. ODOT owns three outfalls that discharge to the Harbor (one on each side of the Fremont Bridge and one on the west side of the St. Johns Bridge) and contributes runoff to 29 outfalls owned by the City of Portland or privately and from scuppers on the Fremont Bridge. The ODOT outfalls investigation was ranked as a high priority for source control. ODOT evaluated the paint on the bridges and collected a limited number of stormwater solids and stormwater samples for analysis. Because concentrations of multiple pollutants analyzed exceed Portland Harbor screening level values, measures to remove pollutants from stormwater prior to discharge are warranted. ODOT is also evaluating the potential for transport of contaminated groundwater in or along stormwater infrastructure piping within the study area uplands to the river. ODOT submitted a plan and schedule for implementation of additional and enhanced practices and controls to improve stormwater discharge and reduce the potential for recontamination of sediment and reduce risk to Willamette River receptors. ODOT and DEQ are currently collaborating to further refine and implement ODOT's source control plan and develop a plan and schedule for demonstrating effectiveness of controlling contaminant discharges from ODOT facilities. Until measures are implemented and demonstrated to be effective, however, the highways and bridges are considered uncontrolled with a medium potential for recontamination.

4.1.4 Port of Portland Stormwater Outfalls

There are 23 MS-4 permitted outfalls to Portland Harbor under the jurisdiction of the Port of Portland. The Port has not entered into an Agreement with DEQ to undertake a stormwater source control evaluation specific to these outfalls. Instead, discharges to the majority (19 at Terminal 4 and 10 at Rivergate) are being investigated under individual site stormwater source control evaluations conducted by the Port or its tenants. These investigations, as well as information on the remaining three Port of Portland MS-4 outfalls, are discussed in Section 4.6 of this report in the Swan Island/Mocks Bottom, Guilds Lake, T4/International Slip and Rivergate geographic regions sections.

4.1.5 Multnomah County Stormwater Discharges

Multnomah County's MS-4 permit covers discharges from the Broadway Bridge, which is further discussed in Section 4.6 of this report in the Albina and Pearl geographic regions.

4.1.6 Private Outfalls

Up to 400 private outfalls are reported to have once discharged to the Portland Harbor study area, though many of these have since been abandoned or determined not to discharge. The City of Portland outfalls, discussed in Section 4.1.2 and each georegion in Section 4.6 of this report, convey stormwater from approximately half of the uplands surrounding the study area, including Forest Park streams. ODOT, Port of Portland and Multnomah County MS-4 outfalls additionally convey approximately five percent of the study area uplands runoff. The remaining approximately 45% of runoff from the study area uplands is conveyed through the active private outfalls, mostly over short distances from properties directly adjacent to the river. Stormwater source control evaluations have been conducted at the majority of these properties and

discharges permitted under NPDES industrial stormwater general permits are also conveyed through some of these outfalls.

A comprehensive inventory of private outfalls into Portland Harbor may be considered a data gap, as detailed in Section 4.8 of this report. However, data from individual NPDES permits and pre-source control measure investigations and effectiveness monitoring from up to 171 sites that underwent stormwater-specific source control evaluations provides empirical information on reduced contaminant concentrations and loads in discharges from the majority of these private outfalls. In addition, the extensive investigations by the City of Portland and ODOT on shared discharges through 39 and 32 outfalls, respectively, as well as on-going monitoring data at the point of discharge to the conveyance system from approximately 75 registrations under the industrial stormwater general permits, provide representative information as to the effectiveness of application of site-specific source control measures and on-going water quality programs in reducing concentrations and loads of contaminants through all outfalls to Portland Harbor. These multiple lines of evidence indicate that contaminants of concern in stormwater discharges to the Harbor have been sufficiently controlled to prevent sediment recontamination and unacceptable risk to Willamette River receptors.

4.2 DEQ Water Quality and Pollution Prevention Programs

In addition to the extensive water quality discharge permit coverage in compliance in Portland Harbor, described in Sections 4.1 and 4.6 of this report, DEQ administers several other water quality programs under Clean Water Act and state authorities that facilitate improvements to stream sediment and water quality. Consistent with multiple EPA CERCLA and Office of Water guidance documents, after upland sources have been identified and controlled to support the in-water remedy, subsequent upland sources are best addressed by on-going Clean Water Act and other state water programs (EPA 1998, 2005, 105a, 2015c). The following on-going state-led programs improve water and sediment quality in tributaries to the Willamette River and the river itself, including the Portland Harbor study area.

Willamette Basin Total Maximum Daily Load – Sections 303 and 304 of the federal Clean Water Act require states to monitor and report on the status of waterbody health and develop plans to improve them, where needed. Known as a TMDL, a Total Maximum Daily Load is a pollution analysis to determine why some waterbodies in the basin do not meet water quality standards and a strategy for returning those waterbodies to a healthy status. In September 2006, EPA approved the DEQ TMDL for the Willamette Basin, which is Oregon's largest basin and includes 12 subbasins. The approved TMDL focuses on water column reductions of bacteria, mercury and temperature, as the main problematic pollutants basinwide, and also focuses on water column toxics reduction in Johnson Creek, which is a major tributary of the Lower Willamette subbasin. Information on DEQ's EPA-approved TMDL for the Willamette basin is available at: http://www.oregon.gov/deq/wq/tmdls/Pages/TMDLs-Willamette-Basin.aspx#TMDLs.

Section 303(d) impairment pollutants in the lowest reach of Willamette River include: aldrin, biological criteria, chlordane, cyanide, DDT, DDE, dieldrin, hexachlorobenzene, iron, manganese, PCBs, pentachlorophenol, PAHs and chlorophyll a. EPA-approved TMDL parameters in the lowest reach include Dioxin (2,3,7,8 TCDD), e coli, mercury and temperature. In alignment with DEQ's 2012 Integrated Report - Total Maximum Daily Load priorities and schedule (DEQ 2014) and the current Performance Partnership Agreement between DEQ's Water Quality Programs and EPA Region 10 Office of Water (EPA & DEQ 2014), DEQ is not currently pursuing TMDLs for the remaining impairment parameters. Rather, DEQ is pursuing facilitation of projects that result in improvements to water quality. The existing sediment

contamination in the lowest reach of the Willamette River resulted mainly from direct dumping of industrial waste products, which ceased several decades ago. Even after several decades of potential degradation and isolation by natural river processes, sediment contamination persists in this reach of the river at concentrations that are well above acceptable concentrations determined by EPA's risk assessment. While Oregon has not promulgated water quality standards for sediment and there is no currently accepted method for accurately determining contaminant loads to sediment from water column discharges, contaminant concentrations in sediment are several orders of magnitude higher than potential loads from all currently permitted discharges combined. Because contaminated sediments impair the water column through resuspension and pore-water exchange partitioning, the most effective water quality improvement in the lower Willamette will be realized through EPA's sediment cleanup in Portland Harbor. Support of this effort has been DEQ's chief focus for facilitating water quality improvement in the basin for more than 15 years. Because the in-water remedy is anticipated to improve water quality by removing or isolating contaminant sources in sediment, thereby preventing them from entering the water column, sediment cleanup is an excellent example of an alternative pollution reduction strategy in lieu of TMDL development. Such approaches are encouraged by EPA's 2013 Office of Water Memorandum: *A New Long Term Vision for Assessment, Restoration and Protection Under Clean Water Act Section 303(d) Programs* (EPA 2013c), committed to by DEQ and EPA in Appendix C 2.6 of the current Performance Partnership Agreement (EPA & DEQ 2014), and are supported by demonstrated success at the McCormick and Baxter site within Portland Harbor. Due to completion of removal and capping in the river at the McCormick and Baxter site, and following eight years of post-remedy water quality monitoring there, DEQ submitted a justification to EPA in 2013 proposing to re-categorize this reach as a Category 4b water for pentachlorophenol, eventually allowing delisting of pentachlorophenol from the 303(d) list. Similarly, DEQ anticipates that Portland Harbor post-remedy water quality monitoring will also allow delisting of several additional toxics parameters throughout the Portland Harbor reach, such that development of TMDLs for those parameters will continue to be unnecessary.

In addition to DEQ's facilitation of EPA's in-stream Portland Harbor cleanup, DEQ is also working to reduce water column toxics in the tributaries to the lower river. Water column toxics load allocations and potential for toxics to deposit on stream bed sediment are based on correlation with total suspended solids. Focusing on reducing total suspended solids in discharges can also decrease concentrations of toxics in both the water column and in stream sediment. This helps to confirm that DEQ's stormwater source control work in the uplands of the Portland Harbor study area and compliance with NPDES industrial stormwater general permits throughout the Lower Willamette subbasin, are improving both the sediment and water quality of the very lowest reach in the subbasin.

Clean Water State Revolving Fund - The Clean Water State Revolving Fund loan program provides low-cost loans to public agencies for the planning, design or construction of various projects that prevent or mitigate water pollution. DEQ partners with Oregon communities to implement projects that attain and maintain water quality standards, and are necessary to protect recreation, fish habitat, boating, irrigation, drinking water and other beneficial uses. A list of projects with water quality benefits to the Lower Willamette subbasin is provided below in Table 4.2.

Table 4.2 Clean Water State Revolving Fund Projects in the Lower Willamette Subbasin

Loan #	Borrower	Project Description	Water Quality Benefit
R06655	City of Milwaukie	Installing sewer collection lines throughout an area of the city near Johnson Creek. Project provides the option for residents on septic systems and cesspools to connect to the Milwaukie Sewer system.	Improved Johnson Creek by preventing direct contamination from raw sewage
R06224 R22403	Clackamas County Service District #1	Installing sewer collection lines throughout an area of unincorporated Clackamas Co near Johnson Creek. Project provides the option for residents on septic systems and cesspools to connect to the CCSD#1 Sewer system.	Improved Johnson Creek by preventing direct contamination from raw sewage
R22400		North Clackamas area facilities plan	Led to projects funded by loans R06224, R22403
R22401		Ultraviolet Light Disinfection at Kellogg	No more chlorine residual in effluent headed to the Willamette
R70030 R70031	Oak Lodge Sanitary District	Construction of a new Wastewater Treatment Plant at current plant's location.	Greatly improves effluent directly discharged to the Willamette
R70650	City of Oregon City	Holcomb outlook park place collector sewers	Improved collection that leads to CCSD treatment plants
R70651		Sewer separation – phase 6	No more combined sewage/storm and the potential for overflow to either
R31740	City of Estacada	Construction of a nitrifying trickling filter for the tertiary treatment of ammonia	Improves effluent discharged to the Clackamas River
R74160	City of Portland	Separating sewer lines in the Tanner Creek area	No more combined sewage/storm and the potential for overflow to either
R74161		Super Adventist LID collector sewers	More sewage to treatment instead of septic
R74162		Irvington & Burnside collector sewers	More sewage to treatment instead of septic
R74163		Riparian Revegetation	More shade improves temperature
R74164		Collection System Expansion. Partnered with Milwaukie and CCSD#1 to sewer area near Johnson Creek.	Improved Johnson Creek by preventing direct contamination from raw sewage
R74165		Wastewater Treatment Plant Disinfection	Less chlorine residual to Willamette
R74166		Kelly Creek-Johnson Creek	Stream and floodplain restoration
R74167		Southwest Parallel interceptor	Fewer combined sewer/storm and overflows
R74168		Peninsular Force Main	Fewer combined sewer/storm and overflows
R74169		Johnson Creek willing seller	Non-point source protection
R74170		Tanner Sewer Separation	Less combined sewer/storm and overflows
R74171		Riparian Revegetation	More shade improves temperature
R74172		Alsop-Brownwood	Stream and floodplain restoration
R92261	Tri-City Service District	Wastewater facilities plan	Planning for other projects funded and listed here
R92262		Alternative disinfection facility	Less chlorine residual to Willamette

Toxics Reduction Strategy – In November 2012, DEQ formalized statewide toxics reduction efforts by publishing a strategy summary, available at: http://www.oregon.gov/deq/Hazards-and-Cleanup/ToxicReduction/Pages/Reducing-Toxics.aspx. The strategy includes a focus list of toxics, which includes most of the impairment pollutants in the Lower Willamette River and Portland Harbor contaminants of concern, such as PCBs, DDT, phthalates, metals and VOCs. The strategy also identified opportunities for reducing loads of the focus list of toxics by working across existing programs in land, water and air quality. Finally, the strategy identifies actions and priorities for enhancing integration, prioritization and effectiveness of existing toxics reduction efforts; identifying further reduction needs; and better assessment and characterization of toxics in Oregon.

Pesticide Stewardship Partnership Program – One of the most successful of DEQ's toxics reduction efforts is the Pesticide Stewardship Program. Information on the program is available at: http://www.oregon.gov/deq/wq/programs/Pages/Pesticide.aspx. Begun in 2000 in the Columbia Gorge fruit growing areas associated with Hood River and Mill Creek watersheds, DEQ used water quality monitoring data on pesticides to explain the problem to the community and engage growers in improving application and management to reduce pesticides in these streams, as demonstrated by on-going monitoring. Substantial improvements have been noted in water quality of the streams over the ten years of the program. Similar programs were launched with federal funding between 2005 and 2007 in three tributaries to the Lower Willamette River – Clackamas River, Pudding River and Yamhill River. Between 2013 and 2015, additional pesticide collection events were held and on-going monitoring indicates substantial reductions in concentrations of pesticides in some watersheds, including Noyer Creek in the Clackamas Watershed, which is tributary to the Lower Willamette River. As the program actions and monitoring are continuing, DEQ anticipates further significant reductions in pesticides in these tributaries, with tandem improvements in the Willamette River.

4.3 Linear Transportation Features

Linear transportation features may have the potential to convey on-going stormwater or erodible soil to the river. If historical or on-going sources are present and potential pathways are uncontrolled, the potential for recontamination of the future in-water remedy exists. The following subsections describe the three linear transportation systems, source control investigations and measures, and their potential for sediment recontamination and unacceptable risk to surface water receptors.

4.3.1 Oregon Department of Transportation Highways

The investigation and source control measures plan for stormwater outfalls and conveyance lines from these facilities is described above in Section 4.1.3 of this report. The ODOT highway facilities within the study area uplands do not include any areas of erodible banks. Therefore, as noted above, the potential for sediment recontamination and unacceptable risk to Willamette River receptors is considered medium until stormwater source control measures are implemented and demonstrated to be effective.

4.3.2 Portland Bureau of Transportation Roadways

There are approximately 267 acres of paved roadways owned by the City of Portland within the study area uplands, 225 acres of which were addressed by the City stormwater source control investigation (CoP 2013b) described above in Section 4.1.2 of this report. Roadways make up only a small portion of the acreage in basins investigated by the City, some of which is mostly

residential and commercial with lower assumed potential for contaminant conveyance. Roadways that serve industrial and contaminated sites have a higher potential for conveying contaminants to the river through the storm sewer system. City programmatic and individual source control measures are applied to roadways and stormwater control components are regularly maintained by the Portland Bureau of Transportation. Additional information on specific practices applied in Portland Harbor upland areas is under development and will be evaluated as part of the City's effectiveness demonstration work for the City outfalls project. No areas of PBOT roadways with erodible banks were identified. Therefore, as described above, the potential for sediment recontamination and unacceptable risk to Willamette River receptors from PBOT roadways is considered low until the existing or additional measures, as warranted, are demonstrated to be effective.

4.3.3 Railroads

Active rail lines, operated by Union Pacific Railroad, BNSF Railway Company and Portland Terminal Railroad, are present on both sides of the Willamette River through Portland Harbor. DEQ rail related source control investigations and control efforts are focused on rail features that have the most potential to be significant sources, including: rail yards (e.g., Willbridge Rail Yard, Guilds Lake Rail Yard, UPRR Albina Rail Yard); rail support and maintenance facilities (e.g., former Hoyt Street Rail Yard and UPRR St. Johns Tank Farm) and spurs at some sites throughout the study area uplands (e.g., Rivergate, T-4/International Slip, Swan Island/Mocks Bottom, T-2, RM 11E, Gunderson). Because investigations identified PCBs and other Harbor-wide contaminants of concern at some of these rail operations, it is anticipated that lines in some areas adjacent to surface water could be potential sources through the stormwater or bank erosion pathways. Five areas where additional evaluation may be warranted include: North Doane Lake; the rail bridge across the Willamette River at approximately river mile 6.8; the east riverfront from Triangle Park south to Mocks Bottom at approximately river mile 7.7 to 8.0E; the east riverfront along the north portion of Willamette Cove at approximately river mile 7.5E; and the east riverfront at the Broadway Bridge and south from approximately river mile 11.6 to 11.9E. Given the small land area, lack of known releases, and lack of information on bank conditions and overland flow potential, DEQ designated further investigations as low priority and considers the potential for sediment recontamination and unacceptable risk to Willamette River receptors to be low. This data gap is acknowledged in Section 5.1.2 of this report, which details plans for filling it, as warranted.

4.4 Groundwater and Plumes

In general, upland site characterization activities follow the CERCLA Preliminary Assessment, Site Investigation, Remedial Investigation process outlined in DEQ and EPA guidance. Upland groundwater investigations focus on determining if groundwater is impacted by site activities and, if so, whether a contaminant plume may adversely impact the Willamette River. Following the JSCS process described in Section 1.2, DEQ categorized groundwater with contaminant plumes into two main categories: 1) plumes that have potential to recontaminate sediment; and, 2) plumes that are not likely to recontaminate sediment, but may present risk to river receptors. Assessment of the potential for sediment recontamination or risk to in-water receptors via groundwater plumes is based on contaminant concentrations, size of the plume and chemical properties allowing contaminants to transfer from groundwater to sediment. DEQ considers plumes with the potential to recontaminate sediment as a high priority to ensure that source control measures are sufficiently in place so that the in-water remedy can proceed. Plumes that present potential risk to river receptors are considered medium to high priority and source

control measures for these plumes may be implemented immediately or integrated into the overall upland or in-water cleanup remedy.

Strategies for groundwater source control include engineered hydraulic control systems to prevent the migration of contaminated groundwater to the Willamette River, remediation technologies that treat or remove contaminants from the groundwater and combinations of control systems and remediation technologies. The effectiveness of the hydraulic control systems is confirmed by measuring groundwater levels at monitoring points specifically designed for this purpose and conducting a capture zone or gradient control analysis (EPA, 2008). Groundwater chemical data from monitoring wells located at the top of riverbanks are used to measure the remedial progress towards achieving protective levels. In instances where contaminant concentrations in riverbank monitoring wells are approaching protective levels, sediment pore water from the biological active zone in the groundwater discharge area may be sampled to confirm source control objectives are met.

Figure 4.3 identifies: 1) sites evaluated by DEQ for groundwater impacts; 2) the contaminant plumes characterized by these investigations; and, 3) plumes where controls have been applied or determined not to require controls. Groundwater investigations and the status and strategy for each plumes identified within the study area uplands is presented by georegion in Section 4.6 of this report. DEQ made data-driven, site-specific determinations that groundwater source control measures were warranted or not. These determinations, along with implementation of any needed source control measures with subsequent effectiveness demonstration, allow DEQ to conclude that groundwater source controls have been applied sufficiently to protect the EPA in-water remedy from sediment recontamination and unacceptable risk to in-water receptors.

4.5 Erodible Banks

Riverbanks at sites were evaluated following the JSCS to determine if they present a potential for contaminant transport to the Willamette River by erosion of bank soils or mass wasting. Bank areas of concern are depicted on geographic regions Figures 4.6.1 through 4.6.9, and in site-specific information presented in Section 4.6 of this report. Per discussions with EPA, except for the few sites discussed in the geographic region sections, DEQ deferred the selection of riverbank source control measures, design, permitting and implementation to EPA. This allows for efficient integration of the riverbank source control measure design, permitting and construction with the in-water sediment remedial work.

4.6 Geographic Regions of Upland Source Control Areas

The following section offers a summary of status and pathway details at each site that DEQ has evaluated for upland source control. DEQ divided the uplands surrounding the study area in nine distinct geographic regions based on historical or current districts or uses, as depicted on Figure 4.6.a. Each geographic region is discussed below using a geographic region figure, sites status table and text.

Figure 4.6.b presents a legend for use in interpreting each georegion figure. These maps are information rich and include:

- Each site investigated, listed by name;
- Source control measures implemented at each site;
- In-water sediment areas of potential concern and sediment decision units;
- EPA in-water early action areas;

- Stormwater outfalls with ownership;
- Anticipated riverbank action areas;
- Groundwater plumes with status; and
- EPA-led upland sites.

The geographic region site tables present a quick overview of each area by listing:

- Each site name and DEQ Environmental Cleanup Site Information (ECSI) data base number;
- Contaminant transport pathways evaluated;
- Priority assigned to each pathway per the JSCS and reported in DEQ Milestone Reports;
- Source control measures applied where needed and when;
- Decision document format, where applicable; and
- Site-specific recontamination potential determination.

Pathway priorities were determined in accord with the JSCS upland contaminant prioritization scheme, summarized in Section 1.2 of this report, and reported in each Milestone Report DEQ submitted to EPA in 2006 through 2013. Once assigned, priorities helped to direct DEQ's workload and the priority assignments are not changed. When the tables indicate that DEQ issued a source control decision (labeled as SCD in tables), all potential contaminant transport pathways were evaluated and EPA and partners had the opportunity for review and comment on each aspect of that particular source control decision. DEQ anticipates that EPA will provide similar opportunity for review and comment by DEQ and partners on source control decisions on the three active EPA-led upland sites. When the tables indicate DEQ issued a no further action (labeled as NFA in tables) determination, this was an action taken under DEQ's Cleanup rules, usually without review by EPA and partners because the pathways to the river were not complete, the action pre-dated the listing of Portland Harbor as a Superfund site or the site was outside of the initial study area. The site specific recontamination potential determination represents DEQ's qualitative evaluation of the available lines of evidence, based on site investigations and implementation of effective source control measures. When more than one pathway is complete, only the highest potential for recontamination is indicated in the table.

Text for each georegion section describes:

- An overview of the geographic region area;
- Contaminants found elevated in in-water sediment areas of potential concern;
- EPA in-water early action areas;
- Direct discharges from area outfalls;
- Additional details on sites with high and medium priority pathway designations listed in the site status tables and those where EPA is responsible for upland source control; and
- DEQ's qualitative conclusions about the potential for recontamination of the in-water remedy for each geographic region.

Because this report is a summary and the source control process is iterative and complex (Flint & Thomas 2013), not all of the evolving details of work on the sites can be captured in the simplified maps, tables and text. More information on the evolving source control efforts at sites can be found online in the DEQ Milestone Reports (2006 – 2013), in DEQ's ECSI database (searchable using site specific ECSI #) or in site files at DEQ's Northwest Region office and available via public records request form.

4.6.1 Albina - RM 9.9 - 11.8 W

Area Overview - The Albina geographic region encompasses the historical town of Albina, established in 1873 and annexed into Portland in 1891 (Roos 2008). The Albina docks first established towering grain elevators in the late 1890s (Blalock 2012). By the early 1900s, manufacturing, shipping and railroad activities greatly expanded in the Albina georegion (Roos 2008), including establishment of Albina Engine and Machine Works, Inc. in 1904, which built, repaired and broke ships through 1971 and then into the mid-1980s as Dillingham Ship Repair (Shipbuilding History 2014). Interstate 5 was built through the area in the 1960s and current land use is a mix of industrial along the shoreline with residential and commercial further from the river, with the limits of the upland study area mainly between the I-405/I-5 freeway corridor and the river.

Sediment Areas of Potential Concern – During the Lower Willamette Group's remedial investigation, EPA identified sediment areas of potential concern 24, 25 and a portion of area 23 off shore along the Albina geographic region, as depicted on Figure 4.6.1. Contaminants found at elevated levels in these AOPC units were identified in a draft matrix in 2010, during the Lower Willamette Group's remedial investigation process, as listed in Table 4.6.1-1 below. As the in-water feasibility study progressed, EPA refined AOPCs into draft Sediment Decision Units (EPA 2014) based on site-wide contaminants of concern. DEQ referred to the AOPCs and associated contaminants of interest in directing upland source control work and as a conservative line of evidence for recontamination evaluation.

Table 4.6.1-1 Albina Geographic Region Sediment Areas of Potential Concern and Elevated Contaminants of Interest

AOPC	Contaminants of Interest
23	cadmium, copper, lead, mercury, zinc, PCBs, DDT
24	copper, lead, mercury, PCBs
25	copper, zinc, PCBs, delta-HCCH, DDx, dieldrin, endrin

(Source: 2/17/2010 draft AOPC Matrix LWG RI)

EPA Early Action-like Supplemental RI/FS Action – EPA entered into an Administrative Order on Consent in April 2013 with the River Mile 11E Group that includes CalPortland (formerly Glacier NW), Ross Island Sand & Gravel, Cargill, Inc., PacifiCorp, CBS Corporation, DIL Trust, Pacific General Electric and the City of Portland. The River Mile 11E area is shown on Figure 4.6.1.

Direct Discharge – While not all the outfalls depicted on Figure 4.6.1 are currently active, each was initially identified as a potential historical discharge point. City of Portland MS-4 permitted stormwater outfalls 42, 43, 44, 44A, 45, 46 and 47 drain portions of the Albina georegion to the Willamette River at the points shown on Figure 4.6.1. However, most drainage from City outfalls 43, 44A and 46 was diverted to the Eastside Tunnel in 2011, eventually being treated at the Columbia Boulevard publicly-owned treatment works and discharged to the Columbia River. In 2015, outfall 44A was abandoned and no longer conveys or discharges runoff from this basin. Detailed information about the basins and sites the City outfalls in this georegion drain is available by outfall number in the appendices of City's 2013 Municipal Stormwater Source Control Report for Portland Harbor. ODOT contributes MS-4 permitted runoff from Interstate 405 through ODOT-owned outfall WR-306 and through scuppers on the Fremont Bridge, both of which contribute discharge to AOPC 25. ODOT is preparing a plan for implementation of source control measures to reduce contaminants above screening levels in stormwater and elevated in

sediment in AOPC 25. Multnomah County contributes runoff from the Broadway Bridge over the river at approximately river mile 11.6. Up to 27 private outfalls also discharge stormwater along the east side bank between river miles 9.9 and 11.8, all but four of which discharges from sites undergoing source control evaluations. While not all are still active, discharges through many of these private outfalls are permitted under five assignments of the NPDES Industrial Stormwater General permits, as listed in Table 4.6.1-2 below. The extensive areas where these permits and management practices are applied are shown with purple striping on Figure 4.6.1. Including ODOTs MS-4 permitted facilities, approximately 50% of the area within the Albina georegion has permits and management practices applied.

Table 4.6.1-2 Albina Geographic Region NPDES Industrial Stormwater General Permit Registrants, No Exposure Certifications, or Best Management Practices

Registrant	Permit #
K F Jacobsen & Co Inc-Plant	1200A
Ash Grove Cement Company	1200Z
Central Premix Concrete Products Company	1200Z
Temco, LLC Irving Elevator	1200Z
Union Pacific Railroad Albina Yard	1200Z
Advanced M&D Sales	NEC
Cloudburst Recycling	NEC
Forge Graphic Works Inc	NEC
Steelab LLC	NEC
Stumptown Printers Worker Coop.	NEC
former Westinghouse (City Water Bur)	BMPs
PacifiCorps Albina & Knott St substations	BMPs
Glacier NW	BMPs

Upland Sites Investigated – As depicted on Figure 4.6.1 and summarized in Table 4.6.1-3, DEQ evaluated 14 upland sites with one or more potential pathways for source control in the Albina geographic region. Additional details are provided in the text that follows the table for the one site with a medium priority pathway.

Table 4.6.1-3 Albina Geographic Region Sites

Site	ECSI#	Pathway(s)	Priority	Source Control Measures Status/ Dates	Decision Document	Recontamination Potential
UPRR Albina	178	Overland flow	Low	Excluded	SCD anticipated 2016	Low
		Bank erosion	Low	Excluded		
		Groundwater	Low	Excluded		
		Stormwater	Low	Cleanout/line repair 2007, 2008 & 2013, BMPs – effectiveness pending		
		Overwater acts	Low	Excluded		
Goldendale Aluminum	2440	Overland flow	Low	Excluded	SCD & NFA 2004 EPA issued letter in support of SCD	Low
		Bank erosion	Low	Excluded		
		Groundwater	Low	Excluded		
		Stormwater		Excluded		

Table 4.6.1-3 Albina Geographic Region Sites (continued)

Site	ECSI#	Pathway(s)	Priority	Source Control Measures Status/ Dates	Decision Document	Recontamination Potential
Pacificorp-Albina Substations	5117	Groundwater Stormwater	Low Low	Excluded Infiltration on site 2012	SCD 2016 EPA review pending	Low
Tarr Inc.	1139	Groundwater	Med	Vapor extraction 2009-2016, bioremediation planned for 2017 - Uncontrolled	SCD anticipated 2018	Low
Glacier NW	5449	Overland flow Bank erosion Groundwater Stormwater Overwater acts	Low Low Low Low Low	Excluded Stabilization SCMs 2015 Anticipated to be excluded BMPs 2012-2105 – effectiveness pending Excluded	SCD anticipated 2016	Low
Westinghouse (former)	4497	Groundwater Stormwater	Low Low	Anticipated to be excluded – wells & monitoring in process Infiltrate/POTW 2012	SCD anticipated 2017	Low
Cargill-Irving Grain Elevator (Temco)	5561	Overland flow Bank erosion Groundwater Stormwater Overwater acts	Low Low Low Low Low	Excluded Anticipated to be excluded Excluded BMPs 2012-2015 – additional SCMs planned 2016 - Uncontrolled Excluded	SCD anticipated 2016	Low
Tucker Building	3036	Stormwater	Low	Storm system removed/paved 2002, Excluded	NFA 2004 included in SCD for 5117 2016	Low
Industrial Battery Building	935	Stormwater	Low	Soil & building removal 1994, Excluded	NFA 1995	Low
Valvoline Inc	3215	Stormwater	Low	Excluded	NFA 2003	Low
Master Chemical	1302	Stormwater	Low	Excluded	NFA 1996	Low
Ross Island	5577	Overland flow Bank erosion Groundwater Stormwater Overwater acts	Low Low Low Low Low	Excluded Excluded Excluded Excluded Excluded	NA	Low
WR Grace (Vermiculite NW)	2761	Stormwater	Low	EPA removal action 2006, Excluded	EPA 2007	Low
Cascade Brake Products	1019	Stormwater	Low	Excluded	NA	Low

14 sites – 9 sites closed – 6 sites (23 pathways) excluded – 5 SCDs anticipated – 9 sites w/SCMs – 2 pathways uncontrolled

Tarr Inc. (ECSI #1139)

The Tarr site, located approximately 1/3 of a mile inland on the east side of the Willamette River near river mile 11, covers approximately 1.49 acres. Commercial and industrial development began on the northern portion of the facility in the late 1950s and a variety of chemicals were handled since then, including fuels (gasoline, diesel, and kerosene), solvents (petroleum, alcohol, ketone, chlorine, and acetate/glycol), and lubricating oils. Underground storage tanks were initially used to store fuel and non-chlorinated solvents. Above ground tanks were installed in 1963 for chlorinated solvent storage. Bulk product storage was converted entirely to above ground tanks in 1989 and the underground tanks were removed in 1990. The remedial investigation determined that site releases impacted upland soil and groundwater with tetrachloroethene and trichloroethene. The stormwater and the riverbank erosion pathways were excluded as incomplete.

Groundwater - A total of sixteen groundwater monitoring wells were installed. The dissolved-phase groundwater plume extends from the Tarr facility to the west-southwest, with approximate dimensions of 600 to 800 feet wide and 2,000 feet long. Access to private property could not be attained for well placement to define the end of the plume adjacent to the Willamette River. However, given the concentrations of PCE and TCE at the furthest down gradient well and the estimated travel distance of 450 feet to the transition zone, the PCE concentration is expected to exceed human health ambient water quality criteria for organism consumption and Portland Harbor screening level value at the interface with the river but present a low sediment recontamination potential. Source control measures are required to protect Willamette River receptors and DEQ anticipates implementation of a final remedy in 2016-17, in accordance with the remedial investigation and feasibility study process schedule. Once implemented, monitoring will be required to demonstrate effectiveness, and source control will be considered complete.

Albina Georegion Recontamination Potential Conclusions – With the exception of the groundwater pathway at the Tarr site, all potential pathways from sites in the Albina georegion were determined to be of low priority. Further investigation supported exclusion of all potential pathways to the river from five sites and one or more pathways at all 14 sites. Stormwater discharges have ceased from the majority of Albina georegion sites, due to a combination of site specific infiltration techniques, infrastructure removal, and municipal stormwater rerouting. While stormwater continues to discharge from some sites, best management practices are applied and discharges are monitored under NPDES regulations and ODOT plans to implement source control measures to reduce contaminants in runoff from I-405/Fremont Bridge in 2015-17. Only one small area of the bank in this georegion, at the Glacier facility, was determined to need source control measures. This bank area was stabilized in 2015. Therefore, provided effective measures are implemented for the Tarr groundwater plume and ODOT stormwater discharges, the potential for sediment recontamination and unacceptable risk to aquatic receptors is low for the entire georegion and source control has sufficiently been achieved to support the in-water remediation work.

4.6.2 Pearl District – RM 10.3 – 11.8 W

Area Overview – While platted as a residential area in 1869, the Pearl District story was driven by trains (Explore the Pearl 2014). Union Station was built in 1896 to accommodate passenger rail service and in the early 1900s railroad barons vied to develop the prime land in the area to support freight handling, locomotive servicing and a multi-modal travel hub. By 1910, multi-story brick freight houses, manufacturing facilities and commercial buildings dominated the area. Rail lines and industrial areas were close to the river to take advantage of barge

connections for raw material imports and finished product exports, but as transport modes shifted to highways and air cargo beginning in the 1950s, passenger and freight rail and barge services declined. The US Post Office built the main mail processing facility for Oregon and Southwest Washington next to Union Station in 1964. By the 1970s the rail yards fell into disuse, warehouses laid empty and infrastructure began failing. Redevelopment planning in the early 1980s led to the current mix of residential and commercial use in the area.

Sediment Areas of Potential Concern – During the Lower Willamette Group's remedial investigation, EPA identified sediment areas of potential concern 24 and 26 off shore along the Pearl District geographic region, as depicted on Figure 4.6.2. Contaminants found at elevated levels in these AOPC units were identified in a draft matrix in 2010, during the Lower Willamette Group's remedial investigation process, as listed in Table 4.6.2-1 below. As the in-water feasibility study progressed, EPA refined AOPCs into draft Sediment Decision Units (EPA 2014) based on site-wide contaminants of concern. DEQ referred to the AOPCs and associated contaminants of interest in directing upland source control work and as a conservative line of evidence for recontamination evaluation. Note that no Sediment Decision Units are identified by EPA on west side of the Willamette River adjacent to the Pearl Geographic Region.

Table 4.6.2-1 Pearl District Geographic Region Sediment Areas of Potential Concern and Elevated Contaminants of Interest

AOPC	Contaminants of Interest
24	copper, lead, mercury, PCBs
26	PAHs, bis(2-ethylhexyl)phthalate

Source: 2/17/2010 draft AOPC Matrix LWG RI)

Direct Discharge – While not all the outfalls depicted on Figure 4.6.2 are currently active, each was initially identified as a potential historical discharge point. City of Portland MS-4 permitted stormwater outfalls 10A, 11, 13, 14, and 15 currently drain small portions of the Pearl georegion to the Willamette River at the points shown on Figure 4.6.2. Most drainage from City outfall 11 comes from Forest Park and Highway 26, where it receives treatment in a series of swales and manholes before being discharged below. City outfalls 10A, 13, 14 and 15 drain small acreages of mostly residential and commercial land use since the majority of the former drainage areas for these outfalls were diverted to the Westside Tunnel, eventually being treated at the Columbia Boulevard publicly-owned treatment works and discharged to the Columbia River. None of the City-owned outfalls in this georegion discharge to AOPC 24 or 26. Detailed information about the basins and sites the City outfalls in this georegion drain is available by outfall number in the appendices of City's 2013 Municipal Stormwater Source Control Report for Portland Harbor. ODOT contributes MS-4 permitted runoff from Interstate 405, Highway 30 and Highway 26 through ODOT outfall WR-307 and City outfalls 11 and 15 and through scuppers on the Fremont Bridge. WR-307 discharges to AOPC 26. ODOT is preparing a plan for implementation of source control measures to reduce contaminants above screening levels in stormwater and elevated in sediment in AOPC 26. Multnomah County contributes runoff from the Broadway Bridge over the river at approximately river mile 11.6. Up to 46 private outfalls also discharge stormwater along the west side bank between river miles 10.3 and 11.6, mostly from sites that have completed or are undergoing source control evaluations. While not all are still active, discharges through several of these private outfalls are permitted under four assignments of the NPDES Industrial Stormwater General permit, as listed in Table 4.6.2-2 below. Permits are not required over approximately 80% of the land area in the Pearl georegion as these have shifted to commercial and residential area. Areas covered under these permits are shown with purple striping on Figure 4.6.2.

Table 4.6.2-2 Pearl District Geographic Region NPDES Industrial Stormwater General Permit Registrants, No Exposure Certifications, Best Management Practices

Registrant	Permit #
National Railroad Passenger Corporation (Amtrak)	1200Z
United States Postal Service	1200Z
Thermal Modification Technologies, Inc.	1200Z
Sulzer Pumps US Inc	1200Z
Iron Mountain	NEC

Upland Sites Investigated – As depicted on Figure 4.6.2 and summarized in Table 4.6.2-3, DEQ evaluated 18 upland sites with one or more potential pathways for source control in the Pearl geographic region. Additional details are provided in the text that follows the table for the two sites with medium priority pathways.

Table 4.6.2-3 Pearl District Geographic Region Sites

Site	ECSI#	Pathway(s)	Priority	Source Control Measures Status/ Dates	Decision Document	Recontamination Potential
PGE Substation E – East	3976	Groundwater	Low	Excluded	NFA 2006	Low
Sulzer Pump	1235	Overland flow	Low	Addressed in stormwater evaluation	SCD anticipated 2016	Low
		Bank erosion	Low	Investigation in process		
		Groundwater	Low	UST/soil removal 1980s & 2012 - Excluded		
		Stormwater	Med	Stormline cleanout 2006 & 2012 - effectiveness pending		
		Overwater acts	Low	Excluded		
Sulzer Pump – Dolan parcel		Stormwater	Low	Investigation needed - Uncontrolled	SCD anticipated 2017	Low
Port of Portland Terminal 1 North	3377	Overland flow	Low	Excluded	SCD 2012	Low
		Bank erosion	Low	Excluded	EPA reviewed the SCD without comment	
		Groundwater	Low	Excluded		
		Stormwater	Low	Stormline cleanout 2008		
		Overwater acts	Low	Excluded		
Port of Portland Terminal 1 South (Riverscape)	2642	Overland flow	Low	Excluded	NFA 2003	Low
		Bank erosion	Low	Excluded	EPA declined to review (outside PH prior to study area expansion)	
		Groundwater	Low	Excluded		
		Stormwater	Low	Excluded - Redeveloped w/stormwater manual		
		Overwater acts	Low	Excluded		
Portland Dock Commission	5173	Groundwater	Low	Excluded	NFA 2010 EPA issued letter in support of NFA	Low

Table 4.6.2-3 Pearl District Geographic Region Sites (continued)

Site	ECSI#	Pathway(s)	Priority	Source Control Measures Status/ Dates	Decision Document	Recontamination Potential
Centennial Mills	5136	Overland flow	Low	Addressed in stormwater evaluation	SCD 2014	Low
		Bank erosion	Low	Excluded	EPA issued letter in support of SCD	
		Groundwater	Med	Excluded w/portion deferred to Tanner Cr pipe remediation in 2016		
		Stormwater	Low	Redevelopment w/ stormwater manual anticipated in 2017-18		
		Overwater acts	Low	Excluded		
Tanner Creek Sewer (Abandoned)	5328	Groundwater	Low	Remediation in 2016 of residual contamination to prevent infiltration to stormline – Uncontrolled	SCD anticipated 2016	Low
Union Station Horse Barn	2407	Groundwater	Low	Excluded	NFA 2014	Low
		Stormwater	Low	Excluded - Redeveloped w/stormwater manual		
USPS - Process &Distrib Center	2183	Groundwater	Low	Excluded	NFA 2012	Low
		Stormwater	Low	Excluded		
Waterfront Pearl Condo	4535	Overland flow	Low	Excluded	NFA 2007	Low
		Bank erosion	Low	Excluded		
		Groundwater	Low	Excluded		
		Stormwater	Low	Soil removal 2005/06, Redeveloped w/stormwater manual		
		Overwater acts	Low	Excluded		
Union Station - Track #5	1414	Groundwater	Low	Excluded	NFA 1998	Low
		Stormwater	Low	Soil removal & institutional control 1995/96		
Graphic Arts Center/Zehrung	187	Groundwater	Low	Excluded	NFA 1988	Low
		Stormwater	Low	Excluded		
Albers Mill Property	4590	Overland flow	Low	No response to 2006 Site Assessment request	Not currently in program	Low
		Bank erosion	Low			
		Groundwater	Low			
		Stormwater	Low			
		Overwater acts	Low			
Union Station - Parcel A North	1962	Groundwater	Low	Excluded	NFA 2013	Low
		Stormwater	Low	Removal/cap 1999		
Sylvan Cleaners	1897	Groundwater	Low	Excluded	NA	Low
		Stormwater	Low	Excluded		
Pearl Building	4960	Groundwater	Low	Deferred to BNSF adjacent remediation	NFA 2008	Low
		Stormwater	Low	Soil removal 2000 & 2003, paved		
Hoyt St Train Yard-Parcel 1	1624	Stormwater	Low	Excluded - Redeveloped w/stormwater manual	NA	Low

Table 4.6.2-3 Pearl District Geographic Region Sites (continued)

Site	ECSI#	Pathway(s)	Priority	Source Control Measures Status/ Dates	Decision Document	Recontamination Potential
Hoyt St Rail yard	1080	Groundwater	Low	Excluded - Deferred to Tanner Cr pipe remediation in 2016	Cert of Completion 2008	Low
		Stormwater	Low	Excluded - Redeveloped w/stormwater manual		
Union Station - Parcel B South	1885	Groundwater	Low	Excluded	NFAs 2000, 2005, 2013	Low
		Stormwater	Low	Excluded - Redeveloped w/stormwater manual		
Pacific States Galvanizing	1024	Groundwater	Low	Removal - tanks 1996, soil 1998 & 2002	NFA 1992, 2012 (off-site plume not delineated)	Low
		Stormwater	Low	Excluded - Redeveloped 2002		

20 sites – 15 sites closed – 10 sites (33 pathways) excluded – 3 SCDs anticipated – 1 site not in VCP – 13 sites w/SCMs – 2 pathways uncontrolled

Sulzer Pump (ECSI # 1235)

The Sulzer Pump site is located on the west bank of the Willamette River at river mile 10.2, and covers approximately 24 acres. Earliest known site operations date back to the 1920s, when steam powered locomotives were built at the site. In the 1940s, the site was used for building and re-fitting military vessels. From the 1950s to the 1980s, construction equipment was fabricated at the site. Since the late 1980s, the facility produces pumps for use in petroleum and chemical industries. Sulzer currently operates on the northwestern half of the property. The remaining half is owned by Dolan Company LLC, though Sulzer retained ownership of a strip of land along this half of the property where the stormwater outfalls are located. Current tenants on the Dolan-owned parcel include Thermal Modification Technologies, Inc., and Dolan Designs, a lighting retail operation. Known contaminants site-wide include: chlorinated solvents and petroleum-related chemicals detected during decommissioning of 12 underground storage tanks in the 1990s; metals detected in storm line sediment in the early 2000s; a pocket of PCBs related to waste oil and transformers and metals and PCBs due to slag in riverbank soils. DEQ determined that contaminant levels in stormwater discharging to the Willamette River and erodible riverbank soils required source control measures.

Riverbank Erosion: A dilapidated dock structure overlies the bank area along the eastern 2/3 of the waterfront. The condition of the dock has deteriorated such that it is deemed unsafe to work on or around, which may limit future near shore sediment work. While the upland top of bank appears to be stable and not susceptible to erosion, DEQ requested a formal stability analysis, for which a work plan is anticipated in the Spring of 2016. If warranted, source control measures will be required to address riverbank soil, however DEQ anticipates that the stability analysis will confirm exclusion of the pathway.

Stormwater and Overland flow: While 17 stormwater outfalls to the Willamette River exist on the site, only seven outfalls are currently in service. A small portion of site stormwater infiltrates into soil and gravel, in an area along the riverbank. DEQ inspected the bank and found no evidence of rills or erosion from overland flow and observations during rain events confirm infiltration rather than sheet flow over the bank. Stormwater lines and catch basins on parts of the site were cleaned 2006 and 2012. A stormwater treatment system was installed in 2013 by a tenant operating a metals recycling facility on a portion of the Dolan-owned parcel to improve

removal of metals and become compliant with their 1200Z Industrial Stormwater general permit. The current tenant does not recycle metals and is not using the treatment system, but does conduct monitoring under a 1200Z permit. Sulzer also operates under a 1200Z permit on their portion of the site. Stormwater monitoring results from the permits and the source control evaluation work indicate a downward trend in contaminant discharge, but additional source control measures may still be needed. Sulzer developed a plan for stormwater control and DEQ will continue to work with Sulzer and Dolan to ensure that adequate controls are implemented and demonstrated effective prior to the in-water the in-water remedy. Therefore, DEQ considers the stormwater pathway controlled, pending results of effectiveness monitoring, and the potential for sediment recontamination is low.

Groundwater: Groundwater monitoring at two locations during the removal of underground storage tanks and a heating oil tank showed chlorinated VOCs and PAHs, respectively, in groundwater. These contaminants appeared localized and attenuated substantially before reaching the river. Push-probe groundwater sampling was conducted along the river bank in 2003 and showed PAHs at concentrations near and marginally above JSCS criteria in most samples. Additional groundwater sampling was requested to confirm whether low level PAHs detections could be attributed to soil, as opposed to groundwater. In 2014, four wells were installed along the waterfront and one well was installed centrally on the site, near the former underground tank area. Samples were collected in the Fall of 2014 through January 2015 and analyzed for VOCs, PAHs, phthalates, metals and petroleum hydrocarbons. Results indicated that concentrations of most analytes were below screening levels, with the exception of limited, minor exceedances of drinking water screening levels for a few VOCs, PAHs and metals. These results confirm that groundwater from the site is not transporting contaminants to the river at levels of concern, such that groundwater source controls are not warranted and the potential for sediment recontamination by groundwater is considered low.

Overwater acts: While historical uses of the dock may have contributed to contamination on the site and off shore, overwater activities ceased prior to source control investigation. The existing dock is dilapidated and the facility does not currently conduct overwater activities so this pathway is, therefore, excluded.

Centennial Mills (ECSI # 5136)

Centennial Mills is located on the west bank of the Willamette River at approximately RM 11.3 and encompasses 3.5 acres. The northern portion of the site contains a multi-story flour mill, formerly occupied by Centennial Mills, while the southern site contains an open horse paddock, corral, and surface parking. Currently, a portion of the former mill and paddock are used by the City of Portland Mounted Patrol Unit for horse stabling and related training. The earliest development on the site was in the late 1800s and included a ferry landing, a dock, and several buildings on piles over the shallow riverbank. The buildings were used for tannery, coal bunker, cold storage, ice factory and ferry landing operations. The mill complex was constructed between 1910 and 1930, with some buildings built on fill soils and others on piles over the river. In 1936, former buildings and the ferry landing were removed in the southeastern third of the site, leaving an embayment to the river. This area was filled by 1950 for use as the mill parking lot. The mill has had several owners, with Archer Daniels Midland Milling being the last to own and operate the mill from 1981 until 2000. The Portland Development Commission purchased the property in 2000, remodeled a portion and built the current horse paddock. The remainder of the mill is vacant and the entire site is slated for redevelopment for commercial use and open space. Known contaminants on the site include metals, petroleum hydrocarbons, and hydrocarbon constituents in filled soil and localized groundwater, particularly in backfill around

the Tanner Creek/storm sewer that runs below the site and discharges to the Willamette River. The contamination appears to be from historical on-site underground storage tanks or from migration along the sewer pipe bed from the former Hoyt Street Railyards site, which is being addressed as a separate action. As part of the mill site redevelopment, contaminated sewer backfill will be isolated with cutoff collars.

Riverbank Erosion: The riverbank beneath the mill complex consists of a bulkhead, shallow beach, and a concrete wall, protected from erosion by foundation walls extending into the river and building piles that reduce wave action. Outside of the mill building, the riverbank is generally covered by riprap and vegetation that minimizes the potential for erosion. Analytical results from both the riverbank and shallow sediment adjoining the site do not show any significant contamination. Based on this information, erosion of upland and riverbank soil is considered insignificant and excluded as a pathway.

Stormwater and Overland flow: Centennial Mills contributed stormwater runoff to the river through 23 roof drains, up to 25 outfalls piped from paved areas (not all of which are currently active) and the active Tanner Creek Sewer outfall. At least two of the 12 outfalls depicted on Figure 4.6.2 have been abandoned. Modestly elevated concentrations of metals were detected in stormwater discharges, but not in river surface sediment immediately adjacent to the site and related outfalls. While additional controls for the existing condition are not warranted, redevelopment of the site under City of Portland Stormwater Manual is anticipated to address metals associated with existing metal roofing and chipping paint at the vacant areas of the site, completing control for the stormwater pathway.

Groundwater: TPH, PAHs, and metals have been detected in site groundwater monitoring wells at low concentrations. These contaminants appear to be associated with contaminated fill placed on-site during site development and minor site-related releases. Detected concentrations are below screening level values and DEQ Ambient Water Quality Criteria and are also generally considered to be of low mobility. Based on this information, site groundwater is considered insignificant and excluded as a source control pathway.

Sampling of backfill around the abandoned storm lines that cross under the site did not identify significant contamination. However, the potential for contamination in the sewer pipe bedding to reach the river will be addressed by a separate investigation and remediation of the adjacent site, known as the Tanner Creek project, anticipated to be complete in 2015. Until this work is completed, the preferentially transport of groundwater pathway is considered uncontrolled. However, due to the moderate concentrations, length of travel and dilution of the creek, the recontamination potential from preferentially transported groundwater is low.

Overwater acts: Uses over water related to docks, ferries and buildings on piles ended at the site in the 1930s and the property along the water is currently vacant. Therefore DEQ excluded this pathway.

Pearl Georegion Recontamination Potential Conclusions – With the exception of the groundwater pathway at the Abandoned Tanner Creek sewer site and the stormwater pathway at the Sulzer/Dolan site, all potential pathways from sites in the Pearl georegion were determined to be of low priority. Further investigation supported exclusion of 33 potential pathways to the river from the 20 sites. Stormwater discharges have been greatly reduced from the Pearl georegion sites, due to a combination of site specific infiltration techniques, infrastructure removal, and municipal stormwater rerouting. While stormwater continues to discharge from some sites, best management practices are applied and discharges are

monitored under NPDES regulations and ODOT plans to implement source control measures to reduce contaminants in runoff from I-405/Fremont Bridge in 2015-17. While the Abandoned Tanner Creek sewer line investigation is not yet complete, the sediment recontamination potential of groundwater travelling preferentially through that old system is low. With the anticipated demonstration of effectiveness of stormwater source control measures at Sulzer and ODOT's facilities, the potential for sediment recontamination and unacceptable risk to Willamette River receptors is low for the entire georegion. Although no active in-water remediation is anticipated adjacent to the Pearl georegion, source control has sufficiently been achieved to support in-water remediation work.

4.6.3 Swan Island/Mocks Bottom – RM 8.1 – 9.9 E

Area Overview – First explored by Lewis and Clark in 1806 and originally charted as Willow Island in 1844, Swan Island was awarded to Lemuel Hendrickson as one of four Pioneer Land Claims in the Portland area in the 1840s (Carter 2013). A natural bar repeatedly formed at the island, which required maintenance dredging from the 1870s through 1920s to keep the ship channels open (OHS 2014). East of the island flowed the main river channel and the marshy lowlands of Mocks Bottom, curving into the base of the high bluff, above which is Mock's Crest. Both areas are named after a family headed by John Mock who inhabited this land claim and later donated the upper portion to the University of Portland, which still looks out over Mocks Bottom, Swan Island and the Willamette River from its perch on the bluff (Foster 2008). In 1922, the Port of Portland had acquired Swan Island (PoP 2014) and got permission in 1927 to close off the east channel creating a lagoon (OHS 2014). In the process, the shape of the island changed significantly with placement of fill dredged from the river's new main channel on the west of the island (PoP 2015). A causeway was built to connect the end of the island to the east bank so the former island could serve as an airport (OHS 2014). The Port estimated that more than 13 million cubic yards of dredged material was also placed in the 1920s and 30s to create commercial and industrial space from the former Mocks Bottom marshlands (Engineering World 1920). By 1940, the airport outgrew the island and was moved and Henry Kaiser's ship building operations began and continued throughout World War II (OHS 2014). Temporary housing for workers was built on Swan Island/Mocks Bottom for the workforce that built converted warships between 1942 and 1945 (Carter 2013). Ship dismantling is reported to have occurred post-war between 1947 and 1949 by Consolidated Builders (PoP 2015). The Port of Portland acquired the shipyard from the United States after the war and made it available for use by local ship repair companies, increasing the industrial manufacturing, shipping and transportation focus of the area in the 1950s (CoP 2013b) and spawning residential needs in the "Overlook" neighborhood up on the bluff (Carter 2013). Heavy industrial uses continue on Swan Island today, supported by a mix of old and newer drainage and utilities infrastructure, and the Mocks Bottom area was developed for light industrial and commercial use in the 1960s through the 1990s, when more modern drainage and utility infrastructure was installed (CoP 2013b).

Sediment Areas of Potential Concern – During the Lower Willamette Group's remedial investigation, EPA identified sediment areas of potential concern 17 in Swan Island Lagoon and areas 21, 22 and part of 23 off shore along the Swan Island/Mocks Bottom geographic region, as depicted on Figure 4.6.3. Contaminants found at elevated levels in these AOPC units were identified in a draft matrix in 2010, during the Lower Willamette Group's remedial investigation process, as listed in Table 4.6.3-1 below. As the in-water feasibility study progressed, EPA refined AOPCs into draft Sediment Decision Units (EPA 2014) based on site-wide contaminants of concern. DEQ referred to the AOPCs and associated contaminants of interest in directing upland source control work and as a conservative line of evidence for recontamination evaluation.

Table 4.6.3-1 Swan Island/Mocks Bottom Geographic Region Sediment Areas of Potential Concern and Elevated Contaminants of Interest

AOPC	Contaminants of Interest
17	arsenic, cadmium, copper, mercury, silver, tributyl tin, zinc, PAHs, dibutylphthalate, phenol, PCBs, delta-HCCH, dieldrin
21	cadmium, mercury, PCBs
22	copper, lead, zinc, PCBs
23	cadmium, copper, lead, mercury, zinc, PCBs, DDT

(Source: 2/17/2010 draft AOPC Matrix LWG RI)

Direct Discharge - While not all the outfalls depicted on Figure 4.6.3 are currently active, each was initially identified as a potential historical discharge point. As shown on Figure 4.6.3, City of Portland MS-4 permitted stormwater outfalls S-1, S-2, M-1, M-2 and M-3 drain portions of the Swan Island/Mocks Bottom georegion to the Swan Island Lagoon, discharging into AOPC 17, and City outfalls S-5 and S-6 drain portions of Swan Island into the Willamette River. Detailed information about the basins and sites the City outfalls in this georegion drain is available by outfall number in the appendices of City's 2013 Municipal Stormwater Source Control Report for Portland Harbor. One Port of Portland MS-4 outfall drains a small portion the southernmost area of Swan Island into the river at AOPC 22. Up to 80 private outfalls also discharge stormwater into the Swan Island Lagoon, and AOPC 17, and up to 34 private outfalls discharge along the west side bank between river miles 8.1 and 9.6, including three each into AOPCs 21 and 21. While not all are still active, the majority of the private, as well as public, outfall discharges are from the Vigor/Portland Shipyard facility, which is undergoing a source control evaluation and plans to implement additional stormwater source control measures. Discharges through several of the private outfalls are permitted under one individual wastewater NPDES permit, 14 assignments of the NPDES Industrial Stormwater General permit, and 25 sites qualify for No Exposure Certification under the general permit or apply best management practices like those required under permit, as listed in Table 4.6.3-2 below. Approximately 85% of the land area in the Swan Island/Mocks Bottom georegion has permits and management practices applied. These extensive areas are shown with purple striping on Figure 4.6.3.

Table 4.6.3-2 Swan Island/Mocks Bottom Geographic Region NPDES Permits

Individual Permits		Stormwater General Permit Registrants, No Exposure Certifications or Best Management Practices	
Registrant	Permit #	Registrant	Permit #
Vigor Industrial LLC	101393	Vigor Industrial LLC	1200Z
		Auto Truck Transport USA LLC	1200Z
		Becker Trucking, Inc.	1200Z
		Coho Distributing-Swan Island	1200Z
		Daimler Trucks North America	1200Z
		Daimler Trucks North America Corp 10	1200Z
		Environmental Fibers International Inc	1200Z
		Chris & Allice LLC (formerly EWH/Service Steel)	1200Z
		Maletis Beverage Corp	1200Z
		NW Processing Solar & Microelectronics LLC	1200Z
		Saia Motor Freight	1200Z
		Savage Services Inc	1200Z
		Swan Island Dairy	1200Z

Table 4.6.3-2 Swan Island/Mocks Bottom Geographic Region NPDES Permits (continued)

Individual Permits		Stormwater General Permit Registrants, No Exposure Certifications or Best Management Practices	
Registrant	**Permit #**	**Registrant**	**Permit #**
		TP Freight	1200Z
		YRC Inc.	1200Z
		Am For Electronics	NEC
		Bridgetown Printing	NEC
		C H Murphy/Clark Ullman, Inc	NEC
		Camco Manufacturing Inc	NEC
		Infiltrator Systems Inc	NEC
		Kach Machine Works Inc	NEC
		Metro Paint Processing Facility	NEC
		Northwest Paper Box	NEC
		Northwest Paper Box Mfrs Inc-Corrugated	NEC
		Oregon Transfer Company	NEC
		Parker Hannifin Corp-Connector Div	NEC
		Project PM LLC	NEC
		Rose City Moving & Storage Co	NEC
		Stack Metallurgical Services Inc	NEC
		Stagecraft Industries	NEC
		Swan Island Sandblasting	NEC
		Temp-Control Mechanical	NEC
		Temp-Control Mechanical	NEC
		United Parcel Service	NEC
		UPS Portland South	NEC
		Vigor Machine	NEC
		Xpress Global Systems	NEC
		US Coast Guard	BMPs
		Fred Devine	BMPs

Upland Sites Investigated - As depicted on Figure 4.6.3 and summarized in Table 4.6.3-3, DEQ evaluated 14 upland sites for source control in the Swan Island/Mock Bottom geographic region, while EPA is overseeing the evaluation on an additional site, US Navy Reserve. Additional details are provided in the text that follows the table for one site with medium priority pathway, Portland Shipyard/Vigor Industrial, and the EPA-led site, US Navy Reserve.

Table 4.6.3-3 Swan Island/Mocks Bottom Geographic Region Sites

Site	ECSI#	Pathway(s)	Priority	Source Control Measures Status/ Dates	Decision Document	Recontamination Potential
US Navy Reserve	5109	Overland flow Bank erosion Groundwater Stormwater Overwater acts	Low Low Low Low Low	Tank removal 1993 Referred to EPA for site-wide assessment in 2011	EPA-led	Low
US Coast Guard	1338	Overland flow Bank erosion Groundwater Stormwater Overwater acts	Low Low Low Low Low	Addressed in stormwater evaluation Excluded Excluded Stormline cleanout, BMPs 2013-15 - effectiveness pending Excluded	SCD anticipated 2016	Low
Fred Devine	2365	Overland flow Bank erosion Groundwater Stormwater Overwater acts	Low Low Low Low Low	Excluded Excluded Excluded BMPs 2010 Excluded	SCD anticipated 2016	Low
Freightliner - Truck Plant (Daimler)	2366	Groundwater Stormwater	Low Low	Vapor control & removal 2010 Stormline cleanout/repair, BMPs 2006-2014, infiltration pond 2016 - Uncontrolled	SCD anticipated 2016	Low
Portland Shipyard • Vigor Industrial, Cascade General (OU 1)	271	Stormwater Overwater acts	Med Med	Stormline cleanout & dry dock BMPs 2009, BMPs 2013, partial treatment 2014 – Additional SCMs needed - Uncontrolled Excluded	SCD anticipated 2018 (OU1)	Med until SCMs implemented
• Port of Portland (OUs 1, 2, 3, 4 & 5)	271	Bank erosion Groundwater Stormwater	Med Med Med	Stabilization (OU5), integration into in-water remedy (OU1 & OU5) - Uncontrolled Excluded Excluded	SCD 2013 (OU3) SCD 2014 (OU1) SCD 2015 (OU4) EPA issued letters in support of SCDs SCD anticipated 2016 (OUs 2& 5)	Med until SCMs implemented

Table 4.6.3-3 Swan Island/Mocks Bottom Geographic Region Sites (continued)

Site	ECSI#	Pathway(s)	Priority	Source Control Measures Status/ Dates	Decision Document	Recontamination Potential
End of Swan Island Lagoon	3901	Overland flow	Low	Excluded	SCD not anticipated	Low
		Bank erosion	Low	Anticipated to be excluded		
		Groundwater	Low	Anticipated to be excluded, pending further investigation		
		Stormwater	Low	Excluded		
		Overwater acts	Low	Excluded		
Freightliner - Parts Mfg Plant (Daimler)	115	Groundwater	Low	Anticipated to be excluded, pending further investigation (see #3901)	SCD anticipated 2018	Low
		Stormwater	Low	Stormline cleanout 2007, BMPs 2007 & 2012 - additional SCMs needed - Uncontrolled		
EWH, LLC (Service Steel)	5685	Stormwater	Low	Stormline cleanout, BMPs 2013/14 - additional SCMs needed - Uncontrolled	SCD anticipated 2017	Low
Fred Meyer - Swan Island	44	Groundwater	Low	Excluded	NFA 1992	Low
		Stormwater	Low	Paved 1988, Excluded		
Estey (Automatic Vending)	1430	Groundwater	Low	Tank removal 1991, Excluded	NFA 1997	Low
		Stormwater	Low	Excluded (paved)		
Office Depot (Island Holdings)	260	Groundwater	Low	Excluded	NA	Low
		Stormwater	Low	Excluded		
GI Trucking	1840	Stormwater	Low	Tank/soil removal 1993, Excluded	NA	Low
Roadway Express	3807	Stormwater	Low	Soil removal 2005	NFA 2010	Low
Lynden Farms (ATC Leasing)	4461	Overland flow	Low	Excluded	NA	Low
		Bank erosion	Low	Excluded		
		Groundwater	Low	Tank removal 2005, Excluded		
		Stormwater	Low	Excluded		
		Overwater acts	Low	Excluded		

14 sites – 6 sites closed – 5 sites (25 pathways) excluded – 7 SCDs anticipated – 1 site EPA – 11 sites w/SCMs – 5 pathways uncontrolled

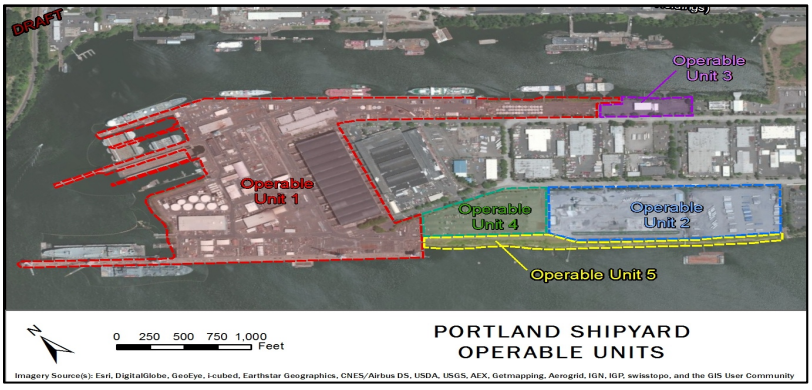
US Navy Reserve (ECSI # 5109)

The US Navy and Marine Reserve Center is located on the east side of Swan Island Lagoon at river mile 8.2. Petroleum underground storage tanks were removed beneath dock area in 1993. Riverbank impacted soil and groundwater impacts remained after completion of the tank removal. DEQ requested the US Navy investigate stormwater as a potential source control pathway, in addition to the riverbank and groundwater issues associated with the former leaking underground storage tanks. The US Navy was unwilling to conduct the additional requested site evaluations. DEQ referred the site to the U.S. Environmental Protection Agency in 2011 for follow up. Investigations are needed, along with implementation of any warranted controls. EPA assessed the site and determined that bank action may be needed in conjunction with the Swan Island Lagoon remedial actions and found that the stormwater pathway could pose a low potential for sediment recontamination (EPA 2015b).

Portland Shipyard (ECSI # 271)
The Portland Shipyard Site is located on the east side of the Willamette River at river mile 8.4 and covers approximately 91 acres. The Port of Portland acquired Swan Island in 1922 and, using fill material dredged from the Willamette River, raised the elevation and created a land bridge, which formed a lagoon. Swan Island was then developed to serve as an airport until the Maritime Commission constructed a shipyard there in 1942. Kaiser operated the shipyard until 1945. The Port of Portland managed it as a multi-user facility from 1950 through 1995, expanding capabilities including the addition of dry docks, construction of a ballast water treatment plant, and development of river berths. In 1996, the Port of Portland entered into an operating agreement with Cascade General, and then sold the portion of shipyard to Vigor Industrial in 2000.

The Portland Shipyard site was divided into five operable units, as shown in the inset figure below:

- Operable Unit 1- Approximately 57 acres currently operated as the Vigor Marine Ship Repair Yard and formerly known as the Portland Shipyard. Stormwater and overwater activities pathways are being evaluated by Vigor. Groundwater and bank erosion pathways were evaluated by the Port of Portland. DEQ determined that the OU1 riverbank erosion pathway is a medium priority for source control.
- Operable Unit 2- Approximately 20 acres located south of North Channel Avenue. Currently, two tenants operate on OU2: Cemex concrete batch plant and Daimler temporary truck staging area. DEQ determined the groundwater pathway from OU2 to be medium priority.
- Operable Unit 3- Approximately 2.5 acres located on North Lagoon Avenue that provides access to Berths 308 and 309. Following Port investigation, pathways from OU3 were determined to be low priority.
- Operable Unit 4- Approximately 7.8 acres located between OU1 and OU2. In 2008, OU4 was designated as a distinct portion out of OU2, in order to facilitate the sale of the property to Shipyard Commerce Center, LLC. OU4 is currently used as a parking lot by Vigor, who is evaluating the stormwater pathway. The groundwater pathway was evaluated by the Port and determined to be low priority.
- Operable Unit 5- Approximately 4 acres of riverbank adjacent to OUs 2 and 4. In 2014, OU5 was designated as a distinct portion out of OU2, in order to facilitate the potential sale of the remaining lands in OU2. DEQ determined that the OU5 riverbank erosion pathway is a medium priority for source control.



Vigor Industrial owns or operates on approximately 66 acres of the Portland Shipyard site. These areas occur in OUs 1 and 4, as described above. Vigor Industrial currently uses the site for full-service ship repair including ship conversions, overhauls, maintenance programs, damage repair, and equipment repair for privately owned and government vessels.

The remedial investigation and source control evaluations determined that site releases impacted upland soil, riverbank soil and groundwater. As such, the pathways of riverbank erosion, groundwater, stormwater and overwater activities were all designated as medium priority for source control.

Riverbank Erosion – DEQ determined that source control measures are needed for two areas of bank within OU1, totaling approximately 1,100 linear feet. Based on the need for at least a portion of the work to be below the ordinary high water line, DEQ recommended that source control measures for these riverbank areas be incorporated by EPA into the final remedy for the in-water cleanup.

DEQ determined that phased source control measures are needed to address portions of the riverbank in OU5 that are susceptible to bank erosion. Bank stabilization treatment for areas with the highest contamination and above ordinary high water is expected to be implemented in the spring of 2016 under DEQ oversight. Areas with lower contaminant concentrations and that are below ordinary high water will be integrated into EPA's in-water remedy. Until all measures to address bank erosion are implemented, DEQ considers the potential for sediment recontamination via bank erosion to be medium.

Groundwater – Based on groundwater evaluation and monitoring data collected during the remedial investigation of the site, DEQ determined that groundwater source control measures are not needed in OU1, OU3, OU4 and OU5, because pathways were incomplete or concentrations in potentially complete pathways were insignificant. Based on preliminary review of groundwater data presented in the OU2 source control evaluation, additional investigation is needed. Regardless of whether the investigation indicates that source control measures are necessary, because of the volatile nature of the chemicals at issue, DEQ considers the potential for sediment recontamination from groundwater at OU2 to be low.

Stormwater – Due to lack of development and conveyance features, DEQ determined that stormwater source control measures are not required for OU2 and OU5. At OU3, DEQ determined that implementation of management practices have successfully minimized contaminants in stormwater, so no additional measures are warranted. Vigor is currently designing and implementing source control measures for stormwater in OU1 and OU4. Compliance with Vigor's NPDES 1200-Z permit requires implementation of an engineered system to address contaminants in two portions of the site by two phases. Vigor is evaluating electrocoagulation and other treatments to meet both the permitted portions requirements and source control requirements site-wide. EPA views the Vigor stormwater pathway as "of high concern because the current controls have not allowed the facility to meet NPDES permit requirements (EPA 2015b)". Until site-wide source control measures are in place and demonstrated to be effective, Vigor's stormwater discharges will continue to represent a medium potential for recontamination.

Overwater Activities – During investigation, DEQ recognized that activities occurring overwater at the shipyard were actually contained in dry docks. Therefore, the overwater activities pathway was excluded and DEQ required Vigor to implement measures to control fugitive airborne emissions from sandblasting and painting in dry docks that could be transported to the river

through the stormwater pathway. The Control of Grit Particulate and Paint Overspray best management practices were implemented in 2009 and includes specifying wet blasting as the preferred paint removal method at the site, considering weather conditions when scheduling work, the use of containment devices such as shrouds, and implementation of painter training and certification program to minimize paint overspray.

Swan Island/Mocks Bottom Georegion Recontamination Potential Conclusions – The Mocks Bottom section of this geographic region was developed relatively recently, predominantly for light industrial and commercial uses. The Swan Island portion of the georegion has a much longer and more industrial history, centered around ship building, breaking and repair and other heavy industrial operations. Of the 14 sites investigated in the georegion, all potential pathways at five sites were excluded. Due to pathway exclusions and source removals or controls, the sediment recontamination potential is considered low at 12 of the 14 total sites. Additional investigation, source control measures and adaptive management in response to effectiveness monitoring for the stormwater pathway is anticipated at three sites, the two Freightliner locations and the EWH site. Sediment recontamination potential from these sites is considered low, but there may be some risk to Willamette River receptors from VOCs in groundwater until the pathway is confirmed to be excluded or controlled.

The two remaining sites are considered medium potential for sediment recontamination. The Vigor Industrial site at the Portland Shipyard is a large site that generates large volumes of stormwater. Vigor is evaluating source control measures to enhance stormwater capture and treatment and adaptive management following effectiveness monitoring is anticipated. In addition, portions of the bank in OU1 and OU5 need source control measures and are anticipated to be integrated into EPA's in-water remedy. Once source control measures, if warranted by the investigations, are implemented and demonstrated to be effective at both medium potential sites, sediment recontamination will be considered low.

The US Navy Reserve site was referred to EPA to complete investigation of the stormwater, groundwater and bank erosion pathways. Until these investigations are completed and any needed controls are implemented and demonstrated to be effective, DEQ recommends EPA consider the sediment recontamination potential from stormwater and bank erosion and the risk to aquatic receptors from groundwater to be of medium concern.
Therefore, provided all pending upland source control measures and in-water remedy integrations are implemented and demonstrated to be effective, the overall potential for sediment recontamination and unacceptable risk to aquatic receptors from upland DEQ-led sites in the Swan Island/Mocks Bottom georegion is low, and source control has sufficiently been achieved to support the in-water remediation work.

4.6.4 Guilds Lake – RM 8.0 – 10.3 W

Area Overview – As told by the Oregon Historical Society (2002), prior to the early 1900s, Guilds Lake was a 400 acre marshy area of willow, white ash, cedar and fir. The shallow lake was fed by Balch Creek and groundwater and drained to Kittredge and Doane Lakes, which then connected to the Willamette River. Small plots on the lake edge were farmed in the 1880s until the lake outlet was cut off in 1888 by an embankment built for the Northern Pacific Railroad line. Garbage incinerators and sawmills operated around the lake in the 1890s. In 1902, John Olmstead began shaping the area into landscaped world's fairgrounds, for an event known as the Lewis and Clark Exposition of 1905. To realize the plan for the area to become an industrial center, the filling in of Guilds Lake began in 1906. Fill material came first from soil sluiced off the West Hills slopes with high pressure hoses jetting water from Balch Creek in preparation for

development up the slope. By 1913, a fifty acre former lake area served as an industrial area near the current location of NW 26th Street and NW Nicolai Street. By the early 1920s, the Port of Portland filled the rest of the lake with 20 million cubic yards of sediment dredged from the Willamette River to deepen the west channel and close off the channel east of Swan Island, creating Swan Island Lagoon. Aside from some wartime housing built there during World War II, the Guilds Lake georegion continues today to be exclusively industrial since the lake was filled. Current industrial activities in the Guilds Lake georegion include manufacturing of barges, railcars and other goods, oil distribution, railroad operations, truck transport, recycling, and various other services.

Sediment Areas of Potential Concern – During the Lower Willamette Group's remedial investigation, EPA identified sediment areas of potential concern 18, 19 and 20 off shore along the Guilds Lake geographic region, as depicted on Figure 4.6.4. Contaminants found at elevated levels in these AOPC units were identified in a draft matrix in 2010, during the Lower Willamette Group's remedial investigation process, as listed in Table 4.6.4-1 below. As the in-water feasibility study progressed, EPA refined AOPCs into draft Sediment Decision Units (EPA 2014) based on site-wide contaminants of concern. DEQ referred to the AOPCs and associated contaminants of interest in directing upland source control work and as a conservative line of evidence for recontamination evaluation.

Table 4.6.4-1 Guilds Lake Geographic Region Sediment Areas of Potential Concern and Elevated Contaminants of Interest

AOPC	Contaminants of Interest
18	aluminum, barium, cadmium, copper, iron, manganese, mercury, silver, zinc, PCBs, PAHs, delta-HCCH, dieldrin, endrin, chloroethane
19	aluminum, barium, cadmium, copper, iron, manganese, mercury, silver, zinc, bis(2-ethylhexyl)phthalate, PCBs, PAHs, dioxins/furans, aldrin, delta-HCCH, dieldrin, endrin, DDx, chloroethane
20	cadmium, copper, lead, mercury, zinc, PAHs, PCBs, dioxins/furans, DDx,

(Source: 2/17/2010 draft AOPC Matrix LWG RI)

Direct Discharge - While not all the outfalls depicted on Figure 4.6.4 are currently active, each was initially identified as a potential historical discharge point and all of the outfalls in this georegion discharge to one of the AOPCs: 18, 19 or 20. City of Portland MS-4 permitted stormwater outfalls 16, 17, 18, 19, and 19A drain portions of the Guilds Lake georegion to the Willamette River at the points shown on Figure 4.6.4. Discharge from these City outfalls is a mix of runoff from Forest Park and varying swaths of industrial areas. Detailed information about the basins and sites these City outfalls drain is available by outfall number in the appendices of City's 2013 Municipal Stormwater Source Control Report for Portland Harbor. ODOT contributes MS-4 permitted runoff from Hwy 30 to City-owned outfalls 16, 17, 18 and 19. The Port of Portland also contributes MS-4 permitted runoff through two outfalls near Balch Creek Cove, located riverward and upstream of City outfall 16 on Figure 4.6.4, one of which discharges to AOPC 20. Up to 61 private outfalls also discharge stormwater along the west side bank between river miles 8 and 10.3, mostly from sites determined not to require source control evaluations. While not all outfalls are still active, discharges through many of these private outfalls are regulated under one NPDES Individual Wastewater permit, 17 sites assignments of the NPDES 1200Z or 1200A Industrial Stormwater General permits, and 45 sites that qualify for No Exposure Certifications under the general permits or apply best management practices like those required under permits, as listed in Table 4.6.4-2 below. Approximately 50% of the Guilds Lake georegion consists of Forest Park and residential areas that don't require permits.

Approximately 30% of the remaining land area has permits and management practices applied, as shown with purple striping on Figure 4.6.4.

Table 4.6.4-2 Guilds Lake Geographic Region NPDES Permits

Individual Permits		Industrial Stormwater General Permit Registrants		1200Z Industrial Stormwater General Permit – No Exposure Certifications
Registrant	**Permit #**	**Registrant**	**Permit**	**Registrant**
Univar USA Inc.	101613	Glacier NW (CalPortland ReadyMix)	1200A	Galvanizers
		Carson Oil Truck Shop	1200Z	Paco Pumps
		Carson Oil Warehouse	1200Z	Port of Portland Terminal 2
		Christenson Oil	1200Z	Stevedoring Services Of America
		Container Management Services	1200Z	Penske Truck Leasing
		Equilon Enterprises, LLC	1200Z	SFI, Inc.
		Esco Corporation (Plant #3)	1200Z	ABF Freight Systems Inc
		Greenway Recycling	1200Z	Alliance Trading LLC
		Gunderson LLC	1200Z	Applied Industrial Technology
		McCracken Motor Freight Inc	1200Z	Ashland Hercules Water Technologies
		Owens Corning Roofing and Asphalt LLC	1200Z	Baxter & Flaming Industries
		BNSF – Portland Hub	1200Z	Benson Industries
		Peninsula Truck Lines, Inc	1200Z	Color Magic Inc
		Portland Terminal RR Co	1200Z	Culver Glass Co Inc
		Tube Forgings of America Inc	1200Z	Documart Copies And Printing
		Western Wire Works	1200Z	Dura Industries
		Wilhelm Trucking Co	1200Z	Electrical Distributing
		Calbag Metals	1200Z	Fast Fabricators
		Oregon Beverage Recycling Cooperative	1200Z	Flatline Fabrication
				Gans Ink & Supply Company
		No Permit But Applying BMPs		Georgia-Pacific NW Service Ctr
		Anderson Bros		Industrial Craters & Packers
		PGE Forest Park		Ink Systems Inc
		Anderson Portland Properties		Kenan Advantage Group Inc
				P-Dinh
				Portland Bindery
				Portland Bolt & Manufacturing
				Premier Finishes Inc
				Pronto Distribution
				Rose City Bindery
				S & H Trucking

Table 4.6.4-2 Guilds Lake Geographic Region NPDES Permits (continued)

Individual Permits		Industrial Stormwater General Permit Registrants		1200Z Industrial Stormwater General Permit – No Exposure Certifications
Registrant	**Permit #**	**Registrant**	**Permit**	**Registrant**
				Special Asphalt Products Inc
				Sterling Business Forms
				Tomra Company
				Tualatin Valley Transportation Inc
				Yeon Mini Storage

Upland Sites Investigated – As depicted on Figure 4.6.4 and summarized in Table 4.6.4-3, DEQ evaluated 50 upland sites for source control in the Guilds Lake geographic region, while EPA led evaluation on an additional site, Van Waters and Rogers (Univar). Additional details are provided in the text that follows the table for sites with medium or high priority pathways and the EPA-led site.

Table 4.6.4-3 Guilds Lake Geographic Region Sites

Site	ECSI#	Pathway(s)	Priority	Source Control Measures Status/ Dates	Decision Document	Recontamination Potential
Anderson Bros	970	Overland flow Groundwater Stormwater	Low Low Low	Excluded Excluded Stormline cleanout/BMPs 2008	NFA 2007, 2009 SCD 2009 EPA issued SCD support letter	Low
Chevron Asphalt	1281	Groundwater Stormwater	Low Low	Excluded Stormline cleanout/BMPs 2009	SCD 2010 EPA comments addressed in final SCD	Low
Willbridge Railyard (BNSF)	3395	Groundwater Stormwater	Low Low	Excluded Sampling 2015	SCD anticipated 2016	Low

Table 4.6.4-3 Guilds Lake Geographic Region Sites (continued)

Site	ECSI#	Pathway(s)	Priority	Source Control Measures Status/ Dates	Decision Document	Recontamination Potential
Glacier Northwest Inc. (part of Front Ave LLP)	2378	Overland flow	Low	Addressed in stormwater evaluation	SCD anticipated 2018	Med until remedy implemented
	1239	Bank erosion	Low	Investigation in process		
		Groundwater	Low	Included in Tube Forgings investigation		
		Stormwater	Low	New storm system/BMPs 2012 – Not yet in program - Uncontrolled		
		Overwater acts	Low	Spill plan & BMPs		
Hampton Lumber (part of Front Ave LLP)	5761	Overland flow	Low	Addressed in stormwater evaluation	SCD anticipated 2018	Med until remedy implemented
	1239	Bank erosion	Low	Investigation in process		
		Groundwater	Low	Included in Tube Forgings investigation		
		Stormwater	Low	BMPs - effectiveness pending		
		Overwater acts	Low	Spill plan & BMPs by lessees		
Tube Forgings (part of Front Ave LLP)	1239	Groundwater	Low	Investigation in process - Uncontrolled	SCD anticipated 2018	Low
		Stormwater	Low	Storm system improvements/BMPs 2013/14 - effectiveness pending		
Schnitzer Kittridge	2442	Groundwater	Low	Excluded	NFA 2007	Low
		Stormwater	Low	Excluded		
Lakeside Industries	2372	Bank erosion	Low	Excluded	SCD anticipated 2017	Low
		Groundwater	Low	Investigation in process, anticipated to be excluded		
		Stormwater	Low	Excluded		
Shaver Transportation	2377	Overland flow	Low	Excluded	SCD 2002 EPA issued letter in support of SCD	Low
		Bank erosion	Low	Excluded		
		Groundwater	Low	Excluded		
		Stormwater	Low	Excluded		
		Overwater acts	Low	Excluded		
Brazil	1026	Stormwater	Low	Soil removal & pipe abandonment 2015	SCD 2016 EPA review in process	Low
Mt Hood Chemicals	81	Groundwater	Low	In situ/vapor extract 2010-11	NFA/SCD Anticipated 2016	Low
		Stormwater	Low	Investigation in process, anticipated to be excluded		
PGE Forest Park	2406	Stormwater	Low	Temp BMPs 2010 - redevelopment pending	PPA 2010	Low
Anderson Portland Properties	5529	Groundwater	Low	Excluded	SCD 2014 EPA issued letter in support of SCD	Low
		Stormwater	Low	Soil Removal 2011/Cleanout 2012/temp BMPs – redevelopment pending		

Table 4.6.4-3 Guilds Lake Geographic Region Sites (continued)

Site	ECSI#	Pathway(s)	Priority	Source Control Measures Status/ Dates	Decision Document	Recontamination Potential
Calbag Metals	2454	Groundwater Stormwater	Low Med	Excluded Stormline cleanout/paving 2005, BMPs 2013-14 – additional SCMs needed - Uncontrolled	SCD anticipated 2017	Low
Texaco Pipeline & Terminal (Shell)	2117 & 169	Groundwater Stormwater	Low Low	Excluded New storm pipe section 1993, Soil Removals 1995, 2004 & 2011, Stormline cleanout 1995 & 2008, New catch basins & BMPs 2012	SCD 2014 EPA issued letter in support of SCD	Low
Container Recovery (OR Beverage Recycling Cooperative (OBRC))	4015	Groundwater Stormwater	Low Low	Excluded BMPs 2013 & 2014	SCD 2015 EPA issued letter in support of SCD	Low
Christensen Oil	2426	Groundwater Stormwater	Med Med	Dual phase extract 2011 - 2014 BMPs 2013	SCD 2015 EPA issued letter in support of SCD	Low
Van Waters and Rogers (Univar)	330	Groundwater Stormwater	Med Med	vapor extract/pump & treat 2010 – New SCMs pending - Uncontrolled Evaluation in progress by DEQ - Uncontrolled	EPA led SCD anticipated 2016	Med
Guilds Lake RR Yard (BNSF) – see Eastman 135	100	Groundwater Stormwater	Low Low	Anticipated to be excluded Infiltration area 2010, Eastern system abandoned 2009-15, on-going BMPs - effectiveness pending	SCD anticipated 2016	Low
Gunderson	1155	Overland flow Bank erosion Groundwater Stormwater	Low High Med High	Addressed in stormwater evaluation Interim bank stabilization Areas 2&3 2013-15 – Area 3 final SCMs to be integrated with in-water remedy - Uncontrolled Sparge /pump & treat 2007 – 2014 – effectiveness pending Stormline cleanout/ paving/BMPs 2013/14, compost treatment system & line abandonment and reconfiguration 2015 – additional SCMs planned 2016 - Uncontrolled	SCD anticipated 2017	High until remedy implemented

		Overwater acts	Low	Containment and operational practices		

Table 4.6.4-3 Guilds Lake Geographic Region Sites (continued)

Site	ECSI#	Pathway(s)	Priority	Source Control Measures Status/ Dates	Decision Document	Recontamination Potential
Wirfs Property (Schnitzer Invest)	2424	Groundwater Stormwater	Low Low	Evaluation in process - Uncontrolled Evaluation in process – anticipated to be excluded	SCD anticipated 2016	Low
Wilhelm Trucking	69	Groundwater Stormwater	Low Med	Excluded New storm system/paving/BMPs 2013 - effectiveness pending	SCD anticipated 2016	Low
Container Management	4784	Groundwater Stormwater	Low Med	Investigation in process Geotextile fabric/gravel at catch basins/BMPs 2011 - additional SCMs needed - Uncontrolled	SCD anticipated 2017	Med
Columbia American Plating	29	Stormwater	Low	Stormline cleanout 2009,BMPs 2011	SCD 2014 EPA issued letter in support of SCD	Low
Carson Oil Co., Inc.	1405	Stormwater	Low	Stormline cleanout & BMPs 2012-2013, additional SCMs planned 2016	SCD anticipated 2016	Low
General Electric Portland Inspection & Repair Service Center	4003	Groundwater Stormwater	Low Med	Excluded Stormline cleanout /BMPs 2007	SCD 2011 EPA issued letter in support of SCD	Low
Galvanizers Company	1196	Groundwater Stormwater	Med Med	Excavation 2001, Excluded BMPs/treatment 2007-2010 /diversion 2011	SCD anticipated 2016	Low
Paco Pumps	146	Stormwater	Low	Soil removal 1987 & 1997, Stormline cleanout /paving/BMPs 2007	SCD & NFA 2007 EPA issued letter in support of SCD	Low
Port of Portland Terminal 2	2769	Overland flow Bank erosion Groundwater Stormwater Overwater acts	Low Low Low Low Low	Addressed in stormwater evaluation Excluded Excluded Soil removal 1998, Stormline cleanout/BMPs 2008 Excluded	SCD 2013 EPA issued letter in support of SCD	Low
Calbag Metals	5059 & 5238	Groundwater Stormwater	Med Med	Excluded Stormline cleanout /paving/BMPs/treatment 2012-15 - effectiveness pending	NFA 2014 SCD anticipated 2016	Low
	5055	Groundwater	Low	Excluded	NFA 2008	Low

Penske Truck Leasing		Stormwater	Low	Soil removal/paving/BMPs - Excluded		

Table 4.6.4-3 Guilds Lake Geographic Region Sites (continued)

Site	ECSI#	Pathway(s)	Priority	Source Control Measures Status/ Dates	Decision Document	Recontamination Potential
Kittridge Distrib Ctr	2442	Groundwater Stormwater	Low Low	Excluded Excluded	SCD 2004 NFA 2007 EPA issued letter in support of SCD	Low
Greenway Recycling	4655	Groundwater Stormwater	Low Low	Excluded Excluded	NFA 2009	Low
SFI, Inc.	5103	Groundwater Stormwater	Low Low	Excluded Soil removal 2008, Cleanout/BMPs 2009	SCD 2010 EPA issued letter in support of SCD	Low
Trumball Asphalt (Owens Corning Yeon)	1160	Groundwater Stormwater	Low Low	Investigation needed, refused to enter VCP BMPs (1200Z) - effectiveness pending	Not in VCP	Low
Dura Industries Inc	111	Stormwater	Low	Excluded	NA	Low
Ashland Chemical (Hill Investment)	1076	Stormwater	Low	refused to enter VCP, BMPs (NEC) - Excluded	NA	Low
Mt Hood Chemical (Color Magic)	1328	Groundwater	Low	Excluded	NFA 1995	Low
Longview City Laundry & Cleaners Inc	1395	Groundwater Stormwater	Low Low	Excluded Excluded	NA	Low
Eastman Chemical Co (McWhorter) (See Shell 169) (See Guilds Lake RR 100)	135	Groundwater Stormwater	Low Low	Plume included in Shell SCD Included in Guilds Lk RR evaluation	Shell SCD 2014 EPA issued letter in support of SCD	Low
	100 (NE parcel)	Groundwater Stormwater	Low Low	Plume included in Guilds Lk RR SCD Included in Guilds Lake RR evaluation	Guilds Lk RR SCD anticipated 2016	Low
Front Avenue MP	4008	Groundwater Stormwater	Low Low	Excluded Soil removal 1993, 2003 & 2004, Stormline cleanout /storm system removal 2004	NFA 2004	Low
Mogul Corp.	1307		Low	Excluded	NFA 2002	Low
King-Ries Property	4560	Groundwater Stormwater	Low Low	Excluded Excluded	NFA 2006	Low
ANFRS Holdings (ABF Freight Systems)	1820	Groundwater Stormwater	Low Low	Excluded Excluded	NA	Low

Table 4.6.4-3 Guilds Lake Geographic Region Sites (continued)

Site	ECSI#	Pathway(s)	Priority	Source Control Measures Status/ Dates	Decision Document	Recontamination Potential
Guilds Lake incinerator/landfill (City of Portland)	404	Groundwater Stormwater	Low Low	Excluded Excluded	NFA 1998	Low
Chapel Steel Inc	4920	Stormwater	Low	Excluded	NA	Low
Dasic International	110	Stormwater	Low	Excluded	NA	Low
Nudelman & Son	966	Stormwater	Low	Excluded	NA	Low
Hercules Inc	988	Stormwater	Low	Excluded	NA	Low

49 sites – 32 sites closed – 16 sites (55 pathways) excluded – 16 SCDs anticipated – 1 site not in VCP – 31 sites w/SCMs – 9 pathways uncontrolled

Calbag Metals (ECSI #2454)

The 4.71-acre facility is located approximately 1,000 feet inland from the southwest shore of the Willamette River in the vicinity of river mile 8.5 within the Portland Harbor study area. From 1968 until 2000 the property was used for metal recycling activities, primarily recovery of copper, aluminum, and lead from coated wires. Calbag operated at the site from 1995 to 2000. The current site owner is BDC Properties LLC and site users include PPV Inc./Bravo Environmental NW Inc. and Fast (metal) Fabricators. Contaminants found at elevated concentrations leaving the site in stormwater include metals, phthalates, PCBs and petroleum.

Stormwater: In 2004, accumulated sediment in City of Portland stormwater pipes adjacent to the site showed elevated concentrations of metals. Calbag subsequently removed about 0.8 tons sediment from the adjacent pipes and 3.2 tons of sediment from on-site stormwater pipes and catch basins in January 2005. The removed sediment significantly exceeded Portland Harbor source control screening levels for copper, lead, chromium, mercury, PCBs, and phthalates. Calbag repaved the entire site in June 2005 and then demonstrated that stormwater contaminant concentrations were substantially reduced. DEQ agreed that no further action was required and issued a source control decision in November 2005. However, DEQ re-opened the evaluation in 2010 based on stormwater solids data showing on-going concentrations of PCBs above screening level values and levels found at other industrial sites being discharged from the site to the City stormwater system, which discharges to the Willamette River at outfall 19. Best management practices are implemented on the site by tenants and are regulated under the "no exposure certification" clause of the NPDES 1200Z Industrial Stormwater general permit. Additional source control measures are planned to address PCBs. Until additional source control measures are implemented and demonstrated to be effective, the stormwater pathway from the site is considered uncontrolled, but the potential for sediment recontamination is low.

Calbag Metals (ECSI #5059 & #5238)

The Calbag Metals site is located approximately ¾ of a mile inland on the west side of the Willamette River at approximately river mile 10.1. Two parcels situated across Nicolai Street from each other cover approximately 1.9 and 0.9 acres, respectively. The 5238 parcel is comprised of a 30,000 square foot warehouse with loading docks and parking. The 5059 parcel has operated as a nonferrous scrap metal recycling facility since mid 1940s. Hazardous substances associated with site activities include metals, petroleum hydrocarbons, PAHs, and PCBs. The source control investigation determined that site releases impacted surface pavement and stormwater.

Groundwater: DEQ evaluated soil and groundwater sampling at the site and issued a No Further Action determination for soil and groundwater in 2014. Therefore the groundwater pathway was excluded.

Stormwater: The 5238 parcel has no catch basins or other stormwater conveyance features, so stormwater runs off the site to catch basins in the street, from where it is conveyed to the river. Stormwater conveyance and treatment features on the 5059 parcel are described below. In 2009, sediments were analyzed from City of Portland storm lines that convey stormwater discharges from the site to the Willamette River at outfall 16 and metals and PCBs were found at concentrations well above screening level values. DEQ determined that contaminant levels in site pavement and stormwater discharging to the Willamette River require source control measures. As shown on Figure 4.6.4, significant portions of the site were repaved, some stormwater pipes were replaced and a multi-component stormwater filtration treatment system was installed in 2012. In addition, sweeping, catch basin filters and other best management practices are implemented at the site to improve stormwater quality, which is managed under a 1200Z Industrial Stormwater general permit. DEQ considers the stormwater pathway from the site to be controlled, pending effectiveness demonstration and the sediment recontamination potential is low.

Christensen Oil (ECSI #2426)

The Christenson Oil site, located more than ½ mile inland on the west side of the Willamette River, approximately at river mile 8.8. An intermittent stream, Green Creek, flows between the two site parcels, which eventually discharges to the Willamette River at City of Portland Stormwater Outfall 18. The site comprises approximately five acres across two parcels. Three acres on the west parcel are used for an office and a warehouse and the two east parcel acres are used for petroleum product blending, which began at initial development in the 1960's. The facility blends and sells various petroleum products, such as Stoddard solvent, various light to heavy lubricating oils, and specialty fuels and products. Up to 306,600 gallons of virgin petroleum products are currently stored in above ground storage tanks, arranged in farms with secondary containment. Releases of oil products from tanks to soil and the creek were reported in 1975, 1995 and 1998 and, during decommissioning of underground storage tanks in 1990, it was discovered that a release of Stoddard solvent had contaminated soil and groundwater beneath the site. Following the remediation and investigations described by pathway below, DEQ issued a source control decision for the site in 2015.

Groundwater: Portions of excavated soils were aerated and spread on the site in 1991 and 1993 and groundwater remediation began. Dual phase extraction activities began in 2011 and monitoring in 2014 and 2015 indicated free product and dissolved concentrations of Stoddard solvent were greatly reduced, though above screening level values. The groundwater likely does not contact site stormwater piping in the vicinity of the residual dissolved plume, and so would not be preferentially transported to the river via stormwater pipes. Concentrations of contaminants in the most down gradient points sampled are low and given the ½ mile distance of the site from the river, DEQ considers the potential for sediment recontamination via groundwater from the site is low.

Stormwater: The stormwater conveyance system captures approximately 15% of stormwater draining from the east parcel, which is regulated under the 1200Z permit. The remainder of rain falling on the site infiltrates in the rock surface around buildings on the west parcel and in the pervious site areas of the east parcel. A small portion of east parcel drainage comingles with the intermittent creek flowing between the parcels and eventually discharging to the Willamette

River at City Outfall 18. Christenson Oil evaluated the stormwater pathway from the east parcel by analyzing stormwater catch basin sediments and stormwater and video surveying. Stormwater and solids samples from the minimal system of catch basins, an oil/water separator and piping, are generally below applicable screening level values. This minimal flow with low concentrations of contaminants presents a low risk of sediment recontamination from the stormwater pathway from the site.

Van Waters and Rogers (Univar) (ECSI #330)

The Univar site is located approximately 2,000 feet from the shore of the west side of the Willamette River at river mile 8.7. Van Waters and Rogers a subsidiary of Univar Corp. started as a chemical supply company in 1946. About 1974, the company expanded into recycling and distilling spent solvents. Documented spills at the site include releases of methylene chloride, trichloroethylene, toluene and caustics. When Van Waters and Rogers decided not to renew the hazardous waste storage permit in December 1985, soil and groundwater sampling was required as part of Resource Conservation and Recovery Act closure activities. The sampling, performed in the summer of 1987, found high levels of solvents in the soil and in the groundwater. Site cleanup is being overseen by the EPA RCRA Corrective Action Program. EPA issued a Record of Decision for the site in 2006.

Groundwater: The record of decision specified expansion of the existing soil vapor extraction system and expansion of the groundwater extraction and treatment system in the source area. The remediation system was subsequently expanded to include a LNAPL pilot test recovery system and DNAPL monitoring. Concurrent with the operation and management of the remediation system, an updated conceptual site model was developed to support a reevaluation of source area remedial technologies and corrective action alternatives. At the time of this report, no EPA project manager is assigned to the site and the status of groundwater remediation at the site is unclear.

Stormwater: The EPA record of decision requires an evaluation of the stormwater pathway to ensure that contaminants from the Univar facility have not been released to stormwater and have not reached the Willamette River. By early 2015, characterization of stormwater and stormwater solids had not been completed under EPA oversight in alignment with DEQ's Guidance for Evaluating the Stormwater Pathway at Upland Sites, 2009. In August 2015, DEQ entered into a letter agreement with Univar to oversee the stormwater source control evaluation. An approved work plan to assess the stormwater pathway from the site is underway. Until any needed source control measures are in place and demonstrated to be effective, site stormwater is considered uncontrolled, but the site is actively working on a plan and schedule for control, should the data warrant it. The similarity of site contaminants with those found in sediment areas where stormwater discharges indicates that the potential for sediment recontamination remains medium.

Gunderson (ECSI # 1155)

The Gunderson site spans approximately 63 acres along 4,000 lineal feet of the west bank of the Willamette River, from approximately river mile 8.5 to 9.2. Barge, ship, and rail car building has occurred on portions of the site since the mid-1900s. The land area was expanded when dredged material and other fill was placed into the river in the 1950s and 1960s. Gunderson's predecessor FMC purchased the upstream third of the site, referred to as Area 3, in 1980. Starting in the 1950s, Area 3 was used for ship demolition and later car shredding. The facility currently builds rail cars and barges. A large "outfitting dock" is suspended on pilings offshore along the length of the Area 3 bankline. The middle third of the site is referred to as Area 2,

which includes a barge launching area and a dock owned and operated by Equilon (see ECSI #2117) that supports a petroleum pipeline and protrudes off shore near the northernmost portion of this area. The northern third of the site s referred to as Area 1. Remedial investigation began in 1994 and determined that upland and riverbank soil, groundwater and stormwater had been impacted by releases during pre and post-1980s operations. Source control contaminants of concern include: dioxins/furans, PAHs, PCBs, butyltins, metals and 1,1,1-trichloroethane.

Riverbank Erosion: DEQ determined that contaminant levels in riverbank soils require source control measures. Interim bank stabilization measures were implemented in phases from the upstream end of the site downstream to the approximate location of City of Portland outfall 18, as depicted in figure 4.6.4, and at the Equilon Dock. DEQ is currently evaluating effectiveness of interim measures, which may be adequate for Area 1 and most of Area 2, completing source control for this pathway. Additional, permanent measures are needed in Area 3 and at the barge launchways in Area 2, which are anticipated to be implemented in conjunction with EPA's in-water remedy. Until measures are implemented and demonstrated effective, sediment recontamination potential from bank erosion from this portion of the site is considered high.

Groundwater: The primary area of concern for groundwater was in the downstream third of the site, where a release of 1,1,1-trichloroethane to groundwater occurred. Active remediation began in 2007, using air sparging and soil vapor extraction at the source and a pump and treat system located downgradient of the release, landward of the riverbank. Based on an optimization evaluation and subsequent sampling, DEQ approved the shutdown of that combined remediation system in May 2014. Following additional groundwater sampling to verify that concentrations were remediated to below applicable screening levels, DEQ anticipates being able to make a source control decision for the groundwater pathway from the site. Given the behavior of 1,1,1-trichloroethane, sediment recontamination is unlikely to occur, even if concentrations remain above screening level values and the plume reaches the river. Therefore, recontamination potential due to groundwater at the site is low.

Stormwater and Overland flow: In 2012 and 2013, Gunderson implemented a series of best management practices, including: paving; mechanized sweeping; catch basin filters; containment of blast grit containment; and removal of sediments from storm lines, to improve stormwater quality. Gunderson also piloted a compost filtration system for reduction of metals and solids in targeted drainages of Area 2. This pilot will be scaled up and additional measures including abandonment of some inlets and reconfiguration of the storm pipe system, infiltration of portions of some drainage areas and additional paving improvements are underway, in response to corrective actions required under the site's 1200Z Industrial Stormwater general permit. DEQ anticipates submittal in 2017 of a revised stormwater source control evaluation with data demonstrating effective control of contaminants in stormwater and the site stormwater will continue to be managed under the 1200Z permit. DEQ considers the stormwater pathway controlled, pending effectiveness demonstration and adaptive management, and the potential for sediment recontamination is low.

Overwater acts: Work over water occurs in two areas at the Gunderson facility: the outfitting dock and the barge launchways, below where ordinary high water occurs. Industrial activities on the outfitting dock include rail car decaling and final outfitting of completed barges. Because these activities have a minimal potential for spills, DEQ determined that improved operational practices and physical containment measures are adequate for the source control process. These practices and measures include: shielding launch way welding areas, regular vacuum truck use and debris cleaning in launch way areas; removal of erodible soil from launch way areas and placement of rock and replaceable straw waddles to disrupt sheet flow and strain

potential solids from runoff. Given these on-going and adaptive management measures employed for overwater activities, DEQ considers this pathway controlled and the potential for sediment recontamination and unacceptable risk to river receptors is low.

Wilhelm Trucking (ECSI #69)

The Wilhelm Trucking site is located approximately ¾ of a mile inland on the west side of the Willamette River at approximately river mile 9.3 and is approximately 6.85 acres. The site consist of three tax lots separated by a rail line and currently used for a transportation terminal, equipment storage, parking, and a custom crate/packing shop. On the westernmost parcel, furnaces were used from 1930 to 1967 to melt lead from bearings. The source control investigation determined that site releases impacted site soils and stormwater. Hazardous substances associated with site activities include metals, petroleum hydrocarbons, PAHs and PCBs.

Stormwater: DEQ determined that contaminant levels in site surface soils and stormwater discharging to the Willamette River require source control measures. In 2013, the stormwater system serving the central and western portions of the site was reconstructed with several two-chamber catch basins and an oil/water separator unit. Also in 2013, the central and western portions of the site were repaved. Regular sweeping and other best management practices are employed on the site to improve stormwater quality, which is managed under a 1200Z Industrial Stormwater general permit. Surficial soil removal is needed at the Magnus portion of the site. DEQ anticipates on-going monitoring to demonstrate effectiveness or that additional measures will be adaptively applied, as warranted. DEQ considers stormwater at the site to be controlled, pending effectiveness demonstration, and the potential for sediment recontamination is low.

Container Management (ECSI #4784)

The Container Management site is located approximately ¾ of a mile inland on the west side of the Willamette River at approximately river mile 9.3 and covers approximately 2.2 acres. The site has operated as a container reconditioning facility since 1939. Hazardous substances associated with site activities include metals, phthalates, pesticides, petroleum hydrocarbons, PAHs, and PCBs. The source control investigation determined that site releases impacted surface soils, stormwater and potentially groundwater.

Groundwater: Given that concentrations of contaminants were found in site soils above levels known to leach into groundwater, DEQ requested and the site prepared a groundwater evaluation plan, which is currently underway.

Stormwater: In 2007, sediments in City of Portland stormwater lines were analyzed at locations above and below the site's connection point to the City conveyance system, which discharges to the Willamette River at City of Portland outfall 18. Stormwater sediment analysis indicated that the site stormwater discharges contained site associated contaminants at concentrations well above screening level values. DEQ determined that contaminant levels in site soils and stormwater discharging to the Willamette River require source control measures. Gravel paving over geotextile was installed in 2011 around catch basins and a loading dock to address elevated levels of contaminants in some soils. Sweeping and other best management practices are implemented at the site to improve stormwater quality, which is managed under a 1200Z Industrial Stormwater general permit. Additional source control measures are warranted at the site and a plan is under development for site-wide implementation of control measures, including paving. Until additional controls are in place and demonstrated to be effective, the pathway is considered uncontrolled. Due to high concentrations of PCBs at the site and

excessive soil track-off from the facility into area stormwater conveyances, represents a medium potential for sediment recontamination of the river at AOPC 19.

General Electric Portland Inspection & Repair Service Center (ECSI #4003)

The 3.06-acre site is located approximately 3,000 feet from the southwest shore of the Willamette River in the vicinity of river mile 9.5 within the Portland Harbor study area. GE purchased the property in 1952 and used it as an electrical equipment service and repair facility and warehouse until September 30, 2010, when the buildings and parking areas were emptied. Hazardous materials utilized during electrical service and repair operations include paints, degreasers, mineral oil, and dielectric fluids. From 1953 to 1976 GE handled dielectric fluids that contained PCBs in concentrations greater than 500 parts per million, from 1976 to 1978, site fluids with PCB concentrations were greater than 50 ppm, and after 1978, the concentration of PCBs in dielectric fluids handled was less than 50 ppm. The source control evaluation included investigation and controls in both the groundwater and stormwater pathways.

Groundwater: In 2007-08, six groundwater monitoring wells were installed on site and sampling showed exceedances of screening level values for PCBs and several metals. Adjacent City of Portland stormwater pipes were abandoned or their flows were diverted to the wastewater treatment plant that discharges to the Columbia River, eliminating the potential for groundwater that could infiltrate pipes being conveyed to the Willamette River. The hydrophobic nature of PCBs and distance of over half a mile make direct discharge of PCBs in groundwater to the river is unlikely. Therefore, the groundwater pathway was excluded.

Stormwater: Approximately 10 tons of catch basin, storm line, and truck ramp sediment were removed in 2004 to 2006 and disposed off site. In 2006 and 2007, GE: removed roof sediment; installed a new roof; removed steam booth exhaust vent solids; cleaned the main building exterior walls; replaced four on-site catch basins with new ones; installed a 13-cartridge and 2-cartridge stormwater filter treatment systems to capture main building roof and parking lot runoff, respectively; replaced, flushed or abandoned site stormlines; and installed curbing and new pavement. Subsequent stormwater monitoring showed PCB concentrations below concentrations found at other industrial sites and DEQ issued a source control decision in 2011. The City of Portland diverted stormwater conveyance lines serving the property to the publicly-owned treatment plant on Columbia Boulevard in 2011, so site runoff no longer discharges to the Willamette River. Therefore, current and future conditions at the site are anticipated to have a low potential for sediment recontamination via stormwater.

Galvanizers Company (ECSI #1196)

The Galvanizers site is located approximately 0.87 of a mile inland on the west side of the Willamette River at approximately river mile 9.6 and covers approximately 1 acre. The site has operated as a galvanizing facility since 1941. Hazardous substances associated with site activities are primarily metals and the most significant metal is zinc. The source control investigation determined that site releases impacted surface soils, groundwater and stormwater.

Groundwater: To address metals in groundwater, contaminated soils were removed in 2001 from an area where an infiltration pit was formerly located. While elevated concentrations of zinc were found in groundwater under the site, zinc concentrations decline with distance from the site and the plume does not appear to reach the river or infiltrate into underground pipes that discharge to the river. Therefore, the groundwater pathway is excluded.

Stormwater: In 2007, sediments were analyzed from City of Portland storm lines that convey stormwater discharges from the site and metals were found at concentrations well above screening level values. Source control measures installed included a stormwater treatment system that targets metals, site paving and catch basin filter inserts. In 2011, the City of Portland diverted stormwater collected from the site, along with approximately half of the basin that formerly discharged through outfall 17, to the wastewater treatment plant, where it now eventually discharges to the Columbia River. Therefore, current and future conditions at the site are not anticipated to contribute to sediment recontamination via stormwater.

Guilds Lake Georegion Recontamination Potential Conclusions – All potential pathways from 41 of the 50 sites investigated in the Guilds Lake georegion were determined to be of low priority. Further investigation supported exclusion of all potential pathways from 14 sites.

Some erodible bank areas at the Gunderson site were determined to be a high priority for source control. Interim measures were put in place to stabilize some bank sections at Gunderson, additional measures are planned be implemented concurrent with the in-water remedy. Until completion of these measures and in-water remedy, sediment recontamination potential from this bank area remains high, as evidenced by the similar nature of the contaminants in the bank areas and those in the sediment management areas off shore.

The groundwater pathway was determined to be a medium priority for source control at five sites: Calbag Metals, Christensen Oil, Univar, Galvanizers and Gunderson. Upon investigation, the groundwater pathway was excluded at Calbag and Galvanizers and various treatments were implemented at Christensen Oil, Univar and Gunderson. These are anticipated to be demonstrated to be effective, and while there may be some risk to Willamette River receptors, the nature of any residual contaminants and distance to the river of the plumes, make sediment recontamination potential of the groundwater pathways within the Guilds Lake georegion low.

The stormwater source control priority was determined to be high at Gunderson and medium at eight sites: Calbag Metals (2 locations), Christensen Oil, Galvanizers, Univar, Wilhelm Trucking, Container Management, and GE Portland Inspection & Repair Service. Stormwater investigation and a variety of source control measures and best management practices have been implemented at all but Univar, though additional measures are needed at Container Management, Gunderson and one Calbag location. ODOT plans to implement measures to reduce contaminants in stormwater from Highway 30 facilities in the area in 2016-17. Demonstration of effectiveness of the implemented measures has been achieved or is underway at all remaining high and medium priority sites. While stormwater continues to discharge from the many industrial sites in this georegion, best management practices and exposure minimization are applied at a substantial number of sites within the georegion. Discharges will continue to be monitored under NPDES regulations, investigations are underway at Univar, Hampton and Glacier, and source control measures will be implemented at Container Management and the ODOT Highway 30 facilities. For all these categories, source control effectiveness demonstrations or additional source control measure implementation, as needed, will be adaptively managed. EPA assessed stormwater from Guild's Lake area discharges as critical and recommended EPA management support DEQ in moving implementation of controls forward in a timely fashion (EPA 2015b). Until measures are implemented and effectiveness is demonstrated, sediment recontamination potential from these facilities should be considered medium.

While the Guilds Lake georegion is the most densely developed area of on-going industrial activity in the Portland Harbor uplands, source control has been sufficiently achieved at the

majority of sources in each pathway. Therefore, provided the in-water integration remedies are implemented and effective stormwater source control measures are implemented at a handful of sites, the potential for sediment recontamination and unacceptable risk to Willamette River receptors is low for the entire georegion and source control has sufficiently been achieved to support the in-water remediation work.

4.6.5 St. Johns – RM 5.1 – 8.1 E

Area Overview - The St. Johns geographic region comprises the St Johns, Overlook and Cathedral Park neighborhoods. Historically, industry was located along the shoreline and residential areas were above the river on the bluffs that rise abruptly from the east bank of the Fremont Bridge and parallel the river up to the St. Johns Bridge (Portland Parks 2013). Industrial lumber and ship building operations began at Triangle Park and Willamette Cove in 1900 and chemical wood treating operations occurred at McCormick and Baxter from 1944 - 1991. Current and future land use designations and development trends have shifted to more residential and commercial use closer to the river.

Sediment Areas of Potential Concern – During the Lower Willamette Group's remedial investigation, EPA identified sediment areas of potential concern 10, 11, 12, 13, 15 and part of area 17 off shore along the St. Johns geographic region. AOPC 17 was subsequently changed to 17D, as it appears on Figure 4.6.5. Contaminants found at elevated levels in these AOPC units were identified in a draft matrix in 2010, during the Lower Willamette Group's remedial investigation process, as listed in Table 4.6.5-1 below. As the in-water feasibility study progressed, EPA refined AOPCs into draft Sediment Decision Units (EPA 2014) based on site-wide contaminants of concern. DEQ referred to the AOPCs and associated contaminants of interest in directing upland source control work and as a conservative line of evidence for recontamination evaluation.

Table 4.6.5-1 St. Johns Geographic Region Sediment Areas of Potential Concern and Elevated Contaminants of Interest

AOPC	Contaminants of Interest
10	mercury
11	copper, mercury, silver, zinc, tributyl tin, PAHs, PCBs, delta-HCCH, DDx
12	copper, mercury, tributyl tin, PCBs
13	cadmium, copper, mercury, zinc, PAHs, bis(2-ethylhexyl)phthalate, carbazole, PCBs, DDx
15	copper, silver, PAHs, delta-HCCH
17 (D)	arsenic, cadmium, copper, mercury, silver, tributyl tin, zinc, PAHs, dibutylphthalate, phenol, PCBs, delta-HCCH, dieldrin

(Source: 2/17/2010 draft AOPC Matrix LWG RI)

Direct Discharges – While not all the outfalls depicted on Figure 4.6.5 are active, each was initially identified as a potential historical discharge point. City of Portland MS-4 permitted stormwater outfalls 48, 49, 50, 52 and 52A. span the east bank throughout the St. Johns geographic region. Approximately seven Port of Portland MS-4 permitted outfalls are clustered around the northernmost end of the geographic region, draining the Terminal 4 facilities. ODOT MS-4 permitted runoff contributes to City outfalls 49, 50 and 52 and investigation of these discharges is still underway. Up to five private outfalls were abandoned (or confirmed not to discharge) at the Mar Com sites, five at the McCormick and Baxter site, two at the Triangle Park site, and two at the Willamette Cove site. All five of these sites are currently undeveloped and stormwater discharges from single active outfalls on each of the Mar Com parcels, one outfall

on the McCormick and Baxter site and one municipal outfall (49) at Willamette Cove. In addition, approximately four private outfalls drain small areas of residential housing located up on the bluffs and two assignments of the NPDES 1200Z industrial stormwater general permit, as indicated in Table 4.6.5-2, below. Approximately 90% of the land in the St. Johns georegion is vacant, residential or commercial and does not require permits. Areas where permits and management practices are applied are shown with purple striping on Figure 4.6.5.

Table 4.6.5-2 St Johns Geographic Region NPDES Industrial Stormwater General Permit Registrants or No Exposure Certifications

Registrant	Permit #
Toyota Logistics Services Inc	1200Z
IFCO Systems	1200Z
Axiom Custom Products	NEC
Bushwacker Inc	NEC
Independent Marine Propeller	NEC
Peninsula Iron Works	NEC
Peninsula Iron Works	NEC
Stenno Carbon Company	NEC

Upland Sites Investigated - As depicted on Figure 4.6.5 and detailed in Table 4.6.5-3, DEQ evaluated ten upland sites for source control in the St. Johns geographic region, as described in the following table and text.

Table 4.6.5-3 St. Johns Geographic Region Sites

Site	ECSI#	Pathway(s)	Priority	Source Control Measures Status/ Dates	Decision Document	Recontamination Potential
MarCom North	4797	Overland flow	Low	Soil and sandblast grit removal 2007	SCD 2004 NFA/ 2009 EPA issued letter in support of SCD	Low
		Bank erosion	Low	Excluded		
		Groundwater	Low	Excluded		
		Stormwater	Low	Excluded		
		Overwater acts	Low	Excluded		
MarCom South	2350	Overland flow	Low	Soil removal 2008	SCD & NFA 2011 EPA comments addressed in final SCD	Low
		Bank erosion	Low	Excluded		
		Groundwater	Low	Excluded		
		Stormwater	Low	Excluded		
		Overwater acts	Low	Excluded		
City of Portland BES Lab	2452	Overland flow	Low	Excluded	SCD 2010 EPA comments addressed in final SCD	Low
		Bank erosion	Low	Excluded		
		Groundwater	Low	Excluded		
		Stormwater	Low	Excluded		
		Overwater acts	Low	Excluded		

Table 4.6.5-3 St. Johns Geographic Region Sites (continued)

Site	ECSI#	Pathway(s)	Priority	Source Control Measures Status/ Dates	Decision Document	Recontamination Potential
Crawford St Corp	2363	Overland flow	Low	Investigation in process - Uncontrolled	SCD anticipated 2018	Low
		Bank erosion	Low	Soil removal 2001 – Additional investigation in process - Uncontrolled		
		Groundwater	Low	Investigation in process		
		Stormwater	Low	Investigation in process - Uncontrolled		
		Overwater acts	Low	Excluded		
McCormick & Baxter	74	Overland flow	High	Soil removal 2005	ROD 1996 CCR* 2005 O&F D** 2011	Low
		Bank erosion & River sediment	High	Soil/bank/sediment removal & cap 2005		
		Groundwater	High	Groundwater containment 2003		
		Stormwater	High	Excluded		
		Overwater acts	Low	Excluded		
Willamette Cove	2066	Overland flow	Low	Soil removal 1999, 2004, 2008, 2014 & 2015	SCD anticipated 2017	Medium until in-water remedy completed
		Bank erosion	Med	Sand removal 2006, SCMs needed – integrate w/in-water - Uncontrolled		
		Groundwater	Low	Investigation in process		
		Stormwater	Low	Excluded		
		Overwater acts	Low	Excluded		
Triangle Park (UP River Campus)	277	Overland flow	Med	Soil removal/cap	EPA-led (completed)	Low
		Bank erosion	Med	Soil removal/cap		
		Groundwater	Med	Excluded		
		Stormwater	Med	Excluded		
		Overwater acts	Low	Excluded		
Peninsula Iron Wks	5686	Stormwater	Low	Overland flow contacts PCB soils off site and may discharge to City OF – communication w/ DEQ suspended	SCD not anticipated	Low
Unocal SS 3911	1593	Stormwater	Low	Excluded	NA	Low
Multnomah County - St. Johns Site	2421	Stormwater	Low	Excluded	NFA (UST)	Low

10 sites - 7 closed - 3 sites (23 pathways) excluded - 2 SCDs anticipated -1 site not in VCP - 1 EPA site - 5 sites w/SCMs - 4 pathways uncontrolled
*Construction Completion Report
** Operational and Functional Determination

McCormick & Baxter (ECSI # 74)

The McCormick and Baxter site is located on the east bank of the Willamette River at approximately river mile 7 and encompasses approximately 41 acres of land between the railroad bridge and the Triangle Park site, with remedial work extending out onto 23 acres of adjacent river bottom. McCormick & Baxter Creosoting Company was founded in 1944 to

produce treated wood products, including lumber, piling, timbers, and railroad ties during World War II and wood-treating operations continued until October 1991. Site investigations that began in 1987 indicated that releases of wood-treating chemical compounds significantly impacted upland soils, groundwater, and riverbed sediments. Contaminants detected include polynuclear aromatic hydrocarbons (PAHs, comprising 85 percent of the creosote), pentachlorophenol, arsenic, chromium, copper, zinc, and dioxins/furans. The site was listed as a Superfund site on June 1, 1994, a record of decision was completed in 1996 (and amended in 1998) and required remedial actions were completed in September 2005. As documented in the September 2011 Five-Year Review Report, DEQ and EPA concur that the remedies are protective of human health and the environment. The site is currently vacant except for a paved parking area, a small shop building, two field office trailers, and associated utilities. Source control is complete for all pathways, as described below, and recontamination potential is considered low.

Overland Flow: In 1999, approximately 33,000 tons of contaminated soil and debris were removed from the top four feet of the site and replaced with an equal volume of clean sand. Site-wide capping in 2005, including a 15-acre impermeable cap within the perimeter of groundwater barrier wall detailed below and a 2-foot deep earthen cap outside the barrier wall footprint.

Stormwater: Following plant operation shutdown in 1991, one cooling water outfall and 3 stormwater outfalls were decommissioned and stormwater was redirected and contained such that most water infiltrates into the ground surface. A stormwater management swale conveys stormwater directly to an on-site retention/infiltration pond and a 6-acre riparian zone along the bankline.

Riverbank Erosion: Several thousand native trees and shrubs were planted throughout the drainage swale and riparian zone in February 2006, to help stabilize the soil against stormwater erosion and river flood erosion, and to reduce rainwater percolation into groundwater by evapotranspiration.

River sediment: In 2005, placement of a 23-acre sediment cap was completed in the river, which was designed to chemically isolate contaminants in groundwater discharging up through river sediment and non aqueous phase liquids seeping from near the former tank farm area and the Willamette Cove. The cap consists of an armored 2-foot layer of sand over most of the cap footprint, a 5-foot sand layer in several more highly contaminated areas and 600 tons of bulk organophilic clay to prevent breakthrough of non aqueous phase liquids. Post-construction sediment cap monitoring at 5-year intervals is conducted, in addition to several special studies to confirm that that cap is functioning as designed.

Groundwater: A fully encompassing 17.8-acre impermeable subsurface barrier wall was designed and constructed in 2003 and 2004 to contain high concentrations of contaminated groundwater residual non aqueous phase liquids. The total length of the wall is 3,792 linear feet and the depth varies from approximately 45 to 80 feet below ground surface, to account for differences in the topography and soil profile at the site. Where the barrier wall borders the river, approximately 900 linear feet are keyed into a silt aquitard and the wall extends down to a depth of approximately 70 to 80 feet below ground surface, which eliminates the potential for contaminants to migrate to the river. Another approximately 900 linear foot portion of the wall, located between the river and Willamette Cove, could not be keyed into the existing inter-bedded sand and silt lenses, but was extended deeper than the river bed to prevent migration of residual contaminants.

Overwater acts: While historical docks allowed extensive overwater activities at the site, these activities ceased prior to cleanup investigation, all overwater structures were removed during remediation and the site is currently vacant. Therefore, the overwater acts pathway was excluded.

Willamette Cove (ECSI # 2066)

Willamette Cove is a 24 acre property located along the northeast bank of the Willamette River between river miles 6 and 7. The westernmost parcel was originally developed in 1901 as a plywood mill and operated as a wood products facility into the 1970s. The property has been vacant since 1979. The central parcel was developed from1903 to 1924 as shops and ancillary structures to support dry dock activities until 1953. Central parcel activities shifted to plywood and lumber mill operations until 1970 and log rafting, marine salvage, demolition contracting, woodworking facilities, and boat building until 1981. The easternmost parcel was occupied by a wood barrel manufacturing plant from 1917 until 1955 and a variety of wood-product-related businesses until 1980. The central and east parcels have been vacant since 1982. All three parcels were acquired by Metro Regional Government in 1996. Contaminants of concern in site soil include lead, mercury, dioxins/furans, PAHs, and PCBs. Excavation of contaminated upland soils occurred in 1999, 2004, 2008 and 2015.

Overland flow: Stormwater at the site is observed to readily percolate into sandy site soils and does not runoff to the river, so this pathway was excluded.

Bank Erosion: The Willamette Cove riverbank is subject to erosion in beach areas, oversteepened areas, and where revetment materials are failing. Riverbank soil samples have been collected above and below the mean high water line and indicate that metals, dioxin/furan, petroleum and PCBs are present in certain areas and will require remediation. Oversteepened bank areas will be laid-back during forthcoming uplands remediation work to minimize future erosion potential and additional bank remediation will be integrated into the in-water remedy, completing source control for this pathway.

Groundwater: Some modest exceedances of screening level values have been observed in groundwater samples, notably for metals and PAHs. The last sampling of site wells was completed in 2005. Redevelopment and sampling of existing riverbank wells and installation of two new wells near Wharf Road and at the Inner Cove, two areas of particular concern, will occur in early 2016. At least two rounds of sampling are anticipated to provide a more current and comprehensive data set for source control decision-making. While additional characterization is needed, DEQ anticipates overseeing installation of any needed source control measures and considers the potential for recontamination of sediment from groundwater from the site to be low.

Stormwater: No stormwater conveyances or outfalls drain the upland site to the river, so this pathway was excluded.

Overwater acts: While historical docks allowed extensive overwater activities at the site, which may have contributed to contamination on the site and of shore, all overwater activities ceased by the early 1980s and remnant overwater structures were removed in the 1990s and the site is currently vacant. Therefore, the overwater acts pathway was excluded.

Triangle Park (University of Portland River Campus) (ECSI # 277)

The University of Portland River Campus (formerly Triangle Park) is located on the east bank of the Willamette River at river mile 7.5. The site covers approximately 35-acres and shares its northwestern property line with the McCormick & Baxter site. The Union Pacific Railroad line and right-of-way bisect the site, running northwest to southeast. An underground fuel pipeline and valve owned by Kinder Morgan Cochin are located on the site, near the south corner. Industrial uses on the site date back to the early-1900s and included lumber operations, shipbuilding, drydock operations, electrical power generation, manufacturing, ironworks, storage, electrical equipment repair, concrete batching operations, asphalt storage and environmental response and cleanup activities such as regulated hazardous waste storage and transformer cleaning and storage. The site was owned by Triangle Park, LLC between 1997 and 2008, which completed a remedial investigation and feasibility study under DEQ oversight in 2004. Hazardous substances detected in upland soil and groundwater included TPH, PAHs, VOCs, metals, and PCBs (soil only). DEQ issued a record of decision in 2005 that required soil removal and capping.

In 2008 the University of Portland acquired the property pursuant to a 2006 DEQ Prospective Purchaser Agreement Consent Judgment and a 2006 Bona Fide Prospective Purchaser's Agreement and Order with EPA. Further site investigations and an Engineering Evaluation and Cost Analysis were required by EPA to support selection of final removal actions for the site. The University completed soil excavation, regrading, capping, and riverbank revegetation in 2012 and 2013 and recorded a DEQ and EPA-approved Easement and Equitable Servitudes in 2014 that prohibits residential and agricultural food production use and requires cap maintenance, proper excavated soil handling and shallow groundwater monitoring for at least six years to assure the continued effectiveness of the removal action. Based on completion of the removal action work, upland source control may be considered complete, pending effectiveness monitoring of groundwater and any adaptive management that may be warranted for the groundwater pathway and stormwater controls implemented with development of the site. DEQ recommends EPA consider the site as a low potential for sediment recontamination and medium potential for risk to Willamette River receptors, until monitoring and adaptive management demonstrate otherwise.

St. Johns Georegion Conclusions on Recontamination Potential – Although historical land use in the St Johns geographic region adjacent to the river was heavily industrial, land use transitioned to more residential and commercial uses. The great majority of the land area in this georegion is currently vacant or redeveloped and remediation of historically industrial parcels is complete, or will be completed with implementation of the in-water remedy. For the ten sites investigated, one or more of the potential contaminant transport pathways at six of the sites were excluded, soil removal occurred at six of the sites, extensive capping at McCormick and Baxter and Triangle Park and groundwater control at McCormick and Baxter. The potential for sediment recontamination is considered low at nine of the sites and will also be low at the tenth site, Willamette Cove, once remediation of beach and bank areas is incorporated into the in-water remedy. Stormwater from the Peninsula Ironworks site and the ODOT bridge and highway facilities makes up a very small percentage of land area within the georegion, and rerouting of stormwater from the Peninsula Ironworks site and completion of the ODOT stormwater source control measure implementation in 2016-17 will further reduce the potential for sediment recontamination from the upland areas in this georegion. As such, the sediment recontamination potential and risk to aquatic receptors for the St Johns geographic region is low and source control has sufficiently been achieved to support the in-water remediation work.

4.6.6 Doane Lake/Willbridge – RM 6.0 – 8.0 W

Area Overview – This industrial area is separated from the slopes of Forest Park by Highway 30 and is heavily industrialized down to the river's edge. Several bulk fuel terminals began operation in the early 1900s and continue to operate today, manufactured gas production occurred from 1912 through 1956, and industrial chemicals and pesticides manufacturing facilities operated here starting in the 1940s. Lead acid battery recycling and secondary lead smelting occurred from 1969 to 1981 and storage and handling of auto shredding residuals occurred in the 1970s. Heavy and light industrial operations continue in the Doane Lake/Willbridge georegion, including silicon wafer fabrication, roofing material manufacturing, specialty gas production, solid waste transfer, bulk fuel transfer and distribution, and rail yard operations.

Sediment Areas of Potential Concern – During the Lower Willamette Group's remedial investigation, EPA identified sediment areas of potential concern 9A, 9B, 14, 16 and part of area 18 off shore along the Doane Lake/Willbridge geographic region. AOPCs 9A and 9B were subsequently changed to 9D and 9U, as they appear on Figure 4.6.6. Contaminants found at elevated levels in these AOPC units were identified in a draft matrix in 2010, during the Lower Willamette Group's remedial investigation process, as listed in Table 4.6.5-1 below. As the in-water feasibility study progressed, EPA refined AOPCs into draft Sediment Decision Units (EPA 2014) based on site-wide contaminants of concern. DEQ referred to the AOPCs and associated contaminants of interest in directing upland source control work and as a conservative line of evidence for recontamination evaluation.

Table 4.6.6-1 Doane Lake/Willbridge Geographic Region Areas of Potential Concern and Elevated Contaminants of Interest

AOPC	Contaminants of Interest
9A (U)	aluminum, barium, beryllium, cadmium, cobalt, copper, iron, lead, manganese, mercury, nickel, tributyl tin, vanadium, zinc, PAHs, 2-methylnaphthalene, acenaphthene, anthracene, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, pyrene, carbazole, dibenzofuran, phenol, PCBs, delta-HCCH, DDx, endrin, 1,1-dichloroethene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, benzene, cis-1,2 dichloroethene, cyanide, ethylbenzene, isopropylbenzene, xylenes, toluene, trichloroethene, carbon disulfide, gasoline range hydrocarbons
9B (D)	aluminum, barium, cobalt, copper, iron, lead, manganese, mercury, nickel, vanadium, zinc, PAHs, 2-methylnaphthalene, acenaphthene, anthracene, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, pyrene, carbazole, dibenzofuran, phenol, PCBs, delta-HCCH, DDx, 1,1-dichloroethane, 1,2,4- trimethylbenzene , 1,3,5-trimethylbenzene, benzene, cis-1,2-dichloroethene, cyanide, ethylbenzene, isopropylbenzene, xylenes, toluene, trichloroethene, carbon disulfide, gasoline range hydrocarbons
14	aluminum, barium, beryllium, cadmium, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, silver, sodium, zinc, PAHs, naphthalene, 1,2-dichlorobenzene, 1,4-dichlorobenzene, phenol, PCBs, dioxins/furans, DDx, delta-HCCH, dieldrin, endrin, chlorobenzene, chloroform, carbon disulfide, perchlorate
16	aluminum, barium, beryllium, cadmium, copper, iron, manganese, mercury, zinc, PAHs, benz(a)anthracene, benzo(a)pyrene, phenol, PCBs, DDx, gasoline range hydrocarbons
18	aluminum, barium, cadmium, copper, iron, manganese, mercury, silver, zinc, PCBs, PAHs, delta-HCCH, dieldrin, endrin, chloroethane

(Source: 2/17/2010 draft AOPC Matrix LWG RI)

Direct Discharges – While not all the outfalls depicted on Figure 4.6.6 are active, each was initially identified as a potential historical discharge point. City of Portland MS-4 permitted stormwater outfalls 22, 22B & 22C drain portions of the Doane Lake/Willbridge georegion into the Willbridge Cove and on either side of the railroad bridge along the west side of the river. Outfall 22 discharges to AOPC 16 and outfalls 22B and 22C discharge to AOPC 14. Detailed information about the basins and sites the City outfalls drain is available by outfall number in the appendices of City's 2013 Municipal Stormwater Source Control Report for Portland Harbor. ODOT contributes MS-4 permitted runoff from Hwy 30 to City-owned outfall 22C, as well as to outfalls WR-584 (at Salzman Creek), WR-205, WR-206, and WR-207 southeast of the west end of St Johns Bridge. Because ODOT does not own these outfalls, they are not labeled on Figure 4.6.6, but are indicated as ODOT-contribution. OF 22A discharges to AOPC 16 and WR-205, WR-206, and WR-207 discharge to AOPC 9D. The Port of Portland formerly contributed MS-4 permitted runoff to outfall 22 at Willbridge cove, but sold the property generating this discharge in 2009. Up to 34 private outfalls also discharge stormwater along the west side bank between river miles 6 and 8, mostly from sites undergoing source control evaluations, though many of these have been confirmed not to discharge. Eighteen of these private outfalls are depicted on Figure 4.6.6 at the EPA-led US Moorings site, without certainty as to their discharge status. All but one outfall depicted at the Arkema site were abandoned or confirmed as inactive. Discharges through many of the remaining active private outfalls in this georegion are permitted under five NPDES Individual Wastewater permits (some include stormwater), ten assignments of the NPDES 1200Z Industrial Stormwater General permit and two sites that qualify for No Exposure Certifications under the permit, as listed in the table below. Approximately 50% of the Doane Lake/Willbridge georegion consists of Forest Park and residential land, which does not require permits. Permits and management practices are applied at nearly 100% of the industrial land, as shown with purple striping on Figure 4.6.6.

Table 4.6.6-2 Doane Lake/Willbridge Geographic Region NPDES Permits

Individual Permits		**1200Z Industrial Stormwater General Permit Registrants, No Exposure Certification or Best Management Practices**	
Registrant	**Permit #**	**Registrant**	**Permit #**
NW Natural	103061	Air Liquide American Specialty Gases	1200Z
Star Link Logistics, Inc (Rhone Poulenc)	101180	Metro Waste transfer Station	1200Z
Koppers	101642	GS Roofing Products Company (CertainTeed)	1200Z
Siltronic	101128	Siltronic	1200Z
Arkema	100752	Brenntag Pacific, Inc	1200Z
Arkema	103075	Arc Terminals	1200Z
		McCall Oil Company Marine Terminal	1200Z
		Chevron USA – Willbridge Distribution	1200Z
		Phillips 66 Company (Willbridge Terminal)	1200Z
		Kinder Morgan Liquid Terminals, LLC (Willbridge Terminal)	1200Z
		US Moorings – Army Corps of Engineers	1200Z
		Chevron Transportation	NEC
		Goby Walnut Products, Inc.	NEC

EPA Early Actions – EPA entered into Administrative Orders on Consent with Arkema in 2005 and NW Natural (Gasco)/Siltronic in 2009 to conduct non-time-critical in-water removals, anticipated to be implemented expeditiously following the in-water record of decision. The

Arkema and NW Natural (Gasco)/Siltronic early action areas are shown on Figure 4.6.6. Effective early implementation of upland source control measures are needed at the EPA early action sites to ensure that the in-water actions can be implemented on schedule. Details of the upland source control measures implemented and planned are presented below.

Upland Sites Investigated – As depicted on Figure 4.6.6 and summarized in Table 4.6.6-3, DEQ evaluated 18 upland sites for source control in the Doane Lake/Willbridge geographic region, while EPA led evaluation on two additional sites, US Moorings and Gould Electronics. Additional details are provided in the text that follows the table for sites with medium or high priority pathways and EPA-led sites.

Table 4.6.6-3 Doane Lake/Willbridge Geographic Region Sites

Site	ECSI#	Pathway(s)	Priority	Source Control Measures Status/ Dates	Decision Document	Recontamination Potential
US Moorings	1641	Overland flow	NA	Vegetated buffer selected	EPA-led	High until fill portion remedy implemented at Gasco
		Bank erosion		Monitoring selected - Uncontrolled		
		Groundwater		Monitoring selected w/ SCMs planned on Gasco site - Uncontrolled		
		Stormwater		NPDES 1200Z implementation – Portion uncontrolled		
		Overwater acts		Evaluation needed - Uncontrolled		
NW Natural - "Gasco" Site	84	Overland flow	Low	SCMs needed – integrate w/in-water – Uncontrolled	SCD anticipated 2020	High until in-water & fill portion upland remedies implemented
		Bank erosion	High	SCMs needed – integrate w/in-water – Uncontrolled		
		Groundwater	High	Alluvium portion containment 2015 - effectiveness pending - Fill portion - Uncontrolled		
		Stormwater	Low	Evaluation underway - Uncontrolled		
		Overwater acts	Low	Spill plan & BMPs		
Koppers Inc	2348	Stormwater	Low	Excluded (discharges to POTW) – after 2 catch basins abandoned	NA	Low
		Groundwater	High	Being addressed by Gasco		
Siltronic Corporation	183	Overland flow	Low	Addressed in stormwater evaluation	SCD anticipated 2020	High until fill portion upland remedy implemented at Gasco
		Bank erosion	Low	SCMs needed – integrate w/in-water - Uncontrolled		
		Groundwater	High	In-situ treatment 2009, Containment 2015 - effectiveness pending, Fill portion - Uncontrolled		
		Stormwater	Low	1200Z permit & BMPs - effectiveness pending		
		Overwater acts	Low	Excluded		

Table 4.6.6-3 Doane Lake/Willbridge Geographic Region Sites (continued)

Site	ECSI#	Pathway(s)	Priority	Source Control Measures Status/ Dates	Decision Document	Recontamination Potential
Rhone Poulenc	155	Bank erosion	High	SCMs needed – integrate w/in-water	SCD anticipated 2022	High until in-water remedy implemented
		Groundwater	Med	OF 22B pipe re-lining 2012 - Uncontrolled		
		Stormwater	Med	SCMs needed - Uncontrolled		
Arkema	398	Overland flow	High	Addressed in stormwater measure	SCD anticipated 2020	High until in-water remedy implemented
		Bank erosion	High	SCMs needed – integrate w/in-water – Uncontrolled		
		Groundwater	High	Containment 2014 - Portion uncontrolled		
		Stormwater	High	Soil removal & cap 2000, additional cap & treatment 2012, polishing pilot 2015 –effectiveness pending		
		Overwater acts	Low	Excluded		
Metro Central Transfer Station	1398	Groundwater	Low	Excluded	SCD 2014 EPA issued letter in support of SCD	Low
		Stormwater	Med	SCMs & BMPs 2000 – 2015		
Schnitzer Invest. Doane Lake	395	Groundwater	Low	Excluded	SCD 2016 EPA issued letter in support of SCD	Low
		Stormwater	Med	Cap to control stormwater runoff 2014 & effectiveness demonstrated 2015		
Air Liquide	395	Stormwater	Low	SCMs & BMPs 2012 & 2013	SCD 2014 EPA issued letter in support of SCD	Low
CertainTeed Roofing (GS Roofing, Former Bird)	117	Overland flow	Low	Excluded	SCD anticipated 2017	Medium
		Bank erosion	Med	Confirm during in-water remedy design if SCM needed - Uncontrolled		
		Groundwater	Med	Data collection underway to determine SCM need - Uncontrolled		
		Stormwater	Med	1200Z permit, storm pipe cleanout 2013, BMPs - effectiveness pending		
		Overwater acts	Low	Excluded		
Gould Electronics, Inc aka GA-TEK	49	Groundwater	Low	Excluded	EPA-led (completed)	Low
		Stormwater	Low	Excluded		

Table 4.6.6-3 Doane Lake/Willbridge Geographic Region Sites (continued)

Site	ECSI#	Pathway(s)	Priority	Source Control Measures Status/ Dates	Decision Document	Recontamination Potential
Kinder Morgan (Willbridge (Terminals)	1549 (160)	Overland flow	Low	Addressed in stormwater and bank erosion evaluations	SCD anticipated 2016	Low
		Bank erosion	Low	Excluded		
		Groundwater	Med	Saltzman Cr. Flume repairs 2007-2009+2014 - effectiveness pending		
		Stormwater	Low	1200Z BMPs - effectiveness pending		
		Overwater acts	Low	Spill plan & BMPs		
Chevron (Willbridge (Terminals)	1549 (25)	Overland flow	Low	Addressed in stormwater and bank erosion evaluations	SCD anticipated 2017	Low
		Bank erosion	Low	Excluded		
		Groundwater	High	Removal/containment 2006-2008		
		Stormwater	Low	OF22 repairs 2009 - effectiveness pending		
		Overwater acts	Low	Spill plan & BMPs		
Conoco Phillips (Willbridge (Terminals)	1549 (177)	Overland flow	Low	Addressed in stormwater and bank erosion evaluations	SCD anticipated 2017	Low
		Bank erosion	Low	Excluded		
		Groundwater	High	Removal/containment 2001		
		Stormwater	Low	On-site repairs 2006, OF22 repairs 2009 - effectiveness pending		
		Overwater acts	Low	Spill plan & BMPs		
McCall Oil	134	Overland flow	Low	Addressed in stormwater evaluation	SCD 2014 EPA issued letter in support of SCD	Low
		Bank erosion	Low	Excluded		
		Groundwater	Med	Excavation 1992		
		Stormwater	Med	SCMs & BMPs 2012 & 2013		
		Overwater acts	Low	Spill plan		
Santa Fe Pacific Pipelines (Kinder Morgan)	2104	Groundwater	Low	Soil vapor extraction 2004-14 - effectiveness pending	SCD anticipated 2017	Low
		Stormwater	Low	Anticipated to be excluded		
Jinkz Corp (V&K Service)	2423	Stormwater	Low	Excluded	NA	Low
ECSO \ Willbridge Landfill	397	Stormwater	Low	Excluded - Landfill closed and capped in 1983	NA	Low

18 sites – 8 sites closed – 3 sites (15 pathways) excluded – 9 SCDs anticipated – 2 EPA sites – 16 sites w/SCMs – 16 pathways uncontrolled

US Moorings (ECSI # 1641)

EPA led the remedial investigation and feasibility study for this site, which is owned and operated by the US Army Corps of Engineers since 1903 to support river dredging, hydro survey and support vessels (USACE 2012). Review of the remedial investigation and feasibility study documents indicate that evaluation of erodible soils and banks, groundwater, stormwater and in-water sediment was undertaken at the site and that the remedy selected included a vegetated buffer along part of the bank, groundwater and erodible soils monitoring, and continued implementation of the 1200Z Industrial Stormwater General permit. Documentation of remedy implementation was not available to DEQ at the time of this report and no EPA project manager is assigned.

The available information on the site investigation indicates that the stormwater pathway was not adequately characterized throughout the site and the potential for groundwater infiltration to the preferential pathways of underground utility lines traversing the site was not evaluated. In addition, uncertainty remains as the activity of the 18 outfalls depicted at the site on Figure 4.6.6. Soil sampling indicates that PAHs are the driving contaminant in site soils, but arsenic, cadmium, chromium, lead, nickel, PCBs, tributyl tin, and DDT also significantly exceed both Portland Harbor screening level values and the range of levels considered “typical” for other industrial sites within Portland Harbor (DEQ, 2010). These contaminants are also of concern in area of potential concern 9A(D), just offshore of the site. While only a portion of the site stormwater is monitored under the 1200Z permit, recent permit monitoring data indicates screening level value exceedances of copper, zinc, cadmium, chromium and nickel. Due to lack of adequate characterization of all potential discharges from the site and data that indicates existing sources with on-going discharge of contaminants of concern for the adjacent sediment management area, DEQ recommends EPA consider the site to have a high potential for recontamination, until these pathways are adequately evaluated and addressed.

NW Natural “Gasco” (ECSI # 84)

The NW Natural facility, also known as the Gasco site, is located on approximately 40 acres of land on the west side of the Willamette River at approximately river mile 6.5. The site is currently used by NW Natural for the processing and storage of liquefied natural gas. Portions of the site are leased for the storage of bulk petroleum and the bulk transfer of creosote oil and coal tar pitch. NW Natural (then known as Portland Gas & Coke) operated an oil manufactured gas plant and by-products refinery on the site between 1913 and 1956. These former operations produced wastes that included lampblack, spent oxide, and gas purifier that was managed in piles and ponds located in non-production areas of the site. Additionally, from 1913 to 1941, wastewater and tar waste from the onsite processes were discharged to low lying areas of the site with drainage features leading to the river. These historical wastes are now collectively referred to as manufactured gas plant residuals. Site investigations conducted in the uplands and offshore areas of the site determined that hazardous substances associated with manufactured gas plant residuals impacted upland soils and groundwater that discharges to the river. These releases also resulted in contamination of the riverbank soil and the potential for stormwater to contact and carry contaminated soil to the river. Hazardous substances associated with the manufactured gas plant residuals include: PAHs, VOCs, SVOCs, metals and cyanide.

Riverbank Erosion: The potential for contaminated bank material to enter the river currently exists at the site. Per discussions with EPA, measures to address riverbank contamination and erosion concerns will be integrated into the remedial design for the sediment remedy, completing upland source control for this pathway. As evidenced by the similarity of contaminants in the bank with those in the adjacent river sediment, until the bank remedy is

implemented, this pathway should be considered to have high potential for sediment recontamination.

Groundwater: To prevent the continued migration of contaminated groundwater to the river, DEQ required control and treatment of groundwater in the alluvium and fill water bearing zones. With input from EPA and the partners, DEQ approved planning and design of groundwater source control measures for the alluvium water-bearing zone in 2011. Construction of the groundwater extraction wells for the Alluvium water bearing zone were completed along the shoreline of the Gasco Site and the northern portion of the adjoining Siltronic property in 2013. The water treatment system was also constructed in 2013, which discharges treated groundwater to the Willamette River under an NPDES permit. The first phase of testing of the alluvium extraction and treatment system began in November 2013 and is now complete. The second phase of testing began in mid-2015, involves full-time full-scale operation and is anticipated to be completed in mid-2016. This portion of groundwater is considered controlled, pending effectiveness demonstration, with a low potential for sediment recontamination.
A plan is under development for construction of a groundwater cutoff and collection trench to address contamination in the fill water bearing zone and construction is anticipated to be underway in early 2017. Until measures are in place and demonstrated to be effective, this portion of groundwater at the site is considered uncontrolled. Due to the nature of the contaminants, discharge flow path and proximity to the river, sediment recontamination potential is considered high.

Stormwater and Overland flow: The majority of site stormwater infiltrates. Stormwater within the Koppers lease area is collected and discharged to the Columbia Boulevard Wastewater Treatment Plant under a City of Portland industrial discharge permit. Stormwater collected within the Pacific Terminals lease area is managed under a 1200Z NPDES permit which discharges to the Willamette River. DEQ is currently reviewing the stormwater and overland flow source control evaluation prepared by NW Natural for the Gasco site and additional controls and effectiveness monitoring may be needed. While technically considered uncontrolled until any needed measures are in place and effective, the stormwater pathway at the site was determined to be a low priority and it is anticipated that whether or not additional controls are warranted, the potential for recontamination due to stormwater is low.

Overwater acts: Marine fuel is pumped from barges to above-ground storage tanks on the Pacific Terminal Services leasehold via dockside pipelines. Coal tar is heated and pumped from ship to a dockside pipeline which is transferred to the Koppers leasehold. Standard best management practices and spill contingencies such as boom deployment are followed during product transfer. Because spills are anticipated to be infrequent and incidental and management practices are in place to prevent and respond to spills, DEQ considers this pathway controlled and the potential for recontamination is low.

Siltronic (ECSI # 183)

The Siltronic facility is located on approximately 80 acres of land on the west side of the Willamette River at approximately river mile 6.7. Siltronic purchased the site in 1978 and currently uses it for the fabrication of silicon wafers. Portland Gas & Coke owned the northern part of the property from 1939 until 1960, on which they stockpiled manufactured gas plant residuals and discharged wastewater and tar wastes to effluent ponds between approximately 1941 and 1956. Prior to 1978, extensive fill from upland sources and river sediment was placed on the site. In addition to these historical sources of contamination to groundwater, releases of chlorinated volatile organic compounds from a former underground solvent storage tank system used by

Siltronic also contributed to contamination of groundwater occurring in the fill and underlying alluvium in the northern portion of the property. This contaminated groundwater discharges to the river.

Riverbank Erosion: The Siltronic riverbank is heavily armored with basalt, such that the potential for contaminated bank material to enter the river is low. Per discussions with EPA, if measures to address riverbank contamination and erosion are necessary, they will be integrated into the remedial design for the sediment remedy, completing upland source control for this pathway. Bank contaminants are similar to those in adjacent river sediment, but erosion potential is currently low and sediment recontamination potential pending an integrated sediment remedy is also low.

Groundwater: DEQ, with input from EPA and the partners, approved an enhanced in-situ bioremediation program in 2008, which Siltronic implemented in the vicinity of a release area from solvent under-ground storage tank system. This interim measure consists of two steps: injection of a slurry of controlled release carbon and zero-valent iron, known as EHC™, into the subsurface; followed by injection of a commercial culture of dehalobacteria, called KB-1™. Initial source area treatment occurred in July 2009 and was expanded with a second treatment in June 2011. Performance monitoring of the effectiveness of the source area treatment is ongoing. The groundwater control and treatment system for the alluvium water bearing zone for the Gasco site extends onto the northern portion of the Siltronic site and intends to control and contain the groundwater impacted by manufactured gas plant residuals and solvent releases. Groundwater impacts south of the groundwater collection systems are low and the need for additional groundwater source control measures will be evaluated during review of the Siltronic remedial investigation, which is expected to be completed in 2016. DEQ considers groundwater in the alluvium in the northern portion of the site controlled, pending effectiveness demonstration, and the potential for sediment recontamination to be low. However, contamination in the fill water bearing zone at Gasco also extends onto the Siltronic property. A plan is under development for a groundwater cutoff and collection trench, expected to be constructed in early 2017. Until measures are in place and demonstrated to be effective, this portion of groundwater at the site is considered uncontrolled. Due to the nature of the contaminants, discharge flow path and proximity to the river, sediment recontamination potential is considered high.

Stormwater: Site stormwater either infiltrates or is managed under the facility stormwater system which discharges to the river under an NPDES 1200Z industrial stormwater general permit. DEQ is currently reviewing the stormwater and overland flow source control evaluation report prepared by Siltronic. The stormwater pathway at the site was determined to be a low priority and it is anticipated that whether or not additional controls are warranted, the potential for recontamination due to stormwater is low.

Overwater acts: The facility does not conduct overwater activities so this pathway is, therefore, excluded.

Arkema (ECSI # 398)

The Arkema site, located on the west side of the Willamette River at river mile 7.2, is approximately 55 acres. Chemical manufacturing operations began at the site in 1941 by Pennsylvania Salt Manufacturing and ceased in 2001. The facility produced various chemicals including sodium chlorate, potassium chlorate, chlorine, sodium hydroxide, DDT, sodium orthosilicate, magnesium chloride hexahydrate, ammonia, hydrogen, sodium and ammonium

perchlorate (rocket fuel) and hydrochloric acid. The manufacturing plant was subsequently demolished with the exception of the administrative building. The remedial investigation determined that site releases impacted upland and riverbank soil, groundwater and stormwater. Contaminants released at the site that have impacted various media include: DDT and isomers, chlorobenzene, chloroform, perchlorate, hexavalent chromium, PCBs and dioxins/furans. DEQ determined that contaminant levels in groundwater, stormwater discharging to the Willamette River and potentially erodible riverbank soils required source control measures.

Riverbank Erosion: DEQ is evaluating riverbank remediation and source control measures as an element of the upland feasibility study. Once measures to address riverbank contamination erosion concerns are agreed on, they will be integrated into the remedial design for the sediment remedy, completing upland source control for this pathway. Due to the potential for erosion and the similarity of bank contaminants to those in adjacent river sediment, until the bank remedy is implemented, sediment recontamination potential should be considered high.

Groundwater: DEQ, with input from EPA and the partners, approved the selected partial remedy in 2009. Construction of a 1,700 lineal foot soil-bentonite slurry groundwater cutoff wall was completed in October 2012, the configuration of which is shown on Figure 4.6.6. The wall is up to 88 feet deep and in contact with basalt bedrock. Construction of a system to collect and treat groundwater landward of the cutoff wall was completed in 2013. Startup testing of the groundwater collection and treatment system began in 2014. Unanticipated variations in groundwater chemistry have required modifications to the treatment plant. With the modifications complete and tested, evaluation of the effectiveness of the hydraulic capture system is scheduled to start in April 2016. Groundwater migrating to the Willamette River outside of the groundwater barrier wall containment system remains as a medium priority for source control. Remedial alternatives to address these groundwater plumes will be evaluated in either the Arkema or Rhone Poulenc upland feasibility studies, which are expected to be completed in 2016 and 2017. Because a plan and schedule for the remainder of groundwater source control is not available at the time of this report, a portion of the groundwater pathway is considered uncontrolled and the potential for sediment recontamination from groundwater is medium.

Stormwater and Overland flow: Soils containing high levels of DDT were removed and capped in 2000, as shown on Figure 4.6.6. Following approval in 2009 by DEQ, with input from EPA and the partners, Arkema completed additional site-wide interim stormwater source control measures in 2012. The interim stormwater source control measures collect and treat stormwater until the system is replaced by final site remedial measures and included: decommissioned catch basins and associated piping to three of four stormwater outfalls; temporary capping of the majority of the site; construction of a perimeter site berm to prevent stormwater migration off site; infiltration of stormwater on Lots 1 and 2; and re-routing of stormwater from Lots 3 and 4 to a stormwater detention basin that drains to a sand filter prior to discharge to the Willamette via a preexisting outfall. Performance monitoring is currently on going under an individual NPDES permit and data indicates the interim control measures are effective. DEQ considers stormwater from the site controlled and the potential for sediment recontamination is low.

Overwater acts: While historical docks allowed extensive overwater activities at the site, these activities ceased prior to cleanup investigation and the site is currently vacant. Therefore, the overwater acts pathway was excluded.

Schnitzer Investment Doane Lake (ECSI # 395)

The Schnitzer Investment Doane Lake site is an undeveloped 3.5 acre site located approximately 1,500 feet inland from the west side of the Willamette River at river mile 7.2. During the early 1970s and possibly late 1960s, the northeast portion of the site was filled with auto shredder residue, which is composed largely of plastic, rubber, glass, foam and non-ferrous metals and contaminated with PCBs. Because of the potential for contaminated stormwater runoff into the City of Portland's outfall basin 22B stormwater system in NW Front Avenue, the site is a medium priority and DEQ selected a source control measure for the site in 2013. This measure includes a one-foot soil cap over the area where shredder residue is present, along with institutional controls. Cap construction was completed in 2014. Effectiveness monitoring demonstrated stormwater from the site is controlled and the potential for sediment recontamination by stormwater is low.

Rhone Poulenc (ECSI # 155)

The Rhone Poulenc site is an 18-acre property approximately 2,000 feet inland from the west side of the Willamette River at river mile 7. The site operated as a pesticide and herbicide manufacturing and formulation facility from 1945 to 1990. Process wastewater and stormwater was discharged to Doane Lake until 1966, and to the nearby Willamette River starting in 1966. Various process and stormwater treatment systems have been implemented over this timeframe. Spills, leaks, and other releases also occurred at the site. Contaminants released at the site that impacted various media include chlorinated pesticides and herbicides, chlorinated benzenes, volatile and semi-volatile organic compounds, metals, PCBs and dioxin/furans. Upland and in-river site investigations concluded that operational releases of hazardous substances have impacted site soils, stormwater and groundwater. Contaminated groundwater plumes from the site extend to and actively discharge to the Willamette River. Both the stormwater and groundwater pathways are medium priority for source control.

Riverbank Erosion: Waste from Rhone-Poulenc and other Doane Lake area sites discharged to the former Doane Lake that flowed through an historical drainage ditch and onto the riverbank at an area close to the City of Portland Outfall 22B and immediately adjacent to the northern edge of Arkema riverbank (see Figure 4.6.6). Contaminated groundwater infiltrated into the City of Portland outfall 22B stormwater system and discharged onto the riverbank in the same area. Soil samples from the drainage ditch showed exceedances of the JSCS screening level values. Dry weather flow, resulting from groundwater intrusion, has historically been present in City outfall 22B conveyance pipes with contaminants in exceedance of JSCS screening level values. Soil samples from the riverbank below the ditch and City outfall 22B discharge point also exceed JSCS screening level values. Given the similarity of bank contaminants to the adjacent in river sediment contaminants and the presence of bioaccumulative contaminants, therefore, riverbank soil below the historical drainage ditch and outfall 22B outlet represents a high potential for recontamination and should be considered by EPA in the design of the in-water remedy for the adjacent sediment management area.

Groundwater: Contaminants in groundwater associated with the site exceed several screening level values at riverbank monitoring wells and transition zone water sample locations. While ranked as a medium priority, DEQ is not requiring an interim control because the contaminants of concern have low organic carbon-water partitioning coefficients, which lowers the likelihood of sediment recontamination. DEQ is requiring the plume to be addressed in the upland feasibility study. Beginning in 2006, Rhone-Poulenc worked to seal and line the City of Portland's outfall basin 22B stormwater lines to prevent infiltration and facilitated transport of contaminated groundwater to the Willamette River. Effectiveness monitoring is scheduled to be completed in

2017. A comprehensive plan to control groundwater discharge to the Willamette River will be evaluated in the site feasibility study, which is expected to be complete in 2016. Because a plan and schedule for groundwater source control is not available at the time of this report, the groundwater pathway is considered uncontrolled and the potential for sediment recontamination from groundwater is medium.

Stormwater: Stormwater primarily either infiltrates on-site or is collected and routed to the facility wastewater treatment plant, which discharges treated groundwater and stormwater to the Willamette River under an individual NPDES permit. However, some stormwater migrates off-site along the property boundary with Metro and NW 61st. Until additional controls are implemented, the stormwater pathway is considered uncontrolled and the potential for sediment recontamination from stormwater is medium.

Gould Electronics, Inc. aka GA-TEK (ECSI #49)

As a site on the National Priorities List, EPA initiated investigation and cleanup of this former smelting, refining and lead-acid battery recycling site under a Unilateral Order issued in 1992. Air, soils, groundwater, and surface water were evaluated and remediation completed in 2000 included soil excavation to an 8.5 acre onsite containment facility, filling of East Doane Lake, wetlands mitigation, groundwater monitoring and institutional controls. The site is currently undeveloped, with no direct transport pathways to the river and leachate monitoring through 2010 indicates no significant issues. Overland flow was recently documented at the site, the source of which may be groundwater from the adjacent site. Additional investigation by Rhone Poulenc is underway to address it. Overall, DEQ considers the potential for recontamination of the river from this site to be low.

Metro Central Transfer Station (ECSI # 1398)

The Metro site is approximately 10.4 acres and is approximately 2,000 feet inland from the west side of the Willamette River at river mile 7.4. A succession of steel companies operated on the site from 1924 until 1989 when it was redeveloped as a solid waste transfer station. Metro has completed a source control evaluation and DEQ issued a source control decision June 30, 2014.

Stormwater: Site stormwater discharges to the City of Portland's outfall basin 22B system under a 1200Z permit. Stormwater monitoring data indicate that implementation of best management practices has resulted in significant reductions in all contaminants. However, consistent permit benchmark exceedances of metals require engineered treatment of stormwater leaving the site by 2015, which will further enhance stormwater source control. Stormwater from the site is considered controlled, pending effectiveness monitoring, and sediment recontamination potential as a result of stormwater from the site is considered low.

Groundwater: Groundwater beneath the site is being evaluated as part of the Rhone Poulenc remedial investigation and feasibility study. No significant groundwater releases attributable to the Metro facility have been identified.

CertainTeed Roofing Products/GS Roofing (ECSI # 117)

The CertainTeed Roofing Products facility (formerly GenStar or GS Roofing or Bird) covers approximately 3 acres located on the west side of the Willamette River at river mile 7.3. Facility operations have included the manufacture of residential and commercial building asphalt shingles for the past 80 years. Site development included the riverward expansion of the

upland area with the placement of industrial fill such as off-spec roofing material. Contaminants associated with the production of roofing and site fill include total petroleum hydrocarbons, polycyclic aromatic hydrocarbons, nickel, copper, zinc and lead.

Riverbank Erosion: Characterization of the riverbank detected contaminants above JSCS screening levels values. Per discussions with EPA, measures to address riverbank contamination erosion concerns will be integrated into the remedial design for the sediment remedy, completing upland source control for this pathway. The facility collected additional riverbank soils date, which is anticipated to be reported in early 2016. Because of the steepness of the riverbank, it's uncertain composition and resistance to erosion, as well as limited base of slope sediment data, DEQ considers the potential for sediment recontamination to be medium.

Groundwater: Groundwater characterization indicates low level exceedances of JSCS screening levels in groundwater in the industrial fill area. Additional characterization of the fill area, pore water, and river sediment was performed in late 2015 and early 2016, but data are not yet available. In addition, a badly weathered stormwater pipe is suspected of conveying groundwater from the fill area to Saltzman Creek. This pipe is scheduled for evaluation in 2016. Because these data and evaluation are not yet available, a final determination of needed groundwater source control or a plan and schedule for control cannot be completed. Therefore, the groundwater pathway at this site is considered uncontrolled and the potential for sediment recontamination is considered low.

Stormwater and Overland flow: Stormwater is discharged under a 1200Z permit to Saltzman Creek, where it joins the Willamette River. Characterization of catch basin solids and stormwater was completed per the JSCS. In 2013, the facility removed historical solids from the storm lines to the extent practical and implemented best management practices, such as sweeping and covering outside operation areas. Monitoring to determine the effectiveness of these measures is ongoing and additional measures may be needed. Given that efforts are underway to monitor and adaptively control stormwater, DEQ considers the pathway controlled, pending effectiveness demonstration, and the potential for sediment recontamination is low.

Overwater acts: The facility does not conduct overwater activities or have overwater structures where these could occur. Therefore, the overwater acts pathway was excluded.

Willbridge Bulk Fuel Terminals (ECSI # 1549)

The Willbridge Bulk Fuel Terminals project is comprised of three separate terminals, Kinder Morgan, Chevron USA and Phillips 66 (Conoco Phillips) and is located on the west side of the Willamette River at river mile 7.5 to 7.7. The terminals have been used for petroleum storage and distribution operations from 1914, 1911 and 1908, respectively. In 1994, DEQ issued a joint order to the three terminals to conduct a remedial investigation and feasibility study. The remedial investigation was approved in 2007 and subsequent work has focused on source control implementation at the terminals.

The **Kinder Morgan Willbridge Terminal (ECSI # 160)** facility consists of approximately 37 acres.

Riverbank Erosion and Overland flow: Characterization of potentially erodible portions of the riverbank did not identify source control concerns, so this pathway was excluded. However, components of the pesticide DDT were detected in a small isolated beach area under the dock, which requires removal. Kinder Morgan is preparing a plan to complete the

removal in 2017 with DEQ oversight. Although DDT is also found in the adjacent river sediments, due to the small area targeted for removal, sediment recontamination potential is considered medium until removal is completed.

Groundwater: DEQ has been tracking the groundwater pathway as a medium priority because of the low level screening level value exceedances of PAHs and metals in monitoring wells near the river. To prevent groundwater from continuing to enter the concrete flume that transports Saltzman Creek along the edge of the site, Kinder Morgan repaired portions flume in 2007, 2008, 2009 and 2014. Kinder Morgan applied for permits to re-line the flume in 2016 to improve reliability of controls for this preferential migration of impacted groundwater to the Willamette River. There are no current groundwater source control measures operating other than routine monitoring and maintenance of interim spill response actions. DEQ considers this pathway controlled, pending effectiveness demonstration of additional flume repairs and the potential for sediment recontamination by groundwater from the site is considered low.

Stormwater and Overland flow: Stormwater at the site discharges to the Willamette River under a 1200Z general stormwater permit, with best management practices including oil/water separators, catch basins, and strip drains applied to reduce solids and operational pollutants in discharge. Additional source control measures were implemented, including removal of solids from stormlines in 2013, 2014 and 2015. Effectiveness monitoring is underway and a revised source control evaluation report is anticipated in 2016. DEQ considers the pathway controlled, pending effectiveness demonstration, and the potential for sediment recontamination is low.

Overwater acts: As part of the source control process, Kinder Morgan implements overwater source control measures for product transfers on the dock areas to prevent discharge of materials to the river. Practices and controls employed are described in the site's Dock Operations Manual, Facility Response Plan and Spill Prevention Control and Countermeasures Plan. DEQ's Emergency Response Section review and approves the Spill Prevention Control and Countermeasures Plan and works with the facility to ensure regulatory compliance. Given the on-going adaptive management of overwater activities through these plans, DEQ considers this pathway controlled.

The **Chevron USA Terminal (ECSI # 25)** is approximately 16 acres.

Riverbank Erosion and Overland flow: Characterization of potentially erodible portions of the riverbank did not identify source control concerns and the bank erosion pathway was excluded. During the 2007 LNPAL removal and installation of a containment barrier wall described below, Chevron removed an area of petroleum hydrocarbon-impacted sediment riverward of a sheetpile wall (see Figure 4.6.6).

Groundwater: Two sheet pile walls and associated groundwater extraction wells to control the migration of LNAPL are in place and being operated since 2001 and 2007. One is located on the Chevron Terminal and the other is located on the Phillips Terminal, as shown on Figure 4.6.6. Chevron and Phillips jointly conducted an investigation and re-lined the 60-inch City of Portland outfall basin 22 stormwater pipe to prevent contaminated groundwater from entering the line and being transported to the river. In 2015, the City of Portland conducted an in-line investigation of the outfall 22 basin in response to several sheen events. Chevron and Phillips 66 are following up on the City's work within their respective stormwater systems, which may require additional lining of pipe sections. The

groundwater source control evaluation is currently in review and a groundwater source control decision for the medium priority dissolved plume outside of the LNAPL area is expected in 2016. Some additional delineation and characterization is being completed on the site, but DEQ generally considers the pathway controlled, pending effectiveness demonstration, and the potential for sediment recontamination is low.

Stormwater and Overland flow: Source control measures in 2009 and 2010 include: removal of surface soil in the tank farm during tank removal and replacement and upgrades to catch basins and an oil/water separator. Locations of the soil removal areas are shown on Figure 4.6.6. Additional stormwater system improvements were implemented in 2015 and, pending effectiveness monitoring, a source control decision is anticipated in 2016. Given that efforts are underway to monitor and adaptively control stormwater, DEQ considers the pathway controlled, pending effectiveness demonstration, and the potential for sediment recontamination is low.

Overwater acts: As part of the source control process, Chevron implements overwater source control measures for product transfers on the dock areas to prevent discharge of materials to the river. Practices and controls employed are described in the site's Dock Operations Manual, Facility Response Plan and Spill Prevention Control and Countermeasures Plan. DEQ's Emergency Response Section review and approves the Spill Prevention Control and Countermeasures Plan and works with the facility to ensure regulatory compliance. Given the on-going adaptive management of overwater activities through these plans, DEQ considers this pathway controlled.

The **Phillips 66 Terminal (Conoco Phillips) (ECSI # 177)** is approximately 30 acres in size.

Riverbank Erosion and Overland flow: Characterization of potentially erodible portions of the riverbank did not identify source control concerns and the bank pathway was excluded.

Groundwater: A sheet pile wall and associated groundwater extraction wells to control the migration of LNAPL is in place on the Phillips facility (Figure 4.6.6). Phillips jointly conducted an investigation with Chevron and re-lined the 60-inch City of Portland outfall basin 22 stormwater pipe, and Chevron also re-lined sections of pipe on the Phillips site, to prevent groundwater from entering the lines and being transported to the river. In 2015, the City of Portland conducted an in-line investigation of the outfall 22 basin in response to several sheen events. Chevron and Phillips 66 are following up on the City's work within their respective stormwater systems, which may require additional lining of pipe sections. The groundwater source control evaluation is currently in review and a source control decision for the medium priority dissolved plume outside of the LNAPL areas is expected in 2016. DEQ generally considers the pathway controlled, pending effectiveness demonstration, and the potential for sediment recontamination is low.

Stormwater and Overland flow: The draft stormwater source control evaluation is in DEQ review and some additional site characterization is forthcoming. Stormwater source control measures included the repair of a number of broken stormwater lines and a manhole junction box. Monitoring to determine the effectiveness of these measures is ongoing and additional measures may be needed. DEQ considers the pathway controlled, pending effectiveness demonstration, and the potential for sediment recontamination is low.

Overwater acts: As part of the source control process, Phillips implements overwater source control measures for product transfers on the dock areas to prevent discharge of materials

to the river. Practices and controls employed are described in the site's Dock Operations Manual, Facility Response Plan and Spill Prevention Control and Countermeasures Plan. DEQ's Emergency Response Section review and approves the Spill Prevention Control and Countermeasures Plan and works with the facility to ensure regulatory compliance. Given the on-going adaptive management of overwater activities through these plans, DEQ considers this pathway controlled.

McCall Oil (ECSI # 134)

The McCall Oil site is located on approximately 36 acres on the west side of the Willamette River at river mile 8.1. Before 1966, much of the land now occupied by McCall was submerged beneath the Willamette River. The Port of Portland created new land here during the mid-1960s by dredging the Willamette River and filling along the shore. The older portion of the site, not created by the 1960s dredging, was vacant until the mid-1940s. Site operations currently include a marine oil terminal and asphalt and chemical distribution. Past operations may have included mineralized wood preservation and did include asphalt roofing shingle manufacture and oil distribution. Remedial investigation of the site identified local soil and groundwater impacts but concluded that migration pathways to the river are either incomplete or insignificant. DEQ issued a SCD in 2014 with the same conclusions.

Riverbank: Riverbank soil was determined not to be significantly impacted and is not considered a potential source to the river and, therefore, was excluded.

Groundwater: Excavation and offsite disposal of contaminated soils in 1992 has removed potential groundwater contaminant sources. The groundwater pathway was evaluated and found not to have contaminants migrating to the river at levels requiring remedial action. No additional source control measures are warranted and the potential for sediment recontamination from groundwater at the site is low.

Stormwater and Overland flow: Site stormwater discharges to the river under a 1200Z general stormwater permit. The facility implemented a number of stormwater best management practices in 2012 and 2013. No additional measures are recommended and the potential for sediment recontamination from stormwater from the site is low.

Overwater acts: Spills from overwater activities at this facility are anticipated to be incidental, minor and infrequent, so the pathway was not specifically called out as part of the source control process. However, McCall Oil employs overwater source control measures for product transfers on the dock areas to prevent discharge of materials to the river. Practices and controls employed are described in the site's Oil Spill Contingency Plan and DEQ's Emergency Response Section reviews and approves the plan and works with the facility to ensure regulatory compliance. Given the on-going adaptive management of overwater activities through the plan, DEQ considers this pathway controlled.

Doane Lake/Willbridge Georegion Recontamination Potential Conclusions – The Doane Lake/Willbridge georegion has a long history of industrial use and many on-going industrial operations. The significant levels and types of contaminants found at elevated concentrations in the river sediment within this georegion are consistent with the documented direct discharges of hazardous substances at high volumes, high concentration and long durations from upland sources to the river. Since direct discharges of contaminants have ceased, the driving source control concerns in the georegion are related to groundwater and bank erosion and, to a lesser extent, stormwater. Of the 16 sites investigated, all potential pathways at three sites were

excluded. Due to pathway exclusions, removals and other source control actions, 13 of the 18 total sites have a low potential for sediment recontamination.

The contaminated fill in the water-bearing zones that extends across portions of the Gasco and Siltronic sites likely has a low to medium potential to recontaminate remediated in-water sediment, but presents a high risk to Willamette River receptors until it is controlled. DEQ anticipates implementation in 2017 of the planned cutoff and collection trench to effectively reduce sediment recontamination potential and unacceptable risk to river receptors, associated with the contaminated fill on those sites.

The portion of the Arkema groundwater plume outside of the newly constructed hydraulic containment system and the Rhone Poulenc groundwater plume and stormwater pathway have a medium potential for sediment recontamination. DEQ expects remedies to be implemented for all three by 2017-2020, prior to or in conjunction with the in-water remedy, further reducing their recontamination potential.

DEQ anticipates that effective bank remedies will be integrated into the in-water remedy at Arkema, Rhone Poulenc, Certainteed (GS Roofing), NW Natural (Gasco) and Siltronic. Until the in-water remedy is implemented integrating these banks, the potential for sediment recontamination is low at Siltronic, medium at GS Roofing and high at Arkema, Rhone Poulenc and Gasco.

Investigations of the stormwater pathway at US Moorings and groundwater pathway at Certainteed (GS Roofing) are incomplete at the time of this report. As evidenced by the type and nature of the contaminants at the sites and in the adjacent river sediment, the US Moorings and Certainteed sites present a medium and low potential respectively for sediment recontamination.

A relatively small percentage of land area is encompassed by the two medium recontamination potential sites needing further investigation. The US Moorings and Certainteed sites, within the Doane Lake/Willbridge georegion, are separated by more than a mile limiting potential for cumulative effects.

While many contaminants in offshore sediment align with contaminants found at adjacent upland sites, direct discharges of high concentrations and volumes no longer occur. All potential pathways for legacy contamination remaining in the uplands have been identified and controlled, have a plan for control prior to the in-water remedy, or are anticipated to be controlled in conjunction with the in-water remedy. Ongoing industrial wastewater and stormwater discharges are regulated under NPDES permits, which are anticipated to become iteratively more stringent with each five year renewal, and ODOT plans to implement source control measures to reduce contaminants in runoff from Highway 30 discharges within this georegion in 2016-17. While source control progress has been made at these complicated sites clustered in this georegion dominated by active petroleum terminals and heavy industrial facilities, EPA's memo assessing source control efforts acknowledges that slow cleanup advances may be hastened under Federal oversight and recommends that EPA management consider including the Doane Lake area within the Portland Harbor Superfund Site definition (EPA 2015b).

However, provided all pending upland source control measures and bank controls determined to be necessary during design of the in-water remedy are implemented and demonstrated to be effective, the overall potential for sediment recontamination and unacceptable risk to Willamette

River receptors from upland sites in the Doane Lake/Willbridge georegion will be low, and source control will have sufficiently been achieved to support the in-water remediation work.

4.6.7 T-4/International Slip – RM 3.4 – 5.1 E

Area Overview – In 1895, the Terminal 4 area featured a slough, ponds and swales and trees along the shoreline (PoP 2004). The Ogden family house appeared in 1897 and by 1906 railroad, pipeline and dock developments began (PoP 2004). In 1917, the slough and shallow offshore areas were filled and inland areas were excavated for development of the present day T-4 and its associated slips, including the partially excavated area now referred to as Wheeler Bay (PoP 2004). First dedicated as a municipal dock in 1919, the Port of Portland's T-4 berthing area coincided with the transition of sacked to bulk grain shipping from the Northwest Region (PoP 2014). Cargoes historically transferred, stored and distributed at the site have included: fuel oils; grain and flour; bulk liquids; coal and soda ash (PoP 2004). Presently, T-4 is a 113-hectare multi-purpose facility with seven berths designed to handle a wide range of cargoes including automobiles, steel, forest products, and liquid and dry bulk (WPS 2014).

The International Slip area includes the present day 200 acres Schnitzer Burgard Industrial Park and a few other industrially occupied parcels. Prior to 1936, the area featured low lying sand deposits and marshy areas (SIC 2000). An oil storage terminal was constructed at the south end of the present day slip in 1938 and dredged sand was placed to develop a ship building facility on the riverfront portions of the present day Schnitzer Steel operation just prior to World War II (SIC 2000). Dredging and extending of the slip for deep draft vessels also began at this time (SIC 2000). Shipbuilding ceased at the end of 1945 and dredged material filled the former shipways in the 1960s and 1970s (SIC 2000). Schnitzer purchased the property in 1972, built additional dock structures and began the shredding, scrapping and recycling activities that continue today (SIC 2000). Industrial activities on the parcels have included: oil storage and distribution; shipbuilding; metal works and storage; log storage; ship breaking; metals recycling (SIC 2000); pipe manufacture and coating; and auto trailer fabrication and painting (PoP 2004).

Sediment Areas of Potential Concern – During the Lower Willamette Group's remedial investigation, EPA identified sediment areas of potential concern 2, 3 and 6 off shore along the T-4/International Slip geographic region, as depicted on Figure 4.6.7. Contaminants found at elevated levels in these AOPC units were identified in a draft matrix in 2010, during the Lower Willamette Group's remedial investigation process, as listed in Table 4.6.7-1 below. As the in-water feasibility study progressed, EPA refined AOPCs into draft Sediment Decision Units (EPA 2014) based on site-wide contaminants of concern. DEQ referred to the AOPCs and associated contaminants of interest in directing upland source control work and as a conservative line of evidence for recontamination evaluation.

Table 4.6.7-1 T-4/International Slip Geographic Region Sediment Areas of Potential Concern and Elevated Contaminants of Interest

AOPC	Contaminants of Interest
2	copper, mercury
3	arsenic, cadmium, copper, mercury, silver, tributyl tin, zinc, PAHs, phenol, PCBs, DDx, delta-HCCH
6	cadmium, copper, silver, zinc, PAHs, carbazole, phenol, PCBs, dioxin/furans, delta-HCCH

(Source: 2/17/2010 draft AOPC Matrix LWG RI)

Direct Discharge - While not all the outfalls depicted on Figure 4.6.7 are active, each was initially identified as a potential historical discharge point. City of Portland MS-4 permitted stormwater outfalls 52C, 52D and 53 drain portions of the T-4/International Slip georegion into the northernmost corner of the head of the International Slip on the Willamette River. Detailed information about the basins and sites the City outfalls drain is available by outfall number in the appendices of City's 2013 Municipal Stormwater Source Control Report for Portland Harbor. Twelve of the 19 Port of Portland MS-4 stormwater outfalls in this georegion discharge runoff to AOPC 6 at the T-4 slips and Wheeler Bay. Up to 34 private outfalls also discharge stormwater along the west side bank between river miles 6 and 8, mostly from sites undergoing source control evaluations. While not all are still active, discharges through many of these private outfalls are permitted under five NPDES Individual Wastewater permits (some include stormwater), seven assignments of the NPDES 1200Z Industrial Stormwater General permit and nine sites that qualify for No Exposure Certifications under the permit, as listed in the table below. Nearly 100% of the land area in the T-4/International Slip georegion is industrial and apply permits and management practices. These extensive areas are shown with purple striping on Figure 4.6.7.

Table 4.6.7-2 T-4/International Slip Geographic Region NPDES Stormwater General Permit Registrants, No Exposure Certification or Best Management Practices

Registrant	Permit #
Kinder Morgan Bulk Terminal 4	1200Z
Northwest Pipe Company	1200Z
Portland Container Repair Inc	1200Z
RB Recycling, Inc	1200Z
WestRock CP LLC	1200Z
Schnitzer Steel International	1200Z
Cereal Food Processors Inc	NEC
Dewils Industries	NEC
IRC Aluminum & Stainless Inc	NEC
Momentive Specialty Chemicals Inc	NEC
Northwest Pipe Company (Parcel 6a)	NEC
Pro Truck Lines	NEC
TOC Holdings Company	NEC
Western Machine Works Inc	NEC

EPA Early Actions – EPA entered into an Administrative Order on Consent with the Port of Portland at Terminal 4 in 2003. EPA approved the work plan and selected a removal action in 2006 that includes monitored natural recovery, dredging, capping and building of a confined disposal facility in one of the slips. A limited portion of the dredging phase and a bank remedy in Wheeler Bay were completed in 2008, and the additional work will be integrated with the larger in-water remedy for the Portland Harbor. Effective early implementation of upland source control measures are needed at the EPA early action sites to ensure that the in-water actions can be implemented on schedule. Details of the upland source control measures implemented and planned are presented below.

Upland Sites Investigated - As depicted on Figure 4.6.7 and summarized in Table 4.6.7-3, DEQ evaluated 20 upland sites for source control in the T-4/International Slip geographic region. Additional details are provided in the text that follows the table for sites with medium or high priority pathways.

Table 4.6.7-3 T-4/International Slip Geographic Region Sites

Site	ECSI#	Pathway(s)	Priority	Source Control Measures Status/ Dates	Decision Document	Recontamination Potential
Time Oil	170	Overland flow	Low	Excluded	SCD anticipated 2018	Low
		Bank erosion	Low	Excluded		
		Groundwater	Med	Soil removals 2011, pump & treat 2002-16 – effectiveness pending – SCMs needed for transport in stormlines - Uncontrolled		
		Stormwater	Low	System mostly abandoned 2009, soil removals 2011 – effectiveness pending		
		Overwater acts	Low	Excluded		
Premier Edible Oils	2013	Overland flow	Low	Addressed in stormwater evaluation	SCD anticipated 2018	Medium until bank remedy completed
		Bank erosion	Low	Uncontrolled - removal & stabilization 2016		
		Groundwater	High	Barrier wall 2015, oxygenation system 2016 – effectiveness pending		
		Stormwater	Low	System decommissioned 2009 – effectiveness pending		
		Overwater acts	Low	Excluded		
Jefferson Smurfit	2371	Overland flow	Low	Excluded	SCD 2001 EPA issued a letter in support of the SCD	Low
		Bank erosion	Low	Excluded		
		Groundwater	Low	Excluded		
		Stormwater	Low	Excluded		
		Overwater acts	Low	Excluded		
Northwest Pipe	138	Groundwater	Low	Investigation in process – anticipate to be excluded	SCD anticipated 2017	Low
		Stormwater	Med	Treatment 2012		
Lampros Steel	2441	Stormwater	Med	SCMs needed - Uncontrolled	SCD anticipated 2019	High until stormwater evaluation & control
Schnitzer Burgard Industrial Park	5324	Being addressed by Schnitzer and individual parcel owners Romar, Boydston, Portland Container, Wilbur Ellis, RB Recycle, Trailer Fleet, IRC, Western Machine, Dunkin Bush, Portland Blast – some specific site details below				
•RoMar	2437	Overland Flow	Med	Excluded	NFA 2006 SCD anticipated 2019	High until stormwater evaluation & control
		Bank erosion	Low	Excluded		
		Groundwater	Low	Excluded		
		Stormwater	Med	Anticipated to be excluded (permit on developed portion, infiltration on vacant parcel)		
•Boydstun Metal Works Inc	2362	Stormwater	Med	Investigation in process - Uncontrolled	SCD anticipated 2019	High until stormwater evaluation & control

Table 4.6.7-3 T-4/International Slip Geographic Region Sites (continued)

Site	ECSI#	Pathway(s)	Priority	Source Control Measures Status/ Dates	Decision Document	Recontamination Potential
•Portland Container Repair Corp	2375	Stormwater	Med	SCMs 2015 & 2016 – effectiveness pending	SCD anticipated 2019	High until stormwater evaluation & control
Schnitzer Steel	2355	Overland flow	High	Asphalt berm 2009	SCD anticipated 2019	High until remedy & SCMs implemented
		Bank erosion	High	Interim SCM 2015, SCMs needed – integrate w/in-water - Uncontrolled		
		Groundwater	Med	Anticipated to be excluded		
		Stormwater	High	Pave & treatment 2012, 2015 & 2016 – effectiveness pending – Additional SCMs needed – Portion uncontrolled		
		Overwater acts	Med	BMPs 2014		
		Air deposition	Med	BMPs 2014		
Terminal 4 Slip 1 - Port of Portland	2356	Overland flow	Low	Addressed in stormwater evaluation	SCD anticipated 2018	Low
		Bank erosion	Low	Regrade/cap 2008		
		Groundwater	Low	Excluded		
		Stormwater	Med	Cleanout/BMPs 2010 & 2013 – effectiveness pending		
		Overwater acts	Low	Excluded		
Terminal 4 Slip 3 - Port of Portland	272	Overland flow	Med	Soil removal/cap 2009, SCMs needed - Uncontrolled	SCD anticipated 2020	Medium until SCMs implemented
		Bank erosion	Med	Bank soil removal 2004, SCMs needed – integrate w/in-water - Uncontrolled		
		Groundwater	Med	Soil/NAPL removal 2004-2015		
		Stormwater	Med	Cleanout/BMPs 2010 - effectiveness pending		
		Overwater acts	Low	Excluded		
UPRR St Johns Tank Farm	2017	Groundwater	Low	Excluded	NFA 2004	Low
		Stormwater	Low	Excluded		
Port of Portland – Auto Storage	172	Overland flow	Low	Excluded	NFA 2004	Low
		Bank erosion	Low	Excluded		
		Groundwater	Low	Excluded		
		Stormwater	Low	Excluded		
		Overwater acts	Low	Excluded		
Klix Corp	1075	Groundwater	Low	Tank removal 1989 - Excluded	NFA 1995	Low
		Stormwater	Low	Soil removal 1991 - Excluded		
Flint Ink Corp	1753	Groundwater	Low	Excluded	NFA 2006	Low
		Stormwater	Low	Excluded		

Table 4.6.7-3 T-4/International Slip Geographic Region Sites (continued)

Site	ECSI#	Pathway(s)	Priority	Source Control Measures Status/ Dates	Decision Document	Recontamination Potential
Borden Chemical, Inc.	1277	Groundwater	Low	Needs investigation – anticipated to be excluded	Not currently in program	Low
		Stormwater	Low	Excluded		
St. Johns - Keeler #2 Right-of-Way (BPA transformer)	1067	NA	NA	Isolated PCB spill - 9,600 sq ft -cleanup - excluded	NA	Low
Harsh Investments	878	Stormwater	Low	Excluded	NA	Low
Union Carbide (NW Container)	176	Stormwater	Low	Excluded	NFA 1995	Low
Crown Cork and Seal Facility	5864	Groundwater	Low	Investigation in process – Anticipated to be excluded	SCD anticipated 2016	Low
		Stormwater	Low	Investigation in process – Anticipated to be excluded		
PGE Rivergate North & South Substations	6069	Groundwater	Low	Investigation in process – Anticipated to be excluded	SCD anticipated 2017	Med
		Stormwater	Med	Investigation in process - Uncontrolled		

21 sites - 8 sites closed - 8 sites (30 pathways) excluded - 12 SCDs anticipated - 1 site not in VCP - 8 sites w/SCMs - 9 pathways uncontrolled

Time Oil (ECSI # 170)

The Time Oil site is located at approximately river mile 3.5 along the east side of the Willamette River. The 52-acre site was developed during WWII to support ship building activities and store and distribute fuels in a main waterfront bulk plant. A second upland petroleum bulk plant, the Bell Terminal, was developed in 1953. Both plants received, stored and distributed petroleum products via ship, rail, and truck until operations ceased in 2001. Other industrial operations at the site included: formulation of pentachlorophenol-based wood preservatives using from 1967 to 1984; storage and transfer of waste oil; bulk storage of aviation gasoline and butane. All industrial features at the site were removed in 2009.

Overland Flow: Because a levee is present along the former industrialized portions of the waterfront that prevents passage of any overland flows, this pathway was excluded.

Bank Erosion: Because the riverbank along the site is stabilized by a revetment and partial vegetation, the potential for erosion is negligible and the bank erosion pathway was excluded.

Groundwater: Contaminants of concern in site groundwater are pentachlorophenol, arsenic and diesel-range hydrocarbons. There is a pentachlorophenol plume identified at the site and a pump and treat system is operating to prevent its migration to the river. Additional evaluation to treat the pentachlorophenol source area using in-situ chemical oxidants is ongoing with the goal being to eliminate the need for the groundwater control system.

There are also three petroleum plumes identified at the site. The northern plume is in area demonstrated to be stable with natural attenuation and beach well data indicates no discharge of contaminants to the river. The southern upland plume originates at the former Bell Terminal and migrates a short distance to join with other groundwater contaminants under the north portion of the adjacent Premier Edible Oils property. This southern upland plume does not

discharge to the river. The middle plume may be discharging arsenic and diesel-range hydrocarbons above screening level values to the river near the private river outfall. DEQ requested evaluation of the geochemical conditions that could result in increased solubility of native metals, including arsenic, in this middle plume to determine whether control measures are needed. Time Oil removed petroleum impacted soil in 2011, which was considered to be a source of the groundwater contamination. Monitored natural attenuation is proposed as a source control measure for this plume.

Facilitated transport within stormwater conveyances features, is suspected of bringing elevated levels of arsenic in groundwater to the river.

Until effectiveness of measures and a lack of facilitate transport are confirmed, DEQ considers the groundwater pathway from the site to be uncontrolled, but the potential for sediment recontamination is considered low.

Stormwater: In 2009, the petroleum terminals and other industrial features of the site were demolished, including most of the stormwater conveyance infrastructure. Contaminated soil areas were also extensively excavated. Currently all stormwater infiltrates on site, with the exception of a 300 feet by 300 feet hard-scaped area near the site entrance, which discharges to the river through a private outfall. Demonstration that the modified stormwater system has achieved adequate control is underway and DEQ considers the stormwater pathway from the site to be controlled, pending this demonstration. The potential for sediment recontamination from stormwater is considered to be low.

Overwater acts: While historically a dock allowed overwater activities at the site, which may have contributed to contamination at and off shore of the site, these activities ceased prior to cleanup investigation and the site is currently vacant. Therefore, the overwater acts pathway was excluded.

Premier Edible Oils (ECSI # 2013)

The Premier Edible Oils site is an 18.5-acre site on the east side of the Willamette River, at approximately river mile 3.5, located at the mouth of a man-made inlet known as the International Slip. Historical operations at the site include: bulk fuel storage tanks from 1943 to 1947; ship-building and related materials storage and handling from 1943 to 1947; manufacture of electrolytic manganese dioxide for dry cell batteries and other industrial chemicals based on manganese from 1950 to 1956; and an edible oil processing and production plant from 1972 to 1997. Source control contaminants of concern include: PAHs, VOCs, petroleum hydrocarbons, and metals.

Riverbank Erosion: Localized areas of contaminated soil are present in the shoreline and bank, which require source control measures. Sampling was completed in December 2014 to confirm the nature, extent and location of contaminants in the erodible shoreline and near-shore area for focused removal and stabilization actions in 2016. Until completion of the final bank remedy, the pathway is considered uncontrolled and sediment recontamination potential from bank erosion is considered medium.

Groundwater: The primary area of concern for groundwater has been in the southwest corner of the site, where historic releases of petroleum fuels to groundwater occurred. Areas of non-aqueous phase liquids in the subsurface present an ongoing source of dissolved petroleum constituents and have also mobilized metals in groundwater by creating reducing conditions in

the subsurface. DEQ approved the site's proposed design of a hydraulic barrier wall, which was installed in 2015 at an approximate length of 550 feet and width of 35 feet. An oxygenation system is planned for installation behind the wall in 2016. Forthcoming performance monitoring is anticipated to demonstrate effective control and DEQ considers the potential for sediment recontamination due to these constituents in groundwater to be low.

Stormwater and Overland flow: The site has been mostly inactive over the past 16 years and currently consists of about 60% open ground with some weathered asphalt paved areas located along remaining structures in the central and southern portions of the property. Between 2008 and 2009, the site owners decommissioned most of the old stormwater system that serves these central and southern areas. Three stormwater catch basins are currently active, which direct surface runoff from the central and south east areas through an outfall in the International Slip at a location east of the property. Demonstration that the modified stormwater system has achieved adequate control is underway. Until control is demonstrated, the stormwater pathway is considered uncontrolled, but recontamination potential is considered to be low.

Overwater acts: While historically a dock allowed overwater activities at the site, which may have contributed to contamination at and off shore of the site, these activities ceased prior to cleanup investigation and the dock is currently dilapidated and unused. Therefore, the overwater acts pathway was excluded.

Schnitzer Steel (ECSI # 2355) and Schnitzer Burgard Industrial Park (ECSI # 5324)

The Schnitzer Steel metals recycling site is located on the east side of the Willamette at river mile 4 and along a man-made inlet referred to as International Terminals Slip. The site occupies approximately 200 acres in area generally referred to as the Schnitzer Burgard Industrial Park. Approximately 93-acres are owned and utilized by Schnitzer Steel for recycling operations that include: scrap metal delivery by heavy rail, truck and barge; loading and unloading of scrap metals at river and slip docks; metals shearing, cutting, processing and sorting areas; scrap metals and product storage area piles on paved and unpaved areas; and warehouse and office space. Contaminants identified in site soils and stormwater include: TPH, metals, PAHs, dioxins, and PCBs.

Schnitzer formerly owned the remaining parcels the make up the Schnitzer Burgard Industrial Park and these parcels are included in the scope of the order under which Schnitzer is performing source control work. DEQ is coordinating participation by the current parcel owners in the Schnitzer Burgard Industrial Park stormwater pathway investigation, led by Schnitzer. DEQ anticipates that all source controls determined to be necessary by the investigation will be implemented and demonstrated to be effective prior to implementation of the in-water remedy.

Overland flow: The banks along the innermost east end of the industrial slip and the south dock area along the slip have the potential for overland flow to contribute to erosion of soil containing contaminants. An asphalt berm was installed along the south dock in 2009 to capture overland flow and route it to the stormwater treatment system. The minor amount of precipitation that falls onto the dock and continues to discharge to the industrial slip waters is considered insignificant. EPA's in-water remedy and an upland soil removal and stabilization action are anticipated to reduce the possibility of erosion by overland flow at the head of the slip. While not significant as a transport mechanism for contamination to the river, the overland flow pathway has largely been addressed and control will be complete upon implementation of the bank and in-water remedial actions.

Riverbank Erosion: The riverbank along the Willamette River is heavily armored by rip rap to prevent erosion and DEQ, therefore, excluded the pathway.

As indicated on Figure 5.4.7, the banks along the innermost end of the industrial slip and the south dock area along the slip have the potential for erosion of soil containing contaminants. Both of these bank areas will be integrated with EPA's in-water remedy and DEQ anticipates removal or containment of contaminated upland soils adjacent to the head of the slip. Until the completion of the final bank actions, the potential for sediment recontamination remains high.

Stormwater: Runoff and process water from Schnitzer Steel's scrap processing areas is contained, collected and reused. A new stormwater system was installed for a portion of the non-processing areas of the site in 2012 that included enhanced runoff capture, storage in a one million gallon tank, stormwater filtration, and consolidation of stormwater outfalls into a single discharge. Additional controls and on-going management practices implemented include paving, sweeping, dust monitoring and control, and employee education. Treatment technologies were evaluated in 2013-2014 and electrocoagulation coupled with filtration was implemented in January 2015 for enhanced treatment of runoff from all non-processing areas of the facility. Performance monitoring is underway. Stormwater controls are still needed in additional areas of the site. Until all needed measures are implemented and demonstrated to be effective, the stormwater pathway from Schnitzer Steel is considered uncontrolled.

Because investigation and implementation of any needed controls is not yet complete in the majority of the Schnitzer Burgard Industrial Park, the stormwater pathway from the parcels identified in Table 4.6.7-3 and Figure 4.6.7 as Romar, Boydstun and Portland Container and other parcels is uncontrolled.

As evidenced by the large cumulative volumes of discharge with relatively high concentrations of the same contaminants that are elevated in the adjacent river and slip sediment, the potential for sediment recontamination due to stormwater discharges from Schnitzer Steel and Schnitzer Burgard Industrial Park parcels remains high.

Groundwater: Evaluation of the VOC plume identified on Figures 4.3 and 4.6.7 indicates that concentrations do not significantly impact to the Willamette River. DEQ is currently evaluating additional groundwater monitoring results and anticipates excluding the groundwater pathway from the site and the potential for sediment recontamination due to groundwater is considered low.

Overwater acts: Schnitzer Steel developed and implements a management plan for loading and unloading of barges to prevent discharge of materials to the waters of the industrial slip. Cutting of barges for metal salvage that historically occurred in the innermost end of the industrial slip will be discontinued after completion of soil removal, stabilization and the in-water remedy there. Given the on-going adaptive management of overwater activities through the plan, DEQ considers this pathway controlled.

Air deposition: A dust control plan was implemented at the site that includes water cannon dust suppression and other measures during dust generating operations. An air sampling program to monitor the effectiveness of dust suppression activities began in the summer of 2014 and was completed in 2015. Given the noted reductions in dust at the site, DEQ considers the air deposition pathway from the site to be controlled, pending on-going implementation of dust control measures and effectiveness demonstration, and the potential for sediment recontamination from dust deposition on the river is low.

Lampros Steel (ECSI # 2441)

The Lampros site is located approximately 1,500 feet inland from the eastern bank of the Willamette River at river mile 4 and encompasses 20 acres of flat terrain within the area referred to as the Schnitzer Burgard Industrial Park. The site is used for structural steel product storage at outside paved areas and there is also warehouse and office space. The warehouse is used for structural steel fabrication, including cutting and welding of materials. Contaminants found in site stormwater and soils and stormwater solids include: PCBs, PAHs, phthalates and metals. Stormwater from the

Stormwater: Initial sampling of stormwater solids and stormwater indicated elevated concentrations of suspended solids and contaminants, warranting implementation of stormwater source controls. Site-wide, pavement is in poor condition, which likely contributes to high concentrations of suspended solids in stormwater. To improve stormwater quality, the site re-paved areas around some stormwater inlets, reconfigured a hillslope discharge point of run-on to control erosion, removed site debris, jet cleaned sections of stormwater lines and swept. Stormwater sampling following implementation of these measures indicated that solids and associated contaminants remain elevated and additional source control measures are warranted. Because implementation of effective controls is not yet complete, the stormwater pathway is considered uncontrolled. As evidenced by the relatively high concentrations of the same contaminants that are elevated in the adjacent river and slip sediment, the potential for sediment recontamination due to stormwater discharges from Lampros Site to the Industrial Slip remains high.

Northwest Pipe (ECSI # 138)

The Northwest Pipe site is located approximately 1,500 feet inland from the eastern bank of the Willamette River at river mile 4 and encompasses 29.15 acres of flat terrain within the area referred to as the Schnitzer Burgard Industrial Park. Approximately 25.27-acres are used by Northwest Pipe for manufacturing, 0.67-acre for offices, and a 3.21-acre parcel on the southern edge of the site is managed by Felton Properties, Inc. The facility produces pipe in diameters ranging from 17 to 144 inches that is used primarily for potable water transmission, in a variety of municipal, industrial, and utility applications. Contaminants identified in site soils and stormwater include: TPH, metals, PAHs, and PCBs.

Stormwater: In July 2011, soil sampling in unpaved areas of the site found PCBs and PAHs at level that exceeded source control and human health screening levels. In 2012, Northwest Pipe removed approximately 1,050 tons of soil and paved exposed soils in four acres, though the small size and large number of these areas does not allow them to be shown on Figure 4.6.7. Two above ground proprietary stormwater filtration systems were installed in 2012 to treat stormwater prior to discharge. On-going management practices include sweeping and debris control and monitoring and corrective actions, as required by the facility's NPDES 1200Z industrial stormwater general permit. Once determined to be effective, the stormwater pathway will be considered controlled and the potential for sediment recontamination by stormwater discharges from the site is considered low.

Groundwater: Preliminary review of the sampling and modeling data for the plume shown on Figures 4.3 and 4.6.7 indicates that VOC impacted groundwater at the site potentially connects to the river. While DEQ considers the potential for sediment recontamination due to groundwater from the site to be low, the VOC groundwater pathway may present a risk to river receptors and is currently under evaluation.

Port of Portland Terminal 4 Slip 1 (ECSI # 2356)

The 98-acre site is located on the east bank of the Willamette River at approximately river mile 4.3 and includes Slip 1 and Wheeler Bay. The Port acquired the property in 1971 as a result of the Port's merger with the City of Portland Commission of Public Docks. Tenant activities include liquid and bulk material transfer to and from boats. An upland Remedial Investigation was completed in 2007 and a Feasibility Study was completed in 2011 which addressed small areas of upland surface soil with no migration pathway to the river. EPA completed a 60% design for a potential confined disposal facility in Slip 1 for Portland Harbor sediment. Source control contaminants of concern include PAHs and arsenic.

Riverbank Erosion: DEQ determined that contaminant levels in portions of the Wheeler Bay riverbank required source control measures. A riverbank removal and capping source control measure was implemented in 2008 as part of the EPA Terminal 4 Early Action. Therefore, the potential for sediment recontamination from bank erosion is low.

Groundwater: Results of the remedial investigation showed no significant groundwater contamination, so the pathway was excluded and the sediment recontamination potential due to groundwater is low.

Stormwater: Based on results of stormwater and stormwater solids sampling, DEQ determined that source control measures were needed in select sub-basins. Pipeline cleaning and other management practices were implemented in 2010 and 2013. The Port began additional data collection in 2015 to guide selection of appropriate control measures and plans to implement additional measures and subsequent effectiveness monitoring in 2016. Given the adaptive management efforts underway, DEQ considers the stormwater pathway at the site controlled, pending effectiveness demonstration, and the sediment recontamination potential is low.

Overwater Activities: Overwater activities at the site consist of liquid and bulk material transfer. Spill prevention and response procedures are in place, in the event of an infrequent, incidental spill. Therefore, the pathway is considered insignificant and was excluded.

Port of Portland Terminal 4 Slip 3 (ECSI # 272)

The 23-acre site is located on the east bank of the Willamette River at approximately river mile 4.6. As early as 1906, Union Pacific Railroad operated a petroleum pipeline and dock used to transfer diesel and oil from marine vessels to storage tanks at the UPRR St. Johns Tank Farm. The City of Portland Commission of Public Docks purchased the property in 1917 and granted UPRR (and subsequently Chevron, starting in 1969) an easement for the continued use of the pipeline and dock. The Port acquired the property in 1971 and petroleum transfer and storage operations ceased in 1983. Diesel releases from the pipeline resulted in petroleum seeps in Slip 3. Currently, the primary tenant activity is bulk material transfer to boats, such as soda ash at the Kinder Morgan facility. Source control contaminants of concern include PAHs and arsenic.

Overland Flow: In 2009, two small, contiguous areas of PAH-contaminated surface soil were removed from the top of bank at Slip 3, disposed off site, and backfilled with clean fill. An additional area of PAH-contaminated surface soil remains in place east of the Slip 3 top of bank that also requires source control measures. The Port plans to remove or cap this area during future development at the site. Until additional measures are implemented, the overland flow pathway is considered uncontrolled. However, because the potential for overland flow is minimal, sediment recontamination potential is considered low.

Riverbank Erosion: In 2004, approximately 4,400 cubic yards of the riverbank material at the head of Slip 3 was removed and replaced with organoclay amended clean fill to address a petroleum contaminant seep from a historic upland subsurface pipeline release. Groundwater monitoring wells within the seep pathway through the amended fill and visual observation of the riverbank indicate that this migration pathway is no longer complete in the treatment area at the head of Slip 3. There are two additional areas of potentially erodible soil containing PAHs along the south bank of Slip 3 and the east bank of the Willamette River south of Slip 3. Due to considerations of cost and efficiency, the Port proposes to address these areas at the time of EPA's in-water remedy. Until source control measures have been implemented, the pathway is considered uncontrolled and the sediment recontamination potential remains medium.

Groundwater: Light non aqueous phase liquids resulting from the diesel pipeline release has been removed from upland wells since 1993. LNAPL recovery rates have diminished, but LNAPL recovery and groundwater monitoring will continue, including sentinel wells in the amended riverbank soil. Therefore, the groundwater remedy appears to be successful, and the sediment recontamination potential due to groundwater at the site is low.

Stormwater: Based on results of stormwater and stormwater solids sampling, DEQ determined that source control measures were needed in select sub-basins. Pipeline cleaning and other management practices were implemented in 2010. The Port began additional data collection in 2015 to guide selection of appropriate control measures and plans to implement indicated measures and subsequent effectiveness monitoring in 2016. Given the efforts underway at adaptive management, DEQ considers the stormwater pathway at the site controlled, pending effectiveness demonstration, and the sediment recontamination potential is low.

Overwater Activities: Overwater activities at the site consist primarily of transfer of soda ash. Spill prevention and response procedures are in place, in the event of an infrequent, incidental spill. Therefore, the pathway is considered insignificant and was excluded.

T-4/International Slip Georegion Recontamination Potential Conclusions – The T-4/International Slip geographic region has a long history of industrial activity, mostly associated with the transfer and distribution of goods and ship building and breaking. Stormwater is the main pathway of concern, though the bank erosion and groundwater pathways into the International Slip also need controls. Of the 20 sites investigated, all potential pathways at seven sites were excluded. Due to pathway exclusions and removal or control of sources, 11 of the 20 total sites have a low potential for sediment recontamination. Groundwater and stormwater investigations are underway at the Crown Cork and Seal facility, but DEQ anticipates the limited infrastructure and distance to the river will limit mobility of any contaminants found and considers this sites sediment recontamination potential to also be low.

There are two sites currently considered as a medium potential for sediment recontamination. Premier Edible Oils implemented a groundwater control measure in 2015 and is currently assessing the need for bank source control measures. Measures to address the overland flow pathway at T-4, Slip 3 will be addressed in conjunction with the in-water remedy and the bank sections at T-4, Slip 3 are anticipated to be integrated into the in-water remedy. Once these source control measures are completed, the potential for sediment recontamination from these two sites will also be considered low.

The stormwater pathways from five sites within the Schnitzer Burgard Industrial Park, RoMar, Lampros, Boydstun, Portland Container Repair and Schnitzer Steel, are considered to have a high potential for sediment recontamination. This conclusion is based on the similarity of the

contaminants found in industrial materials, soils, stormwater and stormwater solids at the sites to those in adjacent sediment in the Slip and the river; the large percentage of land area these sites encompass within the georegion; and the nature and intensity of on-going industrial activities at some of the sites. As current or former owner of these parcels, Schnitzer Steel is investigating the stormwater pathway form these sites, as well as the contributions through City of Portland MS4 outfall 52D. Enhanced stormwater capture and treatment has been implemented at the Schnitzer site, with additional measures planned in 2016. Intensified investigation and implementation of stormwater source control measures, as warranted by the results of the investigation throughout the Schnitzer Burgard Industrial Park, is targeted for 2016-17. EPA's assessment of source control efforts indicated that stormwater investigation was lagging at the Burgard Industrial Park and recommended EPA support DEQ in moving implementation of controls forward in a timely fashion (EPA 2015b). Once source control measures are in place and demonstrated to be effective at all the sites and outfall 52D, the recontamination potential for these five sites will also be considered low.
Therefore, provided all pending upland source control measures and in-water integration remedies are implemented and demonstrated to be effective, the overall potential for sediment recontamination and unacceptable risk to Willamette River receptors from upland sites in the T-4/International Slip georegion is low, and source control has sufficiently been achieved to support the in-water remediation work.

4.6.8 Linnton – RM 3.0 – 6.0 W

Area Overview – The first recorded use of the Linnton area was as a wagon landing in 1843 and by 1883 a railroad line served the area with community buildings and pickling/canning operations springing up by the 1890s (NWN 2011). The first lumber mill appeared in 1904 and ship building, oil storage and distribution, creosoting, and gas and coke manufacture followed by 1914 (NWN 2011). Incorporated as a town in 1910, Linnton was annexed into Portland in 1915 (NWN 2011). Lumber milling and bulk fuel storage and distribution boomed through the 1920s, slowed in the 1930s and then the mills declined in the 1940s and 1950s (NWN 2011). Bulk fuel tanks and operations continue to be prominent along the waterfront in present day Linnton along with some commercial and residential use mixed in on the shoreline and up the hill along Highway 30 and in the hills above the highway.

Sediment Areas of Potential Concern – During the Lower Willamette Group's remedial investigation, EPA identified sediment areas of potential concern 4, 5, 7, 8 and parts of areas 9A and 9B off shore along the Linnton geographic region, as depicted on Figure 4.6.8. Contaminants found at elevated levels in these AOPC units were identified in a draft matrix in 2010, during the Lower Willamette Group's remedial investigation process, as listed in Table 4.6.8-1 below. As the in-water feasibility study progressed, EPA refined AOPCs into draft Sediment Decision Units (EPA 2014) based on site-wide contaminants of concern. DEQ referred to the AOPCs and associated contaminants of interest in directing upland source control work and as a conservative line of evidence for recontamination evaluation.

Table 4.6.8-1 Linnton Geographic Region Sediment Areas of Potential Concern and Elevated Contaminants of Interest

AOPC	Contaminants of Interest
4	copper, mercury, PAHs
5	aluminum, barium, cadmium, copper, iron, manganese, mercury, zinc, benz(a)anthracene, benzo(a)pyrene, PAHs, delta-HCCH, DDx, gasoline range hydrocarbons
7	copper, PAHs
8	aluminum, barium, beryllium, cadmium, copper, iron, lead, manganese, mercury, zinc, PAHs, 2-methylnaphthalene, acenaphthene, anthracene, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, pyrene, PCBs, dioxins/furans, gasoline range hydrocarbons
9A (U)	aluminum, barium, beryllium, cadmium, cobalt, copper, iron, lead, manganese, mercury, nickel, tributyl tin, vanadium, zinc, PAHs, 2-methylnaphthalene, acenaphthene, anthracene, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, pyrene, carbazole, dibenzofuran, phenol, PCBs, delta-HCCH, DDx, endrin, 1,1-dichloroethene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, benzene, cis-1,2 dichloroethane, cyanide, ethylbenzene, isopropylbenzene, xylenes, toluene, trichloroethane, carbon disulfide, gasoline range hydrocarbons
9B (D)	aluminum, barium, cobalt, copper, iron, lead, manganese, mercury, nickel, vanadium, zinc, PAHs, 2-methylnaphthalene, acenaphthene, anthracene, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, pyrene, carbazole, dibenzofuran, phenol, PCBs, delta-HCCH, DDx, 1,1-dichloroethene, 1,2,4- trimethylbenzene , 1,3,5-trimethylbenzene, benzene, cis-1,2-dichloroethane, cyanide, ethylbenzene, isopropylbenzene, xylenes, toluene, trichloroethane, carbon disulfide, gasoline range hydrocarbons

(Source: 2/17/2010 draft AOPC Matrix LWG RI)

Direct Discharge - While not all the outfalls depicted on Figure 4.6.8 are active, each was initially identified as a potential historical discharge point. City of Portland MS-4 permitted stormwater outfall 22D and 23 and 24 are located within the Linnton geographic region, but only outfall 22D still contributes discharge from a portion of the basin. ODOT MS-4 permitted runoff from Highway 30 contributes to discharge from 10 of these private outfalls as well as through ODOT-owned, MS-4 permitted outfall WR-510. Up to 45 private outfalls also discharge stormwater along the west side bank between approximately river miles 3.4 and 6, mostly from sites that have completed or are undergoing stormwater source control evaluations. While not all are still active, discharges through many of these private outfalls are permitted under nine assignments of the NPDES Industrial Stormwater General permits, as listed in Table 4.6.8-2 below. There is also one individual NPDES permitted wastewater discharges currently active in the Linnton geographic region. Approximately 90% of the land area in the Linnton georegion is Forest Park and residential use, which does not require permits. Approximately 60% of the industrialized area along the river applies permits and management practices, as shown with purple striping on Figure 4.6.8.

Table 4.6.8-2 Linnton Geographic Region NPDES Stormwater General Permits

Individual Permits		Stormwater General Permit Registrants	
Registrant	**Permit #**	**Registrant**	**Permit #**
Columbia River Sand & Gravel, Inc	102452	BP West Coast Products LLC	1200Z
		ExxonMobil Oil Corporation - Portland Terminal	1200Z
		Kinder Morgan Liquid Terminals LLC Linnton	1200Z
		Olympic Pipe Line Company	1200Z
		Owens Corning - Linnton	1200Z
		Pacific Terminal Services	1200Z
		Shore Terminals LLC	1200Z
		Knife River - Linnton	1200A

Upland Sites Investigated – As depicted on Figure 4.6.8 and summarized in Table 4.6.8-3, DEQ evaluated 18 upland sites for source control in the Linnton geographic region. Additional details are provided in the text that follows the table for sites with medium or high priority pathways.

Table 4.6.8-3 Linnton Geographic Region Sites

Site	ECSI#	Pathway(s)	Priority	Source Control Measures Status/ Dates	Decision Document	Recontamination Potential
PGE Harborton	2353	Overland flow	Low	Excluded	SCD 2004 EPA issued letter in support of SCD	Low
		Bank erosion	Low	Excluded		
		Groundwater	Low	Excluded		
		Stormwater	Low	Excluded		
		Overwater acts	Low	Excluded		
Ga. Pac. Linnton	2370	Overland flow	Low	Excluded	SCD 2000 EPA reviewed draft without comment	Low
		Bank erosion	Low	Excluded		
		Groundwater	Low	Excluded		
		Stormwater	Low	Excluded		
		Overwater acts	Low	Excluded		
ACF Industries	794	Groundwater	Low	Excluded	SCD 2004 EPA reviewed draft without comment NFA 2007	Low
		Stormwater	Low	Soil removal & cap 2006-07 - Excluded		
Linnton Oil Fire Training Grounds	1189	Overland flow	Low	Excluded	SCD 2005 EPA issued letter in support of SCD NFA 2005, cNFA 2006	Low
		Bank erosion	Low	Excluded		
		Groundwater	Low	Excluded		
		Stormwater	Low	Excluded		
		Overwater acts	Low	Excluded		
Owens-Corning Fiberglass (Trumbull Asphalt)	1036	Overland flow	Low	Excluded	SCD anticipated 2016	Low
		Bank erosion	Low	Excluded		
		Groundwater	Low	Excluded		
		Stormwater	Low	BMPs and SCMs 2009-2014 – effectiveness pending		
		Overwater acts	Low	Excluded		

Table 4.6.8-3 Linnton Geographic Region Sites (continued)

Site	ECSI#	Pathway(s)	Priority	Source Control Measures Status/ Dates	Decision Document	Recontamination Potential
Kinder Morgan Linnton Terminal (GATX)	1096	Overland flow	Low	Addressed in stormwater evaluation	SCD anticipated 2016	Low
		Bank erosion	Low	Anticipated to be excluded		
		Groundwater	High	Barrier Wall 2011-12 – effectiveness pending		
		Stormwater	Low	BMPs 2010 – effectiveness pending		
		Overwater acts	Low	Spill plan & BMPs		
Linnton Plywood (includes Glacier NW #2351)	2373	Overland flow	Low	Removal 2003	SCD 2004 EPA issued letter in support of SCD NFA 2009	Low
		Bank erosion	Low	Excluded		
		Groundwater	Low	Excluded		
		Stormwater	Low	BMPs 2003		
		Overwater acts	Low	Excluded		
BP Terminal 22T (ARCO)	1528	Overland flow	Low	Addressed in stormwater evaluation	SCD anticipated 2017	Low
		Bank erosion & River sediment	Low	Removal 2008		
		Groundwater	High	Pump & treat/contain 2007, expanded hydraulic containment 2014-15 – effectiveness pending		
		Stormwater	Low	On-going BMPs		
		Overwater acts	Low	Spill plan & BMPs		
Olympic Pipeline (within Shore Terminals #5130)	3342	Stormwater	Low	BMPs 2007	SCD 2013 EPA issued letter in support of SCD	Low
ExxonMobil RDC (Lube Oil Plant)	137	Groundwater	Med	Addressed in Shore Terminals evaluation/action	SCD 2013 EPA issued letter in support of SCD	Low
		Stormwater	Low	Existing BMPs		
Shore Terminals (includes former NuStar #1989 & ExxonMobil #137)	5130 (1989 + 137)	Overland flow	Low	Addressed in stormwater evaluation	SCD anticipated 2016	Low
		Bank erosion	Low	Excluded		
		Groundwater	Med	Containment 1980s, Sparge/vapor extract 2005-2015 - effectiveness pending		
		Stormwater	Low	Existing BMPs – effectiveness pending		
		Overwater acts	Low	Spill plan & BMPs		

Table 4.6.8-3 Linnton Geographic Region Sites (continued)

Site	ECSI#	Pathway(s)	Priority	Source Control Measures Status/ Dates	Decision Document	Recontamination Potential
Brix Maritime (Foss)	2364	Overland flow	Low	Addressed in stormwater evaluation	SCD anticipated 2016	Low
		Bank erosion	Low	Excluded		
		Groundwater	Med	Anticipated to be excluded		
		Stormwater	Low	On-going BMPs – effectiveness pending		
		Overwater acts	Low	Spill plan & BMPs		
Marine Finance, AKA Advanced American	2352	Overland flow	Low	Soil removal/cap 2005, excluded	NFA 2007 SCD 2007 EPA reviewed without comment	Low
		Bank erosion	Low	Excluded		
		Groundwater	Low	Excluded		
		Stormwater	Low	Excluded		
		Overwater acts	Low	Excluded		
Transloader International Company, LLC	2367	Overland flow	Low	No response to 1999 site assessment request	Not currently in program	Low
		Bank erosion	Low			
		Stormwater	Low			
		Groundwater	Low			
		Overwater acts	Low			
Babcock Land Company	2361	Overland flow	Low	Excluded	NA	Low
		Bank erosion	Low	Excluded		
		Groundwater	Low	Excluded		
		Stormwater	Low	Excluded		
		Overwater acts	Low	Excluded		
RK Storage & Warehousing	2376	Stormwater	Low	Excluded	NA	Low
GPC Linnton	333	Overland flow	Low	Excluded	NA	Low
		Bank erosion	Low	Excluded		
		Groundwater	Low	Excluded		
		Stormwater	Low	Excluded		
		Overwater acts	Low	Excluded		
Alder Creek Lumber Co. (Sauvie Island)	2446	Overland flow	Low	Excluded	NA	Low
		Bank erosion	Low	Excluded		
		Groundwater	Low	Excluded		
		Stormwater	Low	Excluded		
		Overwater acts	Low	Excluded		
ESCO Landfill (Sauvie Island)	4409	Overland flow	Low	Excluded	NA	Low
		Bank erosion	Low	Excluded		
		Groundwater	Low	Excluded		
		Stormwater	Low	Excluded		
		Overwater acts	Low	Excluded		

19 sites – 13 sites closed – 10 sites (52 pathways) excluded – 5 SCDs anticipated – 1 site not in VCP – 10 sites w/SCMs – 0 pathways uncontrolled

Kinder Morgan Linnton Terminal (GATX) (ECSI # 1096)

The Kinder Morgan Linnton Terminal (formerly known as the GATX terminal) is located between river mile 4 and 5 on the west bank of the Willamette River and covers approximately 17 acres. Petroleum products storage and transfer has occurred at the site since the early 20th century, as well as drum painting and storage, distribution of vehicle tires and distribution of bulk and canned goods to areas service stations. The facility currently stores gasoline, diesel and biodiesel blends on site in 33 above ground storage tanks with the total estimated capacity of 20,000,000 gallons. Fuels are offloaded from barges and ships via a dock facility and tanks are connected the Olympic and SFPP-LP pipelines. The facility also has four warehouses, a maintenance shop, administrative offices, parking lots and out-of-service tanker truck and rail loading racks. The stormwater and groundwater pathways are the primary pathways of concern for the Willamette River and the contaminants of concern for those pathways are metals, TPH, PAHs and VOCs.

Bank Erosion: The bank line at the site consists of a wooden bulkhead wall about 10-12 feet above the rip rap lined beach. These structures prevent bank erosion, with the exception of the exposed beach at the water line. Controls for bank erosion are not needed, so this upland pathway is anticipated to be excluded.

Groundwater: A plume of LNAPL, petroleum hydrocarbons and associated dissolved constituents was identified in the southern and riverward portion of the site. Historically, petroleum sheens were intermittently observed in the river at this shoreline area and were managed with floating absorbent containment booms. In 2004, Kinder Morgan installed a series of groundwater/LNAPL recovery wells along the bulkhead support wall between the tank farm and the southern shoreline area. The recovery system operated and was upgraded over the years and in 2012, Kinder Morgan installed a barrier wall and a new set of recovery wells to contain and continue removing LNAPL. The wall is approximately 220 feet long by 30 to 33 feet deep and the system also provides some groundwater containment and treatment around the wall. Adaptive management and effectiveness monitoring are anticipated to demonstrate that the highest priority portion of the groundwater pathway is controlled and whether additional controls are necessary for the remaining portions of site groundwater. The potential for sediment recontamination due to the petroleum constituents in groundwater at the site is considered low.

Stormwater: Stormwater from the site discharges to the beach through three outfalls covered under the facility's NPDES 1200Z industrial stormwater general permit. Best management practices implemented at the site include: oil-water separators; sealing of metallic roof tops; catch basin repair and cleaning; and increased system inspection frequency. Stormwater sampling data indicate that metals moderately exceed screening level values and additional or enhanced best management practices are anticipated. DEQ considers stormwater at the site controlled, pending effectiveness demonstration, and the potential for sediment recontamination due to metals in stormwater is considered low.

Overwater Activities: Kinder Morgan's overwater activities at the site consist primarily of dock maintenance and petroleum transfer via tanker ships and on the dock lines connected to the tank farm. As part of the source control process, Kinder Morgan is preparing a plan describing overwater practices and controls that are implemented to prevent low-frequency incidental spills, as described in the site's Spill Prevention Control and Countermeasures Plan. DEQ's Emergency Response Section review and approves the Spill Prevention Control and Countermeasures Plan and works with the facility to ensure regulatory compliance. Given the

on-going adaptive management of overwater activities through these plans, DEQ considers this pathway controlled.

Arco/BP (ECSI # 1528)

The active 14-acre bulk petroleum terminal is located on the west bank of the Willamette River at approximately river mile 4.8. Originally developed in 1932, historical releases of petroleum product have resulted in an accumulation of liquid phase hydrocarbons floating on groundwater. In the 1940s, an 800-foot concrete seawall was installed along the entire frontage of the Willamette River. The wall became unstable and BP installed a steel sheetpile wall replacement in 2007 that addressed both geotechnical site stability and liquid phase hydrocarbon containment. In 2008, about 13,300 cubic yards of near-shore petroleum-contaminated sediment was removed, disposed in an off-site landfill, and replaced with clean fill. Source control contaminants of concern include: TPH-Dx, TPH-Gx, cPAHs, and arsenic.

Riverbank Erosion: Due to the sheetpile wall along the entire riverfront, there is no soil riverbank and no potential for riverbank erosion. Therefore, this pathway was excluded.

Groundwater: Groundwater pump and treat landward of the concrete seawall started in the 1970's. Significant expansion of the hydraulic containment system occurred in 2005. Based on groundwater performance monitoring and a numeric groundwater model, DEQ determined that the wall and hydraulic containment system provides adequate containment of liquid phase hydrocarbons and dissolved phase constituents, except for a relatively small amount of flow and dissolved phase constituents around the north end of the wall. By early June 2015, four additional groundwater extraction wells were installed near the northern property boundary to improve hydraulic containment and prevent flow around the north end of the sheet pile wall. Initial reporting on evaluation of hydraulic capture with the new wells is anticipated in early 2016 and preliminary information indicates control is successful. Also in June 2015, in-situ remediation of a portion of the plume that trespassed onto the southeast corner of the adjacent Linnton Plywood site (ECSI #2373) was completed. In situ treatment consisted of injecting a mixture of activated carbon and biological amendments mixed with water at 48 locations between depths of 19 and 30 feet below ground surface. Effectiveness monitoring was delayed until December 2015, due to insufficient water in the monitoring wells caused by dry summer and fall seasons. The potential for sediment recontamination due to the groundwater pathway from the site is considered low.

Stormwater and Overland flow: General petroleum terminal stormwater best management practices, including oil-water separators have been in place at the site since before the source control evaluation began. Monitoring data from 2010 indicate that stormwater from the site does not require further source control measures. Therefore, DEQ considers the stormwater pathway controlled, pending effectiveness demonstration and the sediment recontamination potential due to stormwater from the site is low.

Overwater acts: Spills from overwater activities at this facility are anticipated to be incidental, minor and infrequent, so the pathway was not specifically called out as part of the source control process. However, BP employs overwater source control measures for product transfers on the dock areas to prevent discharge of materials to the river. Practices and controls employed are described in the site's Oil Spill Contingency Plan and DEQ's Emergency Response Section reviews and approves the plan and works with the facility to ensure regulatory compliance. Given the on-going adaptive management of overwater activities through the plan, DEQ considers this pathway controlled.

Shore Terminals (ECSI #5130) and former ExxonMobil (ECSI # 151)

The active 29-acre bulk petroleum terminal is located on the west bank of the Willamette River at approximately river mile 5. Originally developed in 1928, historical releases of petroleum product resulted in separate and dissolved phase groundwater contamination. Shore Terminals acquired the southern 8 acre portion in 1999 from Time Oil Company and the northern 21 acre portion in 2001 from ExxonMobil. DEQ issued a cleanup record of decision for the ExxonMobil site (ECSI #137) in 1997 and subsequently entered a remedial design/remedial action order. The record of decision required free product recovery, air sparging and soil vapor recovery. Source control contaminants of concern include: TPH-Dx, TPH-Gx, BTEX, MTBE, cPAHs, ethanol, and arsenic.

Riverbank Erosion: The shoreline is composed of rip rap and there is low potential for riverbank erosion, so this pathway was excluded.

Groundwater: A subsurface bentonite barrier wall was installed along most of the site in the 1980s, terminating in the vicinity of the northern dock infrastructure about 360 feet from the northern property boundary. Routine groundwater monitoring activities have been performed at the site since the 1990s. At the northern terminus of the barrier wall, ExxonMobil operated an air sparging and soil vapor extraction system, starting in 2000, to address dissolved TPH and a dual-phase extraction system from February 2011 to March 2013. Shore Terminals converted the dual-phase extraction system to a groundwater extraction system in 2013. Recent groundwater monitoring indicates that contaminant concentrations generally meet compliance levels specified in DEQ's record of decision for the site, though arsenic and cPAHs in groundwater north of the barrier wall slightly exceed Portland Harbor screening level values. DEQ anticipates issuing a source control decision in 2016 and sediment recontamination potential from this groundwater pathway is considered low.

Stormwater and Overland flow: General petroleum terminal stormwater best management practices, including oil-water separators have been in place at the site since before the source control evaluation began. Monitoring data indicate infrequent low level exceedances of Portland Harbor screening level values, such that stormwater from the site does not require further source control measures. Therefore, DEQ considers the stormwater pathway controlled and the sediment recontamination potential due to stormwater from the site is low.

Overwater acts: Spills from overwater activities at this facility are anticipated to be incidental, minor and infrequent, so the pathway was not specifically called out as part of the source control process. However, Shore Terminals employs overwater source control measures for product transfers on the dock areas to prevent discharge of materials to the river. Practices and controls employed are described in the site's Oil Spill Contingency Plan and DEQ's Emergency Response Section reviews and approves the plan and works with the facility to ensure regulatory compliance. Given the on-going adaptive management of overwater activities through the plan, DEQ considers this pathway controlled.

Brix Maritime (ECSI # 2364)

The Brix Maritime site occupies approximately 4.7-acres on the west side of the Willamette at River Mile 5.5. Brix Maritime is the main headquarters for tug boat services that includes minor maintenance and fueling. The site has office buildings, warehouse storage, a floating maintenance facility and underground fuel tanks. Contaminants identified in site soils and stormwater include: TPH, metals, and PAHs.

Riverbank Erosion: The site riverbank along the Willamette River is armored by rip rap to prevent erosion. DEQ, therefore, considered the bank erosion pathway incomplete and excluded it from further consideration.

Groundwater: TPH and PAHs from underground storage tank releases have been identified in groundwater at the site. DEQ's preliminary evaluation of groundwater analytical results indicates no significant impact to the Willamette River. DEQ anticipates excluding the groundwater pathway and considers the potential for sediment recontamination by groundwater from the site to be low.

Stormwater and Overland flow: Stormwater management practices implemented at the site include sweeping, installation of catch basin inserts, and debris control. Preliminary evaluation of stormwater sampling analytical data indicates no significant screening level exceedances. DEQ anticipates concurring that effective control has been demonstrated and considers the potential for sediment recontamination from site stormwater discharges to be low.

Overwater Activities: Overwater activities at the site consist primarily of tug maintenance. Spill prevention and response procedures are in place, as regulated by the US Coast Guard. Because adaptive practices are in place in the event of an infrequent, incidental spill, DEQ considers this pathway controlled.

Linnton Georegion Recontamination Potential Conclusions – Industrial land use in the Linnton geographic region has a long and storied history, but was mainly limited to wood milling and bulk fuel storage and distribution. Of the 19 sites investigated for source control, all potential pathways at ten sites were excluded. Fuel-impacted groundwater is the driving source control concern in the georegion, which is dominated by on-going bulk fuel operations. Petroleum-related contaminants were removed from nearshore river sediment adjacent to the BP/Arco facility and groundwater source control measures are in place at all three of the facilities with high priority for groundwater source control actions. While the demonstration of groundwater source control effectiveness is pending, additional source control will be implemented as needed to adaptively manage groundwater at the site. Stormwater source control measures are in place at all seven of the active facilities and DEQ anticipates adaptive management will occur through permit compliance and DEQ Cleanup program oversight, as needed, to maintain control of the stormwater pathway throughout this georegion. ODOT plans to implement source control measures to reduce contaminants in runoff from Highway 30 facilities in 2016-17. Further investigation is needed at the Transloader site, but the priority is low based on minimal land area and the light industrial nature of the current operations. Therefore, provided that the effectiveness of groundwater and stormwater control measures at a handful of sites and roadways is confirmed, the sediment recontamination potential and unacceptable risk to Willamette River receptors for the Linnton geographic region is low and source control has sufficiently been achieved to support the in-water remediation work.

4.6.9 Rivergate – RM 1.9 – 3.4 E

Area Overview – Historically, the Rivergate area consisted of low-lying marsh land, lateral lakes, and cottonwood forests (USCGS 1888). In the early 1900s, it served as a private hunting reserve (PoP 1953). During much of the 20th century, large volumes of material dredged from the Lower Willamette and Columbia Rivers was placed at the Rivergate area, filling in the marshes (OSLB 1976). In 1962, the Port of Portland began acquiring properties in the area to create a new industrial area (PoP 2014) and, beginning in 1967, the manufacturing and distribution industry moved in (ODSL 1972). Since the late 1960s, the Rivergate Industrial District hosted a marine terminal, a steel plate mill, a paper product distribution facility, an

aluminum foundry and truck parts machining facility, food processing and packaging operations, bulk grain exporting, metal alloy distribution, potash and other mineral exporting, limestone production, and storage and cleaning of portable restrooms, and many of these activities still currently occur (PoP 2012).

Sediment Areas of Potential Concern – During the Lower Willamette Group's remedial investigation, EPA identified sediment areas of potential concern 1 (A nearshore and B in the channel) and 2 off shore along the Rivergate geographic region, as depicted in Figure 4.6.9. Contaminants found at elevated levels in these AOPC units were identified in a draft matrix in 2010, during the Lower Willamette Group's remedial investigation process, as listed in Table 4.6.9-1 below. As the in-water feasibility study progressed, EPA refined AOPCs into draft Sediment Decision Units (EPA 2014) based on site-wide contaminants of concern. DEQ referred to the AOPCs and associated contaminants of interest in directing upland source control work and as a conservative line of evidence for recontamination evaluation.

Table 4.6.9-1 Rivergate Geographic Region Sediment Areas of Potential Concern and Elevated Contaminants of Interest

AOPC	Contaminants of Interest
1(A)	cadmium, copper, mercury, zinc, PAHs, PCBs, dioxins/furans, delta-HCCH, DDx,
2	copper, mercury

(Source: 2/17/2010 draft AOPC Matrix LWG RI)

Direct Discharge - While not all the outfalls depicted on Figure 4.6.9 are active, each was initially identified as a potential historical discharge point. Construction of stormwater conveyances occurred in Rivergate the 1970s and 1980s, which is relatively recently in the context of Portland Harbor's industrial history (CoP 2013b). City of Portland MS-4 permitted stormwater outfall 53A drains a portion of the Rivergate georegion into AOPC 1A. Detailed information about the basin and sites the City outfall drains is available by outfall number in the appendices of the City's 2013 Municipal Stormwater Source Control Report for Portland Harbor. Ten Port of Portland MS-4 stormwater outfalls discharge runoff from the georegion, three of which discharge to AOPC 1A. Up to 11 private outfalls also discharge stormwater along the east side bank between approximately river miles 1.2 and 3.2, primarily to AOPC 1A and from sites undergoing source control evaluations. While not all are still active, discharges through many of these private outfalls are permitted under two NPDES Individual Wastewater permits and five assignments of the NPDES 1200Z Industrial Stormwater General permit, with another three sites that qualify for No Exposure Certifications under the permit, as listed in the table below. Nearly 100% of the land area in the Rivergate georegion is industrial and commercial and apply permits and management practices, as shown with purple striping on Figure 4.6.9.

Table 4.6.9-2 Rivergate Geographic Region NPDES Permits

Individual Permits		1200Z Industrial Stormwater General Permit Registrants, No Exposure Certification or Best Management Practices	
Registrant	**Permit #**	**Registrant**	**Permit #**
Ash Grove Cement Rivergate Lime Plant	102465	Archer Daniels Midland Co	1200Z
Evraz Inc NA	101007	Evraz Inc NA	1200Z
		J R Simplot Company	1200Z
		Millbank Materials, Ltd.	1200Z
		SSA Pacific Inc	1200Z
		Georgia-Pacific NW Serv Ctr	NEC
		High-Temp Inc	NEC
		Macro Mfg	NEC

Upland Sites Investigated - As depicted on Figure 4.6.9 and summarized in Table 4.6.9-3, DEQ evaluated six upland sites for source control in the Rivergate geographic region. Additional details are provided in the text that follows the table for two sites with medium or high priority pathways.

Table 4.6.9-3 Rivergate Geographic Region Sites

Site	ECSI#	Pathway(s)	Priority	Source Control Measures Status/ Dates	Decision Document	Recontamination Potential
Terminal 5 – Port of Portland	1686	Overland flow	Low	Excluded	SCD 2008 EPA issued letter in support of SCD NFA 2009	Low
		Bank erosion	Low	Excluded		
		Groundwater	Low	Excluded		
		Stormwater	Low	Excluded		
		Overwater acts	Low	Excluded		
Oregon Steel Mills	141	Overland flow	Low	Addressed in stormwater evaluation	NFA/SCD anticipated 2016	Low
		Bank erosion	High	Removal, cap, stabilization 2015-2016		
		Groundwater	Low	Anticipated to be excluded		
		Stormwater	High	Treatment/BMPs 2010		
		Overwater acts	Low	Excluded		
Consolidated Metco	3295	Groundwater	Med	Excluded	NFA 2011 SCD anticipated 2016	Low
		Stormwater	Med	Cleanout/repair 2010, redevelopment with new SW system 2012-2013 – effectiveness pending		
Ash Grove Cement	4696	Overland flow	Low	Needs investigation – quick lime	SASR* 2009 Not currently in program	Low
		Bank erosion	Low	Needs investigation – quick lime		
		Groundwater	Low	Excluded		
		Stormwater	Low	Needs investigation – quick lime		
		Overwater acts	Low	Needs investigation		

Table 4.6.9-3 Rivergate Geographic Region Sites (continued)

Site	ECSI#	Pathway(s)	Priority	Source Control Measures Status/ Dates	Decision Document	Recontamination Potential
Port of Portland Tract O Property	5307	Overland flow	Low	Excluded	SCD 2010 EPA declined review NFA 2010	Low
		Bank erosion	Low	Excluded		
		Groundwater	Low	Excluded		
		Stormwater	Low	Excluded		
		Overwater acts	Low	Excluded		
JR Simplot (former Unocal)	3343	Overland flow	Low	Needs investigation	Not currently in program	Low
		Bank erosion	Low	Needs investigation		
		Groundwater	Low	ECSI 1982 ammonia cleanup & 2002 diesel spill cleanup		
				Needs investigation		
		Stormwater	Low	Needs investigation		
		Overwater acts	Low			

6 sites – 2 sites closed – 2 sites (13 pathways) excluded – 2 SCDs anticipated – 2 sites not in VCP – 2 sites w/SCMs – 0 pathways uncontrolled
*Site Assessment Strategy Recommendation

Oregon Steel Mills (Evraz) (ECSI # 141)

The site is situated on the eastern bank of the Willamette River at approximately river mile 2 and consists of approximately 145 acres. The site historically manufactured steel slabs, plates, coils, and spiral weld pipe from scrap metal and currently uses purchased steel slabs to produce the same products. Environmental investigations conducted at the site beginning in 2002 revealed the presence of PCBs, metals (chromium, manganese, lead and arsenic), PAHs, and TPH at elevated concentrations in upland site soils; metals and PCBs at elevated concentrations in shoreline and beach soils; and arsenic and manganese in groundwater along the shoreline of the site.

Bank Erosion: A shoreline soil removal and source control action was implemented along approximately 1,700 feet of shoreline in 2015, with vegetation of beach areas anticipated to be completed in spring 2016. The highest remaining concentrations of PCBs and metals along the bank are now covered by geotextile, one foot of crushed stone, and three feet of rock armor. Beach material with the highest concentrations of contaminants has been removed to depths of one to five feet and residual contamination covered with clean river rock. As a result of this action, contaminated material remaining along the bank is no longer exposed to surface water or subject to erosion. Long-term monitoring will be implemented to maintain the bank and support vegetation in the berm and beach areas. Thus, the pathway is considered controlled with a low potential for sediment recontamination.

Groundwater: Based on concentrations of manganese and arsenic detected in shoreline wells in the range of background levels, generally declining concentrations in shoreline monitoring wells when compared to upland wells, and the absence of associated adverse impacts to aquatic species in the river, DEQ determined that no source control measures were needed to control groundwater impacts. Further evaluation of this pathway, considered groundwater data collected in 2015. The EPA-approved methodology for evaluating risk associated with manganese is based on hardness and indicates that manganese does not present an unacceptable risk for site exposure scenarios. DEQ plans to proceed with issuance of a no further action determination and source control decision for this pathway in 2016 and concludes that the potential for sediment recontamination due to arsenic and manganese in shoreline groundwater is low.

Stormwater: In December 2010, DEQ selected a stormwater source control action for the site that includes: removal of localized areas of contaminated soil, paving areas where feasible, and treatment for the majority of stormwater leaving the facility by bioswales, sand filters and a very large collection and clarification basin. Effectiveness and potential modification of the clarification basin were evaluated over 2014 and 2015 and turbidity reducing measures (decreased pump size and more frequent cleanout of the basin) were implemented. Given the commitment to on-going adaptive management of the pathway, DEQ considers stormwater from the site controlled and the potential for sediment recontamination is considered low.

Overwater acts: The dock structure at the site is currently used only to support the water intake. As current overwater activities would not result in any discharge of contaminants, this pathway was excluded.

Consolidated Metco (ECSI # 3295)

The former Consolidated Metco site is located on 19.2 acres approximately 0.25 miles east of the Willamette River at approximately river mile 2.8, in the South Rivergate Industrial Park. During the 1930s through early 1960s material dredged from the Willamette and Columbia rivers was placed in the low-lying wetland areas of the site and construction of six site buildings occurred in 1964, which were operated as an aluminum-casting foundry until 2007. After a comprehensive site investigation and removal of a small subsurface area of soil contaminated with PAHs, DEQ provided a 2011 No Further Action Determination for upland risks on the site. Archer Daniels Midland Company acquired and redeveloped much of the site in 2012, making significant improvements in stormwater management. Stormwater is considered the only complete pathway to the Willamette River and the primary source control contaminants of concern are PAHs, PCBs and metals.

Groundwater: A small area of the site was impacted in 2001 by a release of cutting fluid that contained petroleum hydrocarbons. The majority of impacted soil was removed and investigation confirmed that groundwater did not connect to the river. The potential for contaminated groundwater to flow to the river through or around subsurface stormwater pipes was evaluated. Broken stormwater infrastructure was repaired eliminating the potential infiltration and stormwater monitoring confirmed no significant concentrations of petroleum hydrocarbons. The groundwater pathway was determined to be incomplete at the site and was, therefore, excluded.

Stormwater: As part of the 2009 to 2010 stormwater investigation, Consolidated Metco cleaned out stormwater lines, made conveyance system repairs, implemented best management practices and conducted sampling to evaluate the effectiveness of these measures. The facility was purchased in 2012 by Archer Daniels Midland who redesigned the facility infrastructure. The new stormwater system reconfigured piping, reduced and consolidated existing conveyances, added a new discharge point and added a treatment component. 2013 stormwater sampling data from the new system did not exceed screening level values and on-going operations will be managed under the facility's NPDES 1200Z industrial stormwater general permit. DEQ anticipates resolving drainage questions and issuing a decision indicating that stormwater source control is complete at the site in 2016 and considers the potential for sediment recontamination due to stormwater discharges to be low.

Rivergate Georegion Recontamination Potential Conclusions - Industrial land use in the Rivergate geographic region is relatively recent, emerging in the late 1960s. Of the six sites investigated for source control, all potential pathways at two were excluded. Source control

actions at the two industrial parcels with medium or high priority pathways are complete. Further investigation is needed at two sites, but the priority is low based on absence of contaminants of concern in river sediment offshore, minimal land area and anticipation of exclusion of most pathways. With completion of the bank remedy at Evraz Oregon Steel in 2015, the overall sediment recontamination potential and risk to Willamette River receptors for the Rivergate geographic region is low and source control has sufficiently been achieved to support the in-water remediation work.

4.7 Upstream Inputs

In collaboration with the City of Portland and several other partners, DEQ completed work on multi-phased investigation of sediment contamination in the Willamette River upstream of the Portland Harbor. This investigation took place between approximately river miles 12 to 16, a river section referred to as the Downtown Reach. Results of these investigations are summarized in reports titled: Field and Data Report, Downtown Portland Sediment Characterization [prepared for DEQ by GSI Water Solutions] (2009); Downtown Portland - Willamette River Sediment Evaluation - Preliminary Identification of Locations of Interest (2009); and Portland - Willamette River Sediment Evaluation Downtown Reach - Phase II Follow-up Summary (2011). Table 4.7 lists areas, from downstream to upstream, where DEQ determined some site discovery and source evaluation were warranted. The table also lists sites where sediment cleanups have been completed or are in process under DEQ oversight. The Downtown Reach Sediment Focus Areas and DEQ Upland Cleanup Sites are shown on Figure 4.7. Following the table, the status of work or determinations at each site is summarized. Additional work planned is discussed in Section 5.5 of this report.

Table 4.7 Upstream Sediment and Upland Sites

Site	River Mile	ECSI#	Pathway(s)	Project Status	Supporting Document	Recontamination Potential
Outfall WR-309 Drainage Basin	12.1 East		Stormwater Sediment	No upland sources identified, limited sediment footprint, discharge diverted to POTW		Low
Former Portland Gas Manufacturing	12.1 West	1138	Groundwater Sediment	Upland source control investigation and in-water sediment RI complete. FS currently in review.	Integrated Sediment Investigation and Source Control Evaluation Aug 2013	Low
Outfall 9 Drainage Basin	12.4 West		Stormwater Sediment	Bioassay – no sediment toxicity, No sediment contaminants detected at elevated concentrations, no stormwater connection to Portland Gas Mfg site, City implementing BMPs in drainage basin		Low
Outfall WR-315 Drainage Basin	12.5 East		Stormwater	Upland site discovery complete – low priority for further work		Low
Outfall 8A Drainage Basin	12.9 West		Stormwater	Phase II PCB sample concentration (57 ug/kg) relatively low, no identified sources, City implementing BMPs in drainage basin		Low

Table 4.7 Upstream Sediment and Upland Sites (continued)

Site	River Mile	ECSI#	Pathway(s)	Project Status	Supporting Document	Recontamination Potential
Portland General Electric	13.1 and 13.5 East	5249	Sediment	Upland source control and in-water remedial investigations complete. Upland source control measures complete. RM 13.5 in-water cap completed 2015. RM 13.1 in-water remediation in design.	Final Sediment RI Report River Miles 13.1 and 13.5, Dec 2011	Low
Crescent Park	13.3 East	5547	Bank erosion Groundwater Stormwater	Site investigation concluded the site is not an active source to the Willamette River requiring source control measures.	NFA Dec 2012	Low
Portland General Electric Station L	13.3-13.5 East	151	Upland Sediment	Sediment removal and cap 1990/1991, Cap inspections conducted as part of 5-year reviews .	In-water and Upland Certification of Completions 1991 and 1994 Last 5-year Review Dec 2011	Low
Zidell	13.5-14 West	689	Riverbank Sediment	Riverbank and in-water sediment remedy constructed 2011 and 2012.	Construction Completion Report 7/14/2014	Low
Central District Greenway	14.1 West	5277	Riverbank Sediment	Beach and riverbank removal/cap completed 2013 Characterization needed	Summary of Phase 1A & 1B Activities 6/13/2014	Low
Outfall 28 Drainage Basin	15.1 East		Sediment	Limited impacted sediment footprint, discharge diverted to POTW		Low
Ross Island	15.4	2409	Upland Sediment	Conducted a series of upland removal and capping measures 2007. Between 2001 and 2010 capped lagoon sediment.	Conditional NFA 2011	Low

Outfall Drainage Basins WR-309, WR-315, OF 8A, OF 28 – Site discovery in these basins revealed no conclusive sources. The extent and magnitude of sediment contamination near the outfalls were small and low. Ongoing discharge from these outfalls has been improved by land use changing to residential, commercial and warehousing and by application of numerous stormwater reduction and treatment practices within the basins, including the majority of stormwater from City outfalls being diverted to the wastewater treatment plant. Therefore, additional investigation or control is of low priority or unwarranted.

Crescent Park - Source control measures were completed at the Crescent Site and DEQ issued a No Further Action determination there.

Portland General Electric Station L - PGE implemented a sediment remedy for PCB-containing sediment adjacent to Station L in 1990 and 1991. The remedy required dredging of sediment containing PCB concentrations above 10 mg/kg and capping sediment above 1 mg/kg. In 1994, DEQ issued a cleanup record of decision for the site, which included the upland and

requires diver inspections of the cap every five years. EPA issued a no further remedial action planned determination for the site in 1994. As part of the Downtown Reach study, sediment samples adjacent to the sediment cap were collected and tested for PCBs. Concentrations of PCBs in these samples ranged from non-detect to 17ug/kg.

Ross Island Lagoon - Ross Island Sand and Gravel Company began importing and placing fill in the Ross Island lagoon in 1980 as part of requirements to reclaim this long standing gravel mining area. Some of the fill placed was contaminated. DEQ required Ross Island Sand and Gravel and the Port of Portland, which was the source of much of the contaminated fill, to investigate the adequacy of confinement of the contaminated fill in the lagoon and general site environmental concerns. DEQ issued a cleanup record of decision for the site in 2005 and remedial action, which included stabilization and capping of upland soil, capping of sediment and shoreline areas, establishing 3-to-1 side slopes in the lagoon to ensure stability and long-term monitoring, was completed in 2011.

Zidell - Remedial investigation and cleanup was conducted at the Zidell waterfront property, beneath the Ross Island Bridge spanning approximately river miles 13.5 to 14.5 west, under a DEQ consent judgment. Upland and in-water areas were impacted by releases of metals, petroleum hydrocarbons, PCBs, asbestos, and other contaminants during ship dismantling, ship building, welding, and other miscellaneous industrial activities from 1925 to the mid-1960s and barge-building operations beginning in 1968. Zidell completed upland soil cleanup in 2010, construction of a 16-acre bankline and in-water sediment cap in 2011 and placement of four acres of vegetated soil cap in the City of Portland designated greenway and an additional eight acres of upland cap in 2012. Post construction sampling around the sediment cap detected 14 to 18 ug/kg PCBs.

Central District Greenway - The City of Portland implemented a remedial action for metals, polychlorinated biphenyls, and polycyclic aromatic hydrocarbons contamination in upland and riverbank soil and near-shore sediment in this area located just south of the Zidell site. The remedial action included excavation and offsite disposal of material exceeding ecological hot-spot concentrations and capping material exceeding ecological screening levels with a minimum of one foot of clean material. Reactive core mats were installed in selected lower bankline/in-water areas where higher levels of contamination were left in place. DEQ is currently negotiating completion of characterization of an area of moderate PCB contamination discovered during the work described above and which extends beyond the footprint of that work.

Portland General Electric - DEQ oversaw remedial investigation work at two historical PGE sites at river mile 13.1 and 13.5 east, where an in-water sediment remedy feasibility study and upland source control evaluation were completed in 2014. Associated in-water remedial action was performed in at RM 13.5 in 2015 and is anticipated to be completed at RM 13.1 in 2016. DEQ also oversaw site investigations and follow-up actions at three focus areas.

Former Portland Gas Manufacturing - A Remedial Investigation was completed at this site located at river mile 12.1 west and a Feasibility Study is nearing completion. DEQ anticipates a combination of in-water removal, capping and monitored natural recovery to be implemented in 2017.

Based on evaluations of the work on the Downtown Portland Sediment Characterization project (available at: http://www.oregon.gov/deq/Hazards-and-Cleanup/CleanupSites/Pages/Willamette-River.aspx), DEQ concluded that sediment contamination in the downtown reach of the Willamette River does not pose a threat of recontamination to Portland Harbor. This is because:

1) contaminated sediment areas have been identified and addressed or will be by 2017; 2) upland sources have been eliminated or controlled; 3) stormwater discharges have been reduced in quantity and contaminant concentrations; 4) the extent and magnitude of sediment contamination identified in the downtown reach is small and an order of magnitude lower in comparison to Portland Harbor; and, 5) contaminant concentrations in suspended sediment passing through the downtown reach to Portland Harbor are currently much lower than the remedial action levels being evaluated for Portland Harbor and will decrease further following completion of the additional Downtown Reach sediment cleanups coupled with long term natural recovery. Therefore, recontamination of remediated sediment in Portland Harbor from Downtown Reach upland sites or sediment is highly unlikely. Further, the Portland Harbor in-water remedy should not be delayed and monitored natural recovery areas within the Harbor will not be impeded by upstream sources.

5.0 Demonstrating Compliance with Source Control Objectives

Multiple lines of evidence were evaluated to indicate that source control will be achieved with sufficiency to allow the EPA in-water remedy in Portland Harbor to go forward without threat of actionable sediment recontamination. This section recaps conclusions on each potential pathway and highlights work that must be completed to support these conclusions. In particular, on-going source control efforts must be completed, work in bank areas anticipated to be integrated into the in-water remedy must be actualized, limited additional in-water and upland investigation may be warranted, and a plan for comprehensive monitoring and adaptive management must be jointly developed and implemented.

5.1 Schedule for Completion of Controls at Sites with Pending Source Control Decisions

Table 5.1 presents a summary of all sites by georegion that have yet to receive comprehensive final source control decisions. Specific pathways that are considered uncontrolled or controlled pending effectiveness demonstration at the time of this Summary Report Update are indicated. The table also includes plans, where developed, and estimated schedules for completion of source control decisions by pathway. Twenty-two sites have uncontrolled pathways and no plan as yet for control. While these sites are highlighted as DEQ's or EPA's highest priority for source control completion, 14 of the 22 have a low potential for sediment recontamination. While multiple pathways may be complete at a site, EPA prefers submittal of a single source control decision for all pathways. As such, sites with multiple as yet uncontrolled pathways are likely to complete the site-wide decision at the latest estimated date for individual pathways.

Table 5.1 Sites with Pending Source Control Decisions

Georegion & EPA Key Area	Site Count	Site Name	ECSI #	Uncontrolled Pathways	Recontamination Potential	Source Control Status	Plan & Schedule
Albina & RM 11E	1	Tarr	1139	GW	Low	Uncontrolled - w/plan	Bioremediation & institutional controls planned 2017, SCD anticipated 2018
	2	Westinghouse	4497	GW	Low	Exclusion anticipated	Monitoring in process, SCD anticipated in 2017
	3	Glacier NW	5449	SW	Low	Controlled - effectiveness pending	SCD anticipated 2016
	4	Cargill	5561	SW	Low	Uncontrolled - w/plan	SCMs 2016, SCD anticipated 2016
	5	UPRR Albina	178	SW	Low	Controlled - effectiveness pending	SCD anticipated 2016
Pearl	6	Tanner Creek Sewer (abandoned)	5136	GW	Low	Uncontrolled - w/plan	Remediation in 2016 of residual contamination, SCD anticipated 2016
	7	Sulzer & Dolan	1235	Bank	Low	Uncontrolled -w/ plan	Investigation in process - integrate w/ in-water remedy, if needed, SCD anticipated 2016
				SW	Low	Uncontrolled - no plan	SCMs 2016 & investigation, SCD anticipated 2017
Swan Is/Mocks Bottom & Swan Is Lagoon	8	Freightliner Parts Plant	115	SW	Low	Uncontrolled - no plan	SCMs 2018, SCD anticipated 2018
	9	Freightliner Truck Plant	2366	SW	Low	Uncontrolled - w/ plan	SCD anticipated 2016
	10	Vigor (Shipyard)	271	SW	Med	Uncontrolled - no plan	plan in development, SCD anticipated 2018
		Port (OU 1 & OU5)		Bank	Med	Uncontrolled w/ plan	Integrate w/ in-water remedy
	11	EWH	5685	SW	Low	Uncontrolled - no plan	SCMs needed, SCD anticipated 2017
	12	US Navy Reserve	5109	Bank	Med	Uncontrolled - no plan	EPA-led - investigation needed
				SW/Over		Uncontrolled - no plan	
				GW		Uncontrolled - no plan	
				Water		Uncontrolled - no plan	
	13	US Coast Guard	1338	SW	Low	Controlled - effectiveness pending	SCD anticipated 2016

Table 5.1 Sites with Pending Source Control Decisions (continued)

Georegion & EPA Key Area	Site Count	Site Name	ECSI #	Uncontrolled Pathways	Recontamination Potential	Source Control Status	Plan & Schedule
Guilds Lake & Outfall Basin 18 Contributors	14	Gunderson	1155	Bank	High	Controlled by interim measures	Interim measures in place - Area 3 to be integrated w/in-water remedy
				SW	Low	Uncontrolled - w/plan	SCMs 2016, SCD anticipated 2017
	15	Wllbridge Rail Yard BNSF	3395	SW	Low	Sampling	SCD anticipated 2016
	16	Mt Hood Chemical	81	SW	Low	Exclusion anticipated	SCD anticipated 2016
	17	Container Management	4784	GW	Low	Uncontrolled - no plan	Investigation in progress, SCD anticipated 2017
				SW	Med	Uncontrolled - no plan	Additional SCMs needed, SCD anticipated 2017
	18	Front Ave LLP - Hampton Lumber	5761	Bank	Med	Uncontrolled - w/plan	Investigation in process, integrate w/ in-water remedy, if needed
				SW	Low	Controlled - effectiveness pending	SCD anticipated 2016
	19	Front Ave LLP - Glacier NW (CalPortland)	2378	Bank	Med	Uncontrolled - w/plan	Investigation in process, integrate w/ in-water remedy, if needed
				SW	Low	Uncontrolled - no plan	Investigation needed
	20	Front Ave LLP - Tube Forgings	1239	GW	Low	Uncontrolled - no plan	Investigation in process, SCD anticipated 2018
				SW	Low	Controlled - effectiveness pending	SCD anticipated 2016
	21	Wirfs (Schnizter invest)	2424	GW	Low	Uncontrolled - no plan	investigation needed - SCD anticipated 2017
	22	Carson Oil	1405	SW	Low	Uncontrolled - w/plan	SCMs 2016, SCD anticipated 2016
	23	Wilhelm Trucking	69	SW	Low	Controlled - effectiveness pending	SCD anticipated 2016 or 2017
	24	Calbag	2454	SW	Low	Uncontrolled - no plan	SCMs needed, SCD anticipated 2017
Guild	25	Calbag	5059	SW	Low	Controlled - effectiveness pending	SCD anticipated 2016

Table 5.1 Sites with Pending Source Control Decisions (continued)

Georegion & EPA Key Area	Site Count	Site Name	ECSI #	Uncontrolled Pathways	Recontamination Potential	Source Control Status	Plan & Schedule
	26	Guilds Lk RR Yard/Eastman	100 & 135	SW	Low	Controlled - effectiveness pending	SCD anticipated 2016
	27	Galvanizers	1196	SW	Low	Diverted	SCD anticipated 2016
	28	Lake Side Industries	2372	GW	Low	Exclusion anticipated	Investigation in process, SCD anticipated 2017
	29	Univar (Vanwater and Rogers)	330	GW	Med	Uncontrolled w/ plan	EPA-led w/o PM - new technology proposed
				SW	Med	Uncontrolled - no plan	Investigation in process, SCD anticipated 2017
St Johns & Willamette Cove	28	Willamette Cove	2066	Bank	Med	Uncontrolled - w/ plan	Integrate w/in-water remedy
				GW	Low	Uncontrolled - no plan	Investigation in process, SCD anticipated 2017
	29	Crawford St	2363	Bank	Low	Uncontrolled - no plan	Investigation in process, SCD anticipated 2018
				GW	Low	Uncontrolled - no plan	
				SW/over	Low	Uncontrolled - no plan	
Doane Lake/Willbridge & Doane Lake	30	Arkema	398	Bank	High	Uncontrolled - w/ plan	integrate w/in-water remedy
				GW	Med	Uncontrolled - no plan	Barrier wall/extraction partial control, additional SCMs needed, SCD anticipated 2020
	31	NW Natural - Gasco	84	over	Low	Uncontrolled - w/ plan	integrate w/ in-water remedy
				Bank	High	Uncontrolled - w/ plan	
				GW	High	Uncontrolled - w/ plan	alluvium zone controlled, fill zone cutoff & trench planned 2018, SCD anticipated 2020
				SW	Low	Uncontrolled - no plan	Plan & schedule under development, SCD anticipated 2017
Do	32	Siltronic	183	Bank	Low	Uncontrolled - w/ plan	Integrate w/ in-water remedy, if needed

Table 5.1 Sites with Pending Source Control Decisions (continued)

Georegion & EPA Key Area	Site Count	Site Name	ECSI #	Uncontrolled Pathways	Recontamination Potential	Source Control Status	Plan & Schedule
				GW	High	Uncontrolled - w/ plan plan	Bioremediation & Gasco alluvium zone controlled, Gasco fill zone cutoff & trench planned 2018, SCD anticipated 2020
	33	Rhone Poulenc	155	Bank	High	Uncontrolled - w/ plan	Historical drainage ditch outlet, integrate w/ in-water remedy, if needed
				GW	Med	Uncontrolled - no plan	plan & schedule underdevelopment, SCD anticipated 2022
				SW	Med	Uncontrolled - no plan	portion needs SCMs, SCD anticipated 2019
	34	US Moorings	1641	Bank	High	Uncontrolled - no plan	EPA-led - investigation needed
				GW	High	Uncontrolled - no plan	
				SW/Over	High	Uncontrolled - no plan	
	35	GS Roofing (Certainteed)	117	Bank	Med	Uncontrolled - w/ plan	integrate w/ in-water remedy, if needed
				GW	Low	Uncontrolled - no plan	Investigation in process, SCD anticipated 2017
				SW	Low	Controlled - effectiveness pending	SCD anticipated 2016
	36	Kinder Morgan Booster Stn (SFPP)	2104	GW	Low	Controlled - effectiveness pending	SCD anticipated 2017
				SW	Low	Controlled - effectiveness pending	SCD anticipated 2016
	37	Willbridge Chevron/Conoco	1549 (25 & 177)	GW	Low	Controlled - effectiveness pending	SCD anticipated 2017
				SW	Low	Controlled - effectiveness pending	
	38	Kinder Morgan - Willbridge	1549 (160)	GW	Low	Controlled - effectiveness pending	SCD anticipated 2016
				SW	Low	Controlled - effectiveness pending	
T4/ Int	39	T4 (Slip 3)	272	Overland	Low	Uncontrolled - w/ plan	SCMs planned - SCD anticipated 2018

Table 5.1 Sites with Pending Source Control Decisions (continued)

Georegion & EPA Key Area	Site Count	Site Name	ECSI #	Uncontrolled Pathways	Recontamination Potential	Source Control Status	Plan & Schedule
				Bank	Med	Uncontrolled - w/ plan	Integrate w/ in-water remedy
				SW	Low	Uncontrolled - w/ plan	SCMs 2017 - SCD anticipated 2018
	40	T4 (Slip 1)		SW	Low	Uncontrolled - w/ plan	SCMs 2017 - SCD anticipated 2018
	41	SBIP (various sites)	5324	SW	High	Uncontrolled - no plan	Investigations in process
	42	Schnitzer Steel	2355	Bank	High	Uncontrolled - w/ plan	Remediate Head of Slip and integrate south slip bank w/ in-water remedy - SCD anticipated 2020 Integrate south slip bank w/ in-water remedy
				GW	Low	Exclusion anticipated	SCD anticipated 2016
				SW	High	Uncontrolled w/ plan	Paving and additional treatments - SCD anticipated 2019
	43	NW Pipe	138	GW	Low	Exclusion anticipated	SCD anticipated 2017
	44	Lampros Steel	2441	SW	High	Uncontrolled - no plan	SCMs needed
	45	Time Oil	170	GW	Low	Uncontrolled - no plan	GW controls in place - effectiveness pending, Facilitated gw transport SCMs needed - SCD anticipated 2018
				SW	Low	Controlled - effectiveness pending	
	46	Premier Edible Oils	2013	Bank	Med	Uncontrolled - w/ plan	Removal & stabilization planned 2016, SCD anticipated 2018
				GW	Low	Uncontrolled - w/ plan	Barrier wall 2015, oxygenation planned 2016, SCD anticipated 2018
				SW	Low	Controlled - effectiveness pending	SCD anticipated 2017
	47	Crown Cork & Seal	5864	GW	Low	Exclusion anticipated	SCD anticipated 2016
	48	PGE Rivergate N & S Substations	6069	GW	Low	Exclusion anticipated	Investigation in process
				SW	Low	Uncontrolled - no plan	
Linnton	49	Shore Terminals	5130 & 137	GW	Low	Controlled - effectiveness pending	SCD anticipated 2016

Table 5.1 Sites with Pending Source Control Decisions (continued)

Georegion & EPA Key Area	Site Count	Site Name	ECSI #	Uncontrolled Pathways	Recontamination Potential	Source Control Status	Plan & Schedule
				SW	Low	Controlled - effectiveness pending	
	50	Kinder Morgan-Linnton	1096	GW	Low	Controlled - effectiveness pending	SCD anticipated 2016
				SW	Low	Controlled - effectiveness pending	
	51	Owens Corning Fiberglass (Trumbull Asphalt)		SW	Low	Controlled - effectiveness demonstrated	SCD anticipated 2016
	52	Arco/BP	1528	GW	Low	Controlled - effectiveness pending	SCD anticipated 2017
	53	Brix Maritime	2364	GW	Low	Exclusion anticipated	SCD anticipated 2016
				SW	Low	Controlled - effectiveness pending	
Rivergate	54	Evraz - Oregon Steel	141	GW	Low	Exclusion anticipated	SCD anticipated 2016
Rivergate	55	Con Metco	3295	SW	Low	Controlled - effectiveness pending	SCD anticipated 2016
Site-wide	56	ODOT	5437	SW	Med	Uncontrolled - w/ plan	SCD anticipated 2019
Site-wide	57	City Outfalls	2425	SW	Low	Controlled - effectiveness pending	SCD anticipated 2016

5.1.1 Sites That May Need Investigation

The following table includes nine sites within the study area uplands that have been identified as potentially needing investigation, but are not currently in or communicating with the DEQ Cleanup program. These sites were all designated low priority, to be pursued as resources allow, and have varying levels of information available. DEQ will track them by georegion and engage them as joint monitoring of the remedy indicates is warranted.

Table 5.1.1 Sites Not Currently in DEQ Cleanup Program

Site	ECSI#	Georegion	Pathway(s)	Priority	Source Control Measures Plan & Schedule
Albers Mill Property	4590	Pearl	Overland flow Bank erosion Groundwater Stormwater Overwater acts	Low Low Low Low Low	Investigation may not be warranted due to lack of known releases – Low priority and potential for recontamination
Pacific States Galvanizing	1024	Pearl	Groundwater	Low	Anticipated to be excluded – Low recontamination potential
End of Swan Island Lagoon	3901	Swan Is/ Mocks Btm	Groundwater	Low	Under agreement, but declined to undertake further investigation of groundwater – Low priority and recontamination and in-water risk potential
Trumball Asphalt (Owens Corning Yeon)	1160	Guilds	Groundwater Stormwater	Low Low	Refused to enter VCP – Anticipated to be excluded – Low recontamination potential
Peninsula Ironworks	5686	St Johns	Stormwater	Low	Under agreement, but stopped working - Potential gutter reroute and soil removal, but no firm plan or schedule – Low recontamination potential
Borden Chemical, Inc.	1277	T4/Intnl Sl	Groundwater Stormwater	Low Low	Investigation may not be warranted due to lack of known releases – Low priority and potential for recontamination
Transloader International Co, LLC	2367	Linnton	Overland flow Bank erosion Stormwater Groundwater Overwater acts	Low Low Low Low Low	Investigation needed - Low priority and recontamination potential
Ash Grove Cement	4696	Rivergate	Overland flow Bank erosion Stormwater Overwater acts	Low Low Low Low	Investigation needed, but due to benign nature of potential contaminant (quick lime) - Low priority and recontamination potential
JR Simplot (Unocal)	3343	Rivergate	Overland flow Bank erosion Stormwater Overwater acts	Low Low Low Low	Investigation needed, but due to lack of significant releases - Low priority and recontamination potential

5.1.2 Railroads

As noted in Section 4.3.3 of this report, DEQ identified five areas adjacent to the river where additional evaluation of the bank erosion and stormwater pathways may be warranted along sections of rail lines. While this may be considered a data gap, the priority for investigation and

potential for sediment recontamination and unacceptable risk to Willamette River receptors from these areas is low. Three of these areas have potential to impact active sediment remediation areas planned by EPA: the rail bridge across the Willamette River at approximately river mile 6.8; the east riverfront along the north portion of Willamette Cove at approximately river mile 7.5E; and the east riverfront at the Broadway Bridge and south from approximately river mile 11.6 to 11.9E. If a recontamination threat emerges in sediment areas off shore of any of these five locations, DEQ will work with the railroads and adjacent landowners, to assess the potential for overland flow and/or bank erosion in these areas and to follow through with investigation and source control measures, as warranted.

5.2 Bank Areas Needing Evaluation and/or Remedy

Under the JSCS and subsequent discussions with EPA, DEQ completed riverbank source control evaluations for all riverfront sites in the DEQ Cleanup Program. When the evaluation concluded that there is potential for a length of riverbank to be a source, DEQ and EPA agreed to categorize potential source riverbanks as to whether or not they were adjacent to a sediment area anticipated to require active in-water sediment remediation.

For those riverbanks that are not adjacent to anticipated active sediment remediation areas, DEQ will evaluate remedial options for the riverbank, select riverbank source control measures and work with the responsible party to design, permit and construct the riverbank source control measure. For those riverbanks adjacent to anticipated active sediment remediation areas, DEQ will, in most cases, refer the site to EPA so that the recontamination evaluation, remedial design, permitting and construction can be integrated with the in-water sediment remedy. DEQ has discretion to require additional measures, including construction of riverbank remedial measures at sites adjacent to identified active sediment remediation areas. Table 5.2 identifies the riverbanks that DEQ referred to EPA for further action and integration with the in-water remedy.

Table 5.2 Riverbanks Referred to EPA for Integration with In-River Remedy

Site	ECSI#	Georegion	Action Needed	Recontamination Potential
Sulzer	1235	Pearl	Confirm during design if SCM needed	Low
US Navy Reserve	5109	Swan /Mocks	Investigation needed	Medium
Port of Portland (OU1)	271	Swan /Mocks	SCMs needed – integrate w/in-water remedy	Medium
Hampton Lumber	5761	Guilds Lake	Confirm during design if SCM needed	Medium
Glacier Northwest Inc.	2378	Guilds Lake	Confirm during design if SCM needed	Medium
Gunderson	1155	Guilds Lake	SCMs needed – integrate w/in-water remedy	High
Willamette Cove	2066	St. Johns	SCMs needed – integrate w/in-water remedy	Medium
Crawford Street	2363	St. Johns	Confirm during design if SCM needed	Low
NW Natural Gasco	84	Doane/Will	SCMs needed – integrate w/in-water remedy	High
Siltronic	183	Doane/Will	SCMs needed – integrate w/in-water remedy	Low
Rhone Poulenc	155	Doane/Will	SCMs needed – integrate w/in-water remedy	High

Table 5.2 Riverbanks Referred to EPA for Integration with In-River Remedy (continued)

Site	ECSI#	Georegion	Action Needed	Recontamination Potential
Arkema	398	Doane/Will	SCMs needed – integrate w/in-water remedy	High
CertainTeed (GS Roofing)	117	Doane/Will	Confirm during design if SCM needed	Medium
Schnitzer Steel	2355	T-4/Intnl Slip	SCMs needed – integrate w/in-water remedy	High
Terminal 4 Slip 3 - Port of Portland	272	T-4/Intnl Slip	SCMs needed – integrate w/in-water remedy	Medium

5.3 Groundwater

As identified on Figures 4.6.1 through 4.6.9 and in the text of each georegion in Section 4.6, site investigations identified and characterized groundwater plumes at upland sites. With the exception of four sites identified in Table 5.1, the groundwater plumes have been sufficiently characterized to make a source control determination on the need for a source control measure. The four sites still under investigation, Container Management, Front Ave LP, Willamette Cove and GS Roofing, are all considered to have low potential for recontamination or in-water risk from upland-sourced groundwater. DEQ anticipates completion of characterization of these plumes in 2016 sufficient to support decisions as to whether controls are needed or not. Additionally, as noted in Table 5.1, groundwater monitoring is planned or ongoing at sites to demonstrate effectiveness of pending or operating groundwater source control measures.

Source control measures are in place for plumes or portions of plumes that are high priority because they have the potential to recontaminate sediment. Evaluation of the performance of systems already in place at all high priority plumes is ongoing, with effectiveness demonstrations expected to be complete in 2016 and 2017. While many source control measures for medium priority plumes are already in place, measures for all medium and high priority plumes are anticipated to be in place by 2020 and demonstrated to be effective by 2022.

5.4 Stormwater

When CERCLA sediment sites become recontaminated, the primary source is incomplete sediment removal or previously unidentified upstream sources (ASTSWMO 2013, Nadeau & Skaggs 2007). A less frequent recontamination pathway is stormwater. In most cases this was because combined sewer overflows, particularly those with industrial wastewater and stormwater contributions, had not been controlled prior to in-water remedy implementation (ASTSWMO 2013, Nadeau & Skaggs 2007). Because of the prevalence of uncontrolled combined sewer overflows and limited understanding of stormwater contributions, in general, the stormwater pathway's potential to recontaminate CERCLA sediment sites has received national attention and became a focus pathway for DEQ's source control program. As noted in Section 4.1.2 of this report, industrial wastewater discharges were separated in most of Portland Harbor's industrial areas in the 1950s and all combined sewer overflows were effectively controlled between 2000 to 2011. Thus, the primary threat for recontamination via stormwater, is not likely to be relevant in Portland Harbor. Another protection against recontamination and in-water risk in Portland Harbor, is the fact that Forest Park and other open space make up nearly half the drainage area into Portland Harbor. Unlike the densely developed areas surrounding CERCLA sediment sites that have become recontaminated by stormwater, precipitation from these forested areas filters through vegetation and soils and is conveyed in

many small creeks from the west side hillslopes to mix with treated stormwater discharges from the developed lowlands before discharging into the Portland Harbor reach.

To ensure that stormwater discharges to Portland Harbor will not recontaminate sediment or pose unacceptable in-water risk, DEQ comprehensively investigated the stormwater pathway throughout the study areas uplands draining to the Harbor and applied controls, as warranted. Following finalization of the EPA/DEQ Joint Source Control Strategy in 2005, DEQ partnered with EPA and the City of Portland to flesh out the JSCS Framework for Portland Harbor Stormwater Screening Evaluations into DEQ's 2009 Guidance for Evaluating the Stormwater Pathway at Upland Sites. This guidance was updated based on Portland Harbor area data in 2010 and 2015. The investigative process and controls applied through this guidance often exceed requirements in current NPDES permits (MS4, 1200Z and A Industrial Stormwater general and individual), for example by requiring stormwater solids sampling and removal of solids from stormwater conveyance lines. Control measures applied on sites are in line with or exceed efficacy of measures recommended on EPA's menu of construction and post-construction best management practices, for integration into CERCLA decision documents to support protectiveness of the remedy (EPA 2007). Finally, EPA confirmed in the April 2015 memorandum on DEQ's Portland Harbor source control efforts that "DEQ's source control efforts go above and beyond any requirements under the current Clean Water Act (CWA) 1200-Z permit for stormwater" and that "DEQ should be commended for their work on the stormwater pathway evaluation at sites/facilities that have completed this work" (EPA 2015b).

DEQ screened 171 sites for potential stormwater pathway impacts and applied the guidance and controls, as warranted, at 75 sites within the study area uplands. Investigations included stormwater and stormwater solids sampling and performance monitoring following implementation of controls. On-going stormwater discharges from most of these sites continue to be regulated under the NPDES individual and general permit program, which includes inspection, monitoring and corrective actions at 90 industrial sites within the study area uplands and an additional 85 sites certified to have no exposure of stormwater to industrial activities. With the exception of the Pearl and St. Johns georegions being mostly residential land use, sites with regulated controls on stormwater typically cover large parcels of the developed land within each georegion of the study area uplands, as shown by purple striping coverage on Figures 4.6.1 through 4.6.9. Together, sites with stormwater source controls and regulatory controls in place, cover approximately 70% of the developed land area draining into Portland Harbor. The remaining 30% of developed land is largely in residential and commercial use. The City of Portland's municipal stormwater investigation demonstrates that effective stormwater programs and controls are in place for approximately 50% of total land draining into the Portland Harbor study area, including most of the residential and commercial areas and open space. Monitoring and corrective actions for effective controls will continue to be applied for on-going discharges from the areas that drain to Portland Harbor under Clean Water Act, state and local authorities, consistent with EPA CERCLA and Clean Water Act guidance on source control (EPA 2005, EPA 2007, EPA 1998, EPA 2015a, EPA 2015c).

Demonstration of effectiveness and appropriate adaptive management, per the iterative nature of source control work, is still underway at some sites. DEQ anticipates acquiring Harbor-wide representative stormwater source control effectiveness monitoring data in conjunction with work at individual sites; in the City of Portland, ODOT and Port of Portland conveyance systems; and through the individual and general NPDES stormwater permit program. As noted in Section 4.1.1 of this report, analysis of 1200Z stormwater permit monitoring data as it is generated will continue to inform decisions about stormwater quality in Portland Harbor.

If a potential recontamination threat from stormwater emerges, DEQ will conduct additional evaluation and require additional source control efforts, as warranted. Elements of additional evaluation may include:

1. A more comprehensive inventory of private outfalls that discharge to the Portland Harbor study area and further investigation, as needed; and,
2. Qualitative evaluation of load reduction at active outfalls.
    a. Contaminant and total suspended solids concentrations relative to concentrations in sediment decision units discharged to,
    b. Stormwater solids composition compared to sediment composition in sediment decision units

DEQ may also consider expanding the 1200Z permit within the Portland Harbor geographic area, potentially requiring controls and operational practice improvements and monitoring by currently unpermitted sites that conduct industrial activities like those that trigger permit coverage.

5.5 Upstream inputs

As noted in Table 4.7 above, DEQ is currently overseeing work to address in-stream sediment at three sites in the Downtown Reach, at river mile 13.1 E, 13.5 E, and 12.1 W. Once complete, performance monitoring data will fill some data gaps on contaminant concentrations in the sediment of this reach. In addition, Table 5.5 lists potential data gaps in areas of the downtown reach and the plan for filling them.

Table 5.5 Potential Upstream Data Gaps and Actions

Site/Area	River Mile	ECSI #	Potential Data Gap and Proposed Action
Central District Greenway	14.1 West	5277	Additional PCB sediment data riverward to bound the PCB detection of 1.6 mg/kg
Sellwood Bridge	16.1-16.5 West	NA	Sediment sampling to follow up on elevated fish tissue samples collected in 2012 by LWG. DEQ initiated follow-up with the former boat center owner from this area and the City of Portland.
Former Portland Shipbuilding Company/northern Willamette Park	15.5 West	5970	Downtown Reach Phase I investigation samples in the vicinity did not contain elevated PCBs, but samples are limited. Source control evaluation starting with surface sediment data to better characterize potential historical releases. DEQ completed a strategy recommendation for the site in June 2015 and concluded that this site is unlikely to be a source of elevated PCBs measured in the 2012 fish tissue study.
Outfall Drainage Basins • WR-309 • WR-315 • ~~OF 8A~~ OF 36 • ~~OF 28~~ OF 37 OF 40	• 12.1 East • 12.5 East • ~~12.9 West~~ • ~~15.1 East~~	NA	For outfalls that continue to discharge to areas with elevated CoCs in river sediment, video storm lines to assess sediment accumulation, sample and analyze accumulated sediment, and remove, as warranted by analysis. DEQ refined the list of outfalls for further investigation to: ODOT WR-309 & WR-315 and City OFs 36, 37 & 40; and initiated discussions with ODOT & the City to investigate them.

Table 5.5 Potential Upstream Data Gaps and Actions (continued)

Site/Area	River Mile	ECSI #	Potential Data Gap and Proposed Action
Downtown Reach	12 - 16 East & West	NA	Sediment traps were deployed by LWG in 2007 at approximately RM 11 and RM 16 and by the City in 2009 between RM 11 and 12. Data collected at RM 12 likely reflects pre-cleanup conditions. Deploy sediment traps to better understand current conditions following in-river cleanups at Zidell, CD Greenway, PGE RM 13 and Portland Gas Mfg. DEQ requested EPA to include these sediment traps into the long-term monitoring plan for Portland Harbor.

5.6 Loading Analysis and Recontamination Evaluation

As noted in Section 1.2 of this report, DEQ and EPA agreed to a joint framework and are jointly developing an approach for demonstrating prevention of recontamination (EPA 2013a). The agreed to approach is based on the JSCS, EPA National Guidance, emerging information from recontaminated sediment sites and Proposed Plan/Record of Decision examples in Washington and New York. In keeping with these resources and examples, DEQ's assessment of recontamination is a lines and weight of evidence approach, which is largely qualitative, and will be enhanced by more quantitative information, as needed.

Very large volumes of water and sediment that travel down the Willamette River and into the study area far surpass the combined volumes of water and sediment discharged through all outfalls into the study area. Furthermore, industrial sources were separated in the 1950s, combined sewage overflows were controlled in 2000-2011, 50% of the area draining to the Harbor is derived from forested open space, more than 70% of the developed land draining to the study area has undergone stormwater investigation and control, and modeling by the LWG and at several upland sites indicates that bedload volumes mask the potential for recontamination by contemporaneous stormwater from almost all areas. DEQ is confident that the qualitative information developed to date demonstrates that stormwater will not recontaminate the sediment remedy in Portland Harbor.

However, as one pathway that has resulted in recontamination at other sediment sites, a stormwater site-level recontamination evaluation framework was developed by EPA's contractor, with input from DEQ, and is being applied at select sites. The intended use of the framework is for developing more quantitative information at some sites to enhance the robustness of the overall recontamination evaluation, as needed. Potential opportunities for developing more quantitative loading analyses include: the EPA-led remedial design phase of the in-water remedy; and, modeling of cumulative contributions from multiple sites discharging to the river. It will be important to understand the potential loads discharging to hydrodynamically different areas of the river, specifically the Swan Island Lagoon and the International Slip, as well as targeting key areas where greater potential loads were likely discharged, for example in the highly industrialized Doane Lake, Guilds Lake and river mile 11 East areas. Robust data quality objectives applied at these areas can help confirm qualitative assumptions and inform the long-term monitoring plan development. Coupled with additional baseline loading data collected Harbor-wide during the remedial design phase of the in-water remedy, a course can be laid for confirming both source control and in-water remedy effectiveness. DEQ will continue to work with EPA to build and refine an integrated long-term monitoring and responsive management plan that allows swift actions on a case-by-case basis,

should upland or in-water recontamination threats to the remedy be identified following source control completion and in-water remedy implementation.

6.0 Source Control Conclusions

In accordance with DEQ's role under the 2001 MOU and further direction by EPA Region 10, this report details how DEQ has met goal one and is on track to meet goal two of the agreed to source control process established by the 2005 JSCS, which are:

1. To complete determinations of the need for source control measures at all upland sites within the study area; and,
2. To have needed measures in place prior to implementation of CERCLA in-water remedies, in order to prevent likely future adverse effects on water or sediment quality (EPA & DEQ 2005).

DEQ comprehensively applied the source control framework of the JSCS, as described above in Section 1.2 of this report, to identify, characterize and sufficiently control all potential sources of contaminants to the expanded Portland Harbor study area. DEQ identified approximately 495 commercial and industrial properties within the study area uplands. As described in Section 4.6 of this report and the associated figures, DEQ screened in 171 sites, or approximately 35% of the commercial and industrial properties within the Portland Harbor study area uplands, for further evaluation. DEQ excluded 63 sites as having no significant pathway for contaminant transport to Portland Harbor. DEQ implemented source control measures for one or more pathway at 105 sites and completed source control decisions (including exclusions) at approximately 100 of the sites evaluated and EPA completed source control at two additional sites. As of the date of this report, final actions, demonstration of effectiveness and decisions for 60% of upland sites have been completed. Controls are in place for all pathways and effectiveness demonstration is underway for 26 of the remaining 57 sites, with source control decisions anticipated by 2016 and 2017, which will confirm control of 75% of the sites evaluated. Plans are in place or under development to complete implementation of controls at the remaining 23% of sites evaluated by DEQ prior to or in conjunction with the in-water remedy. The three upland sites with uncontrolled pathways that EPA is leading make up the final 2% of sites and also need completed investigation and implementation of any needed controls. Comprehensive investigation and stormwater controls were applied at more than 70% of the developed area draining to Portland Harbor and on-going regulation of stormwater discharges under the NPDES program will continue to monitor and improve discharges to protect the water column and sediment of the river. In addition to source control within the study area uplands, DEQ completed evaluations and cleanup at eight upland sites, in-water evaluations at nine sediment areas, and undertook cleanup actions at six sediment areas in the "Downtown Reach" of the Willamette River, immediately upstream of Portland Harbor.

As summarized in Section 1.3 of this report, DEQ's evaluation of the potential for recontamination of the eventual in-water sediment remedy in Portland Harbor considers multiple lines of evidence, including:

- Contaminants found in sediment off shore of sites;
- Contaminants found on sites and the behavior of these contaminants in and at the interfaces of the media present on the sites;
- Sufficiency of effective source control work completed;
- Geographical and climatic setting;

- Density, distribution and type of development present;
- Regulatory programs in place; and,
- Adaptive management opportunities.

Site by site determinations on recontamination potential are tabulated in Section 4.6 of the report, with additional text details on all high and medium priority pathway sites and those working under EPA oversight for source control. Georegion-level recontamination potential conclusions, considering the lines of evidence listed above, are provided at the end of each georegion section. When viewed on a Harbor-wide basis, these conclusions strongly support a low potential for recontamination of remediated sediment and represent acceptable risk to Willamette River receptors, provided that all planned source control measures and bank remediation to be integrated with the in-water remedy are completed and demonstrated to be effective. As discussed in Section 5 of this report, DEQ has plans in place to complete implementation of remaining source control measures and to track this progress and effectiveness. DEQ recommends that EPA assign project managers and adopt a similar approach for completing implementation of any needed controls and effectiveness demonstrations at the EPA-led upland sites with as yet uncontrolled pathways. DEQ also intends to conduct further investigations to fill the identified data gaps and to continue to collaborate with EPA on development and implementation of a long term monitoring and responsive management plan. This plan is anticipated to employ multiple lines of evidence, including comprehensive baseline sampling and analysis, to demonstrate source control and remedy effectiveness and to monitor for recontamination. The plan will also include a process for adaptive response to any additional remedial actions or corrective measures that may become warranted as monitoring data indicate.

Regardless of where in-water remedial actions are implemented in Portland Harbor and which cleanup levels are used to assess recontamination and risk to river receptors, source control efforts in the uplands surrounding and upstream of the study area will be sufficient to prevent sediment recontamination and unacceptable risk to receptors from upland-related discharges. Therefore, implementation of the proposed in-water remedial actions should go forward.

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Figure 4.1

PORTLAND HARBOR STUDY AREA

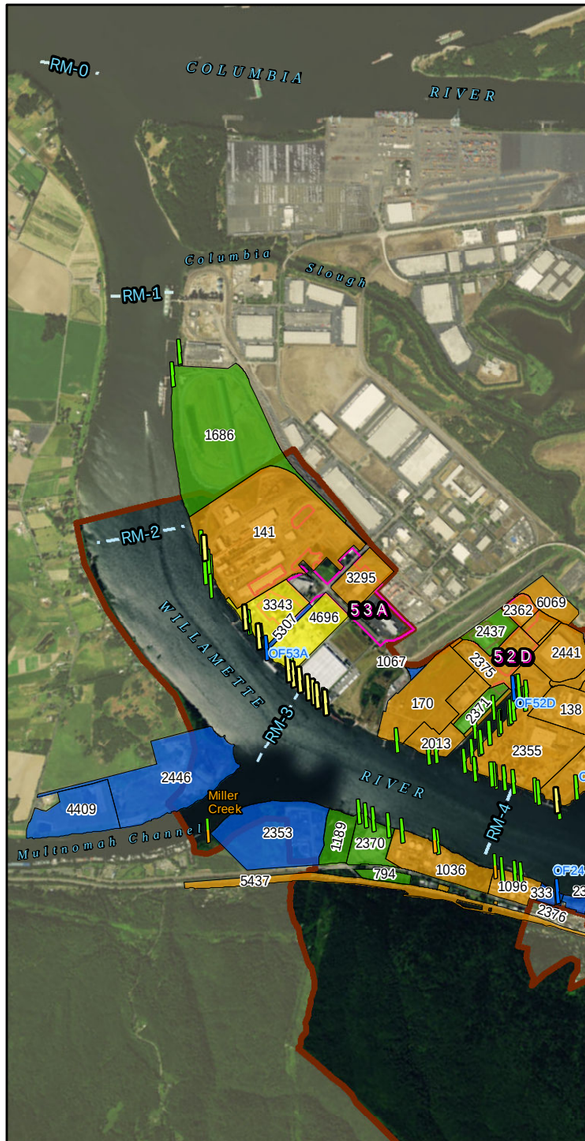
Status of Stormwater Source Control Evaluations January 2016

DEQ
State of Oregon Department of Environmental Quality

LEGEND

- Source Control Evaluation Not Needed
- Source Control Decision / No Further Action Issued
- Need for Source Control Evaluation to be Determined / Low Priority
- Source Control Evaluation In Progress
- Source Control Evaluation Needed
- EPA Lead
- 1840 Environmental Cleanup Site (ECSI)
- 43 City Stormwater Basin Boundary
- Portland Harbor Watershed Boundary
- RM-4 Willamette River Mile
- City of Portland Outfall
- ODOT Outfall
- ODOT Contribution to Outfall
- Port of Portland Outfall
- Private Outfall

* Not all outfalls depicted are currently active.



0 0.25 0.5 0.75 1 Miles

0 2,000 4,000 6,000 Feet

Environmental Cleanup Sites from OR DEQ Environmental Cleanup Site Inventory (ECSI) database.
Taxlots from Metro RLIS. Outfalls from City of Portland BES.

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

PORTLAND HARBOR STUDY AREA

Identified Groundwater Plumes
January 2016

DEQ
State of Oregon
Department of
Environmental
Quality

LEGEND

- Groundwater Source Control Evaluation Sites
- Groundwater Plume
- EPA Lead
- 1840 Environmental Cleanup Site (ECSI)
- RM-4 Willamette River Mile
- Plume Contained or Treated or No Control Needed

0 0.25 0.5 0.75 1 Miles

0 2,000 4,000 6,000 Feet

N

Environmental Cleanup Sites from OR DEQ Environmental Cleanup Site Inventory (ECSI) database.
Taxlots from Metro RLIS.

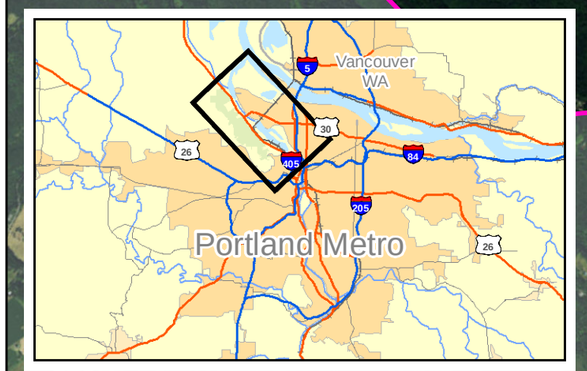
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, & User Community

PORTLAND HARBOR STUDY AREA GEOREGIONS

LEGEND

- Albina
- Doane Lake/Willbridge Areas
- Guilds Lake Industrial Area
- Linnton Area
- Pearl
- Rivergate
- St. Johns
- Swan Island/Mocks Bottom
- T-4/International Slip
- Georegion Boundary
- ODOT Project Area/Contribution - Highway runoff flows to multiple City or private outfalls
- EPA Lead
- City of Portland Outfall
- ODOT Outfall
- ODOT Contribution to Outfall
- Port of Portland Outfall
- Private Outfall

* Not all outfalls depicted are currently active.



0 0.25 0.5 0.75 1 Miles

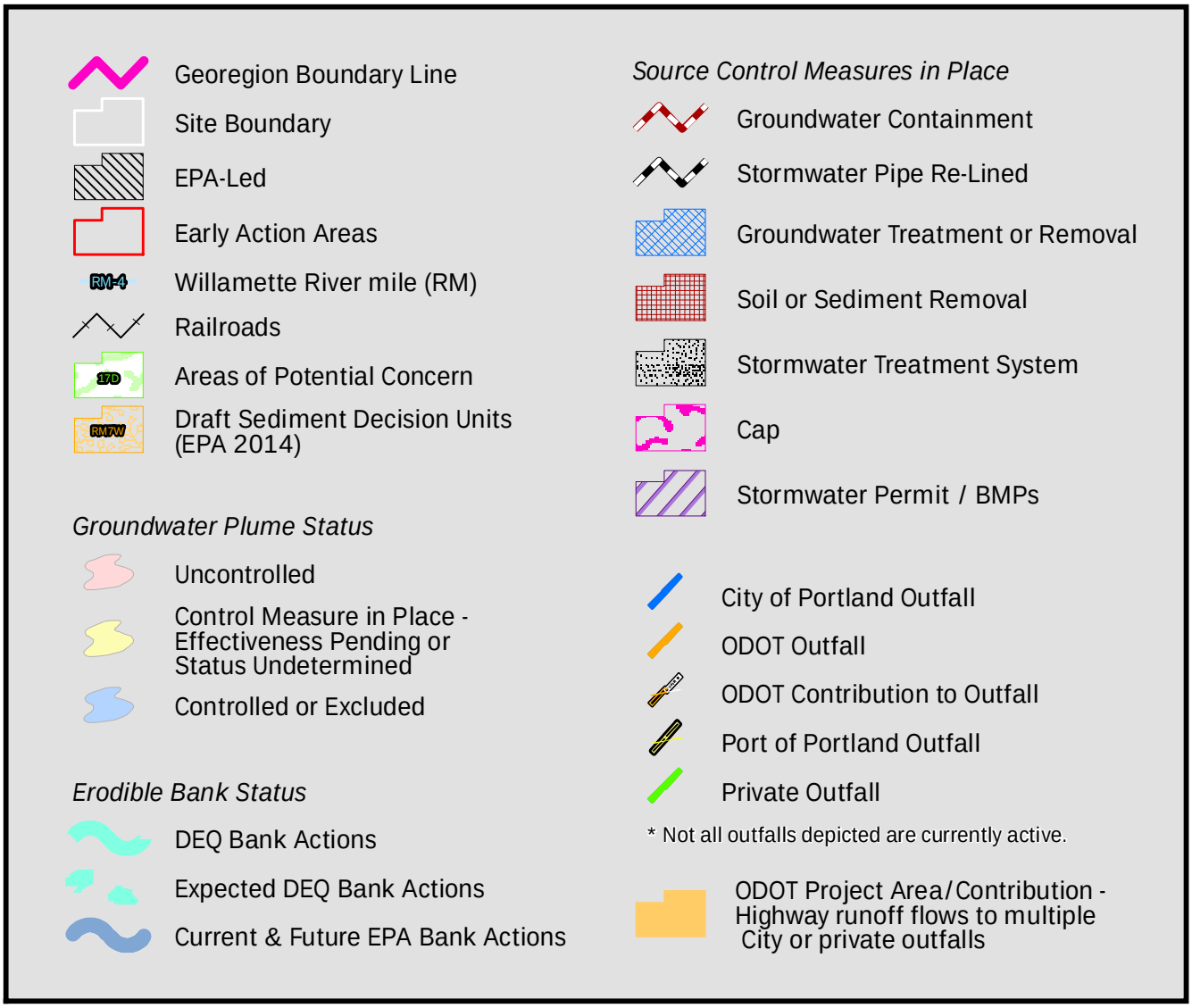
0 2,000 4,000 6,000 Feet

Environmental Cleanup Sites from OR DEQ Environmental Cleanup Site Inventory (ECSI) database.
Taxlots from Metro RLIS. Outfalls from City of Portland BES.

DEQ
State of Oregon
Department of Environmental Quality

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

PORTLAND HARBOR GEOGRAPHIC REGION MAPS
KEY TO SYMBOLS



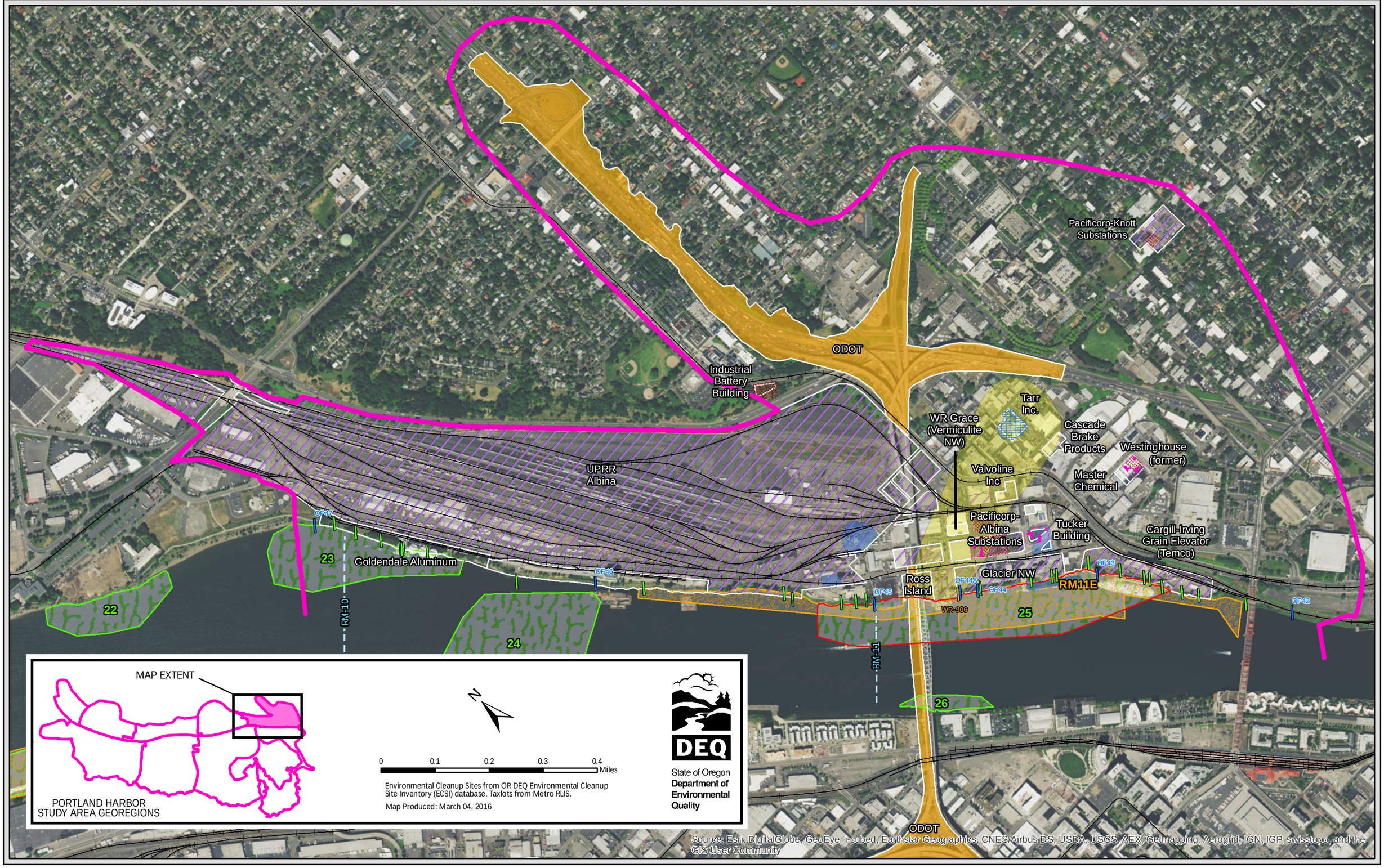
DEQ

State of Oregon
Department of Environmental Quality

Environmental Cleanup Sites from OR DEQ Environmental Cleanup Site Inventory (ECSI) database.
Taxlots from Metro RLIS. Outfalls from City of Portland BES.
Date: 3/7/2016

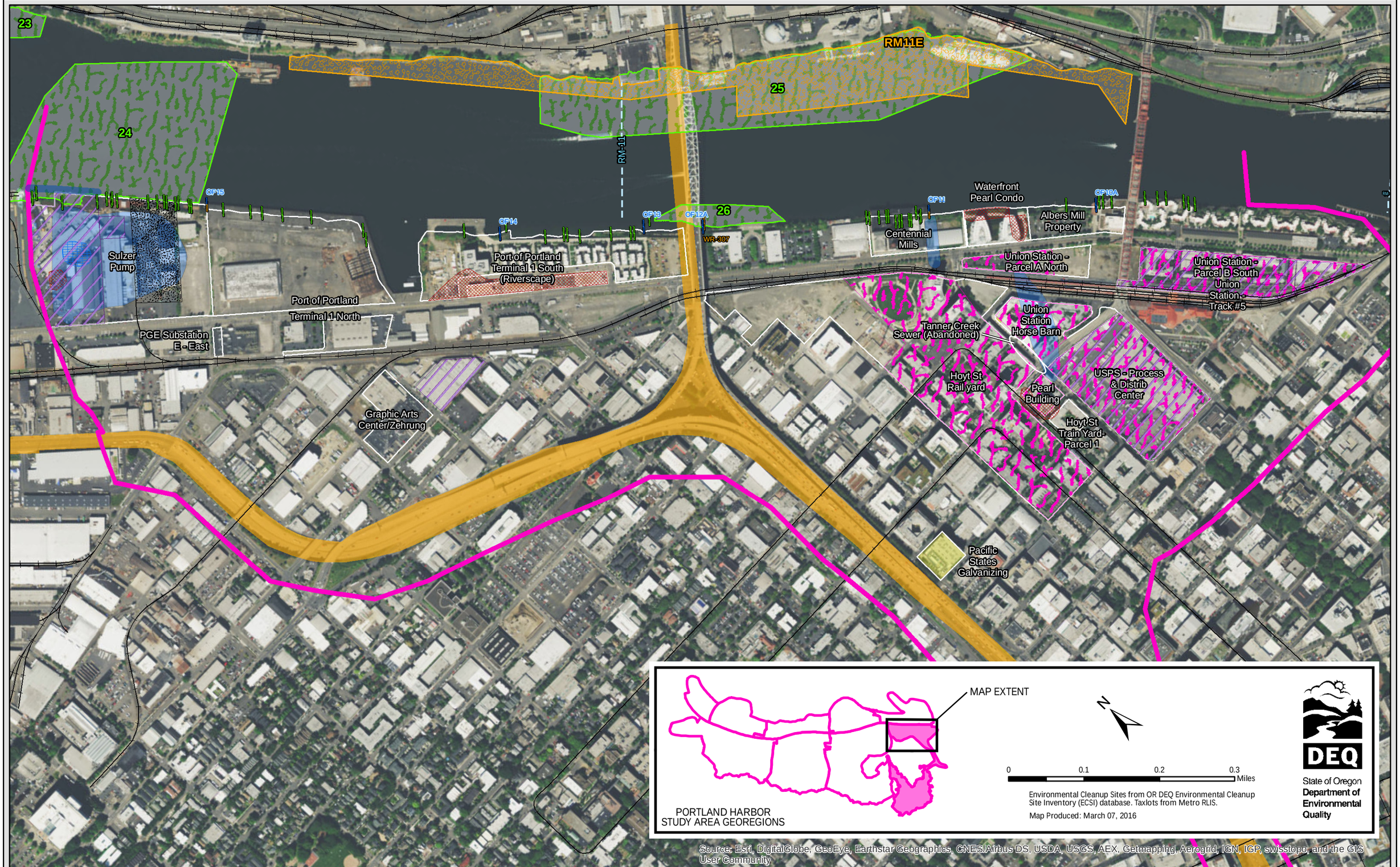
ALBINA GEOGRAPHIC REGION

Figure 4.6.1



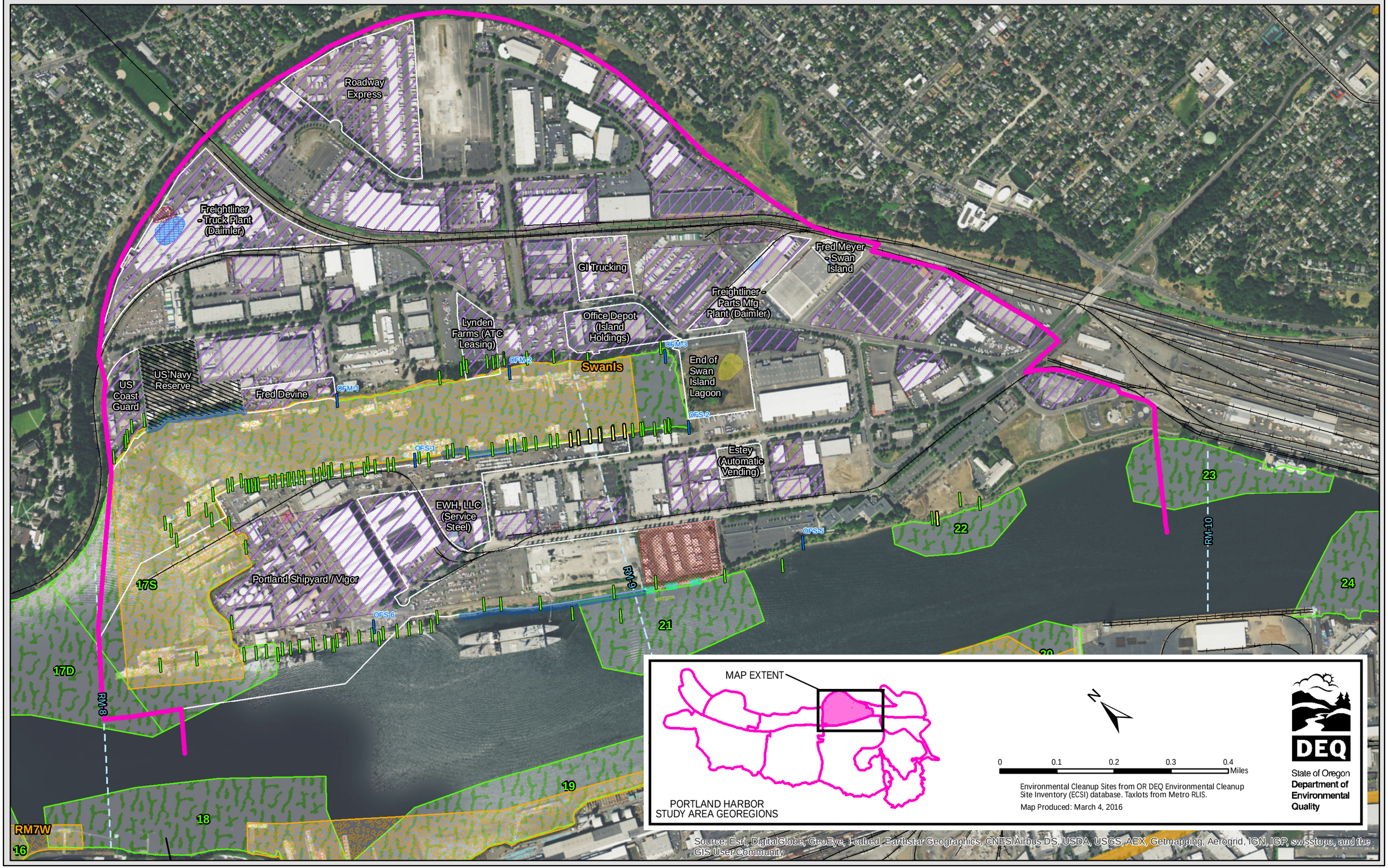
PEARL DISTRICT GEOGRAPHIC REGION

Figure 4.6.2



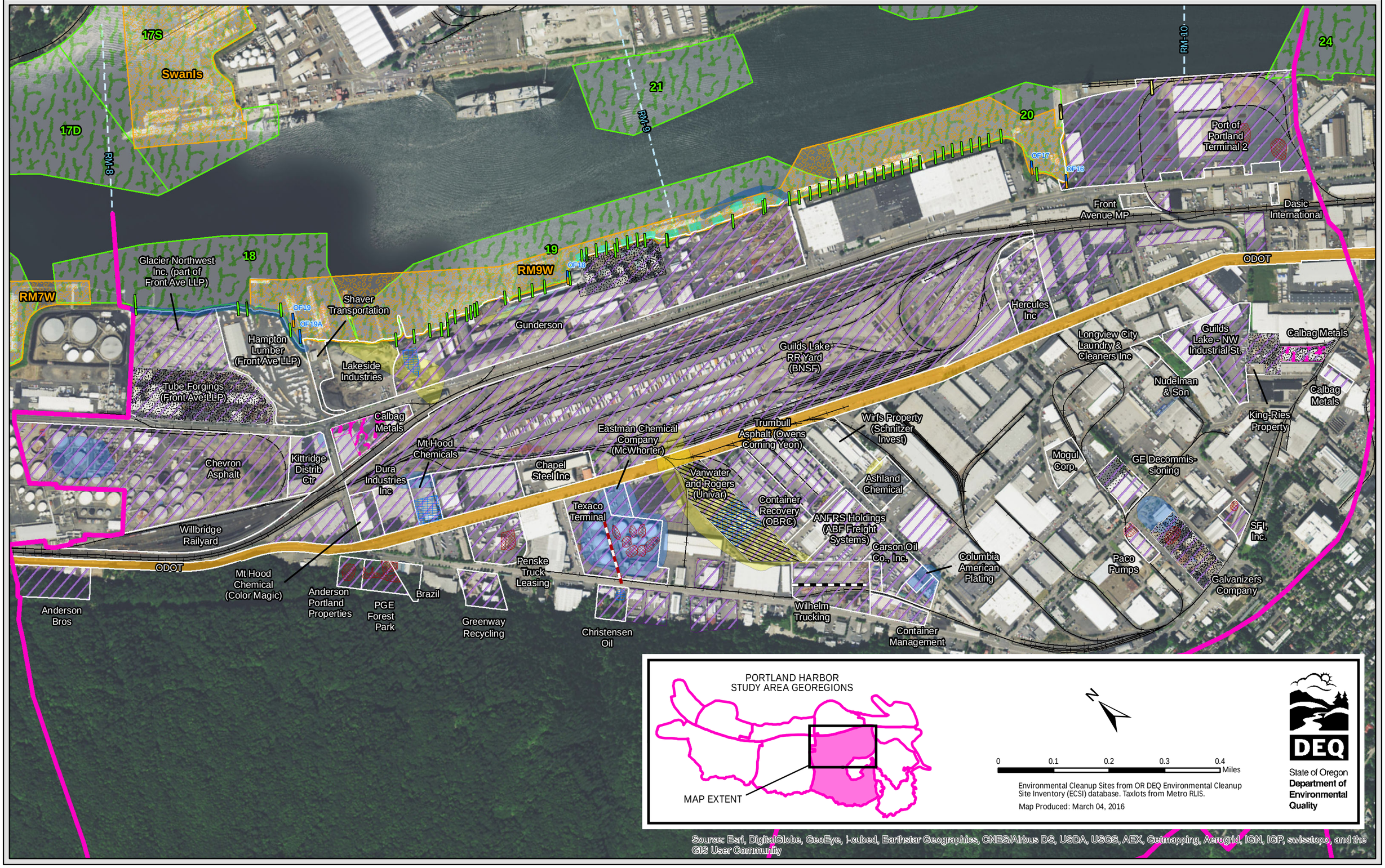
SWAN ISLAND / MOCKS BOTTOM GEOGRAPHIC REGION

Figure 4.6.3



GUILDS LAKE GEOGRAPHIC REGION

Figure 4.6.4



ST JOHNS GEOGRAPHIC REGION

Figure 4.6.5

St. Johns Site
Unocal SS 3911
Willamette Cove
McCormick & Baxter
Triangle Park
Swanis
17S
17D
15
OF48
Triangle Park
RM6.5E
13
OF49
Peninsula Iron Wks
Crawford St Corp
MarCom North
MarCom South
OF52A
City of Portland BES Lab
OF50
OF52
11
RM5.5E
12
RM-6
RM-7
14
RM-8
16
18
RM7W
9U
RM6Nav

MAP EXTENT

PORTLAND HARBOR
STUDY AREA GEOREGIONS

0 0.1 0.2 0.3 0.4 Miles

Environmental Cleanup Sites from OR DEQ Environmental Cleanup Site Inventory (ECSI) database. Taxlots from Metro RLIS.

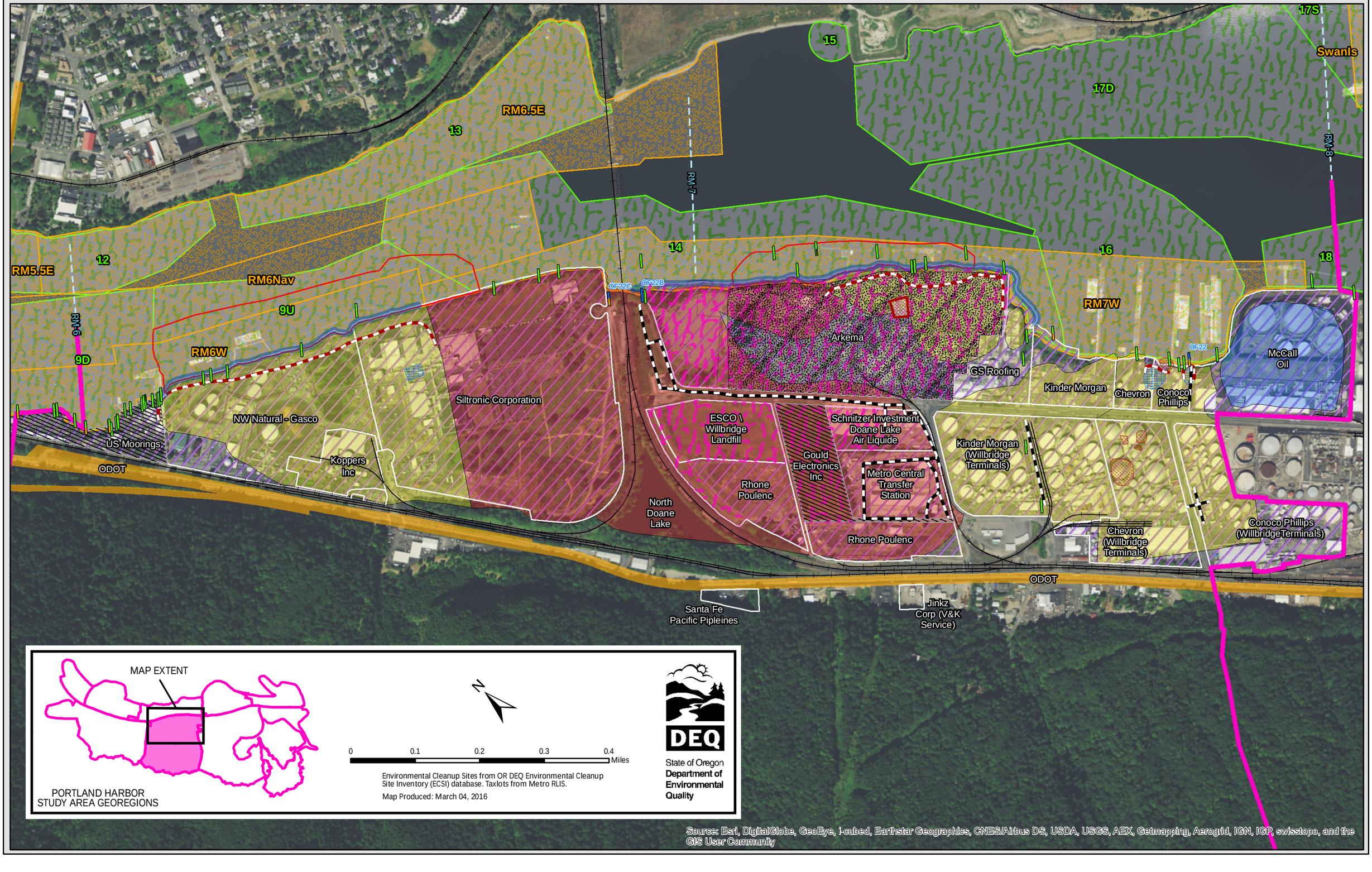
Map Produced: March 21, 2016

DEQ
State of Oregon
Department of Environmental Quality

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

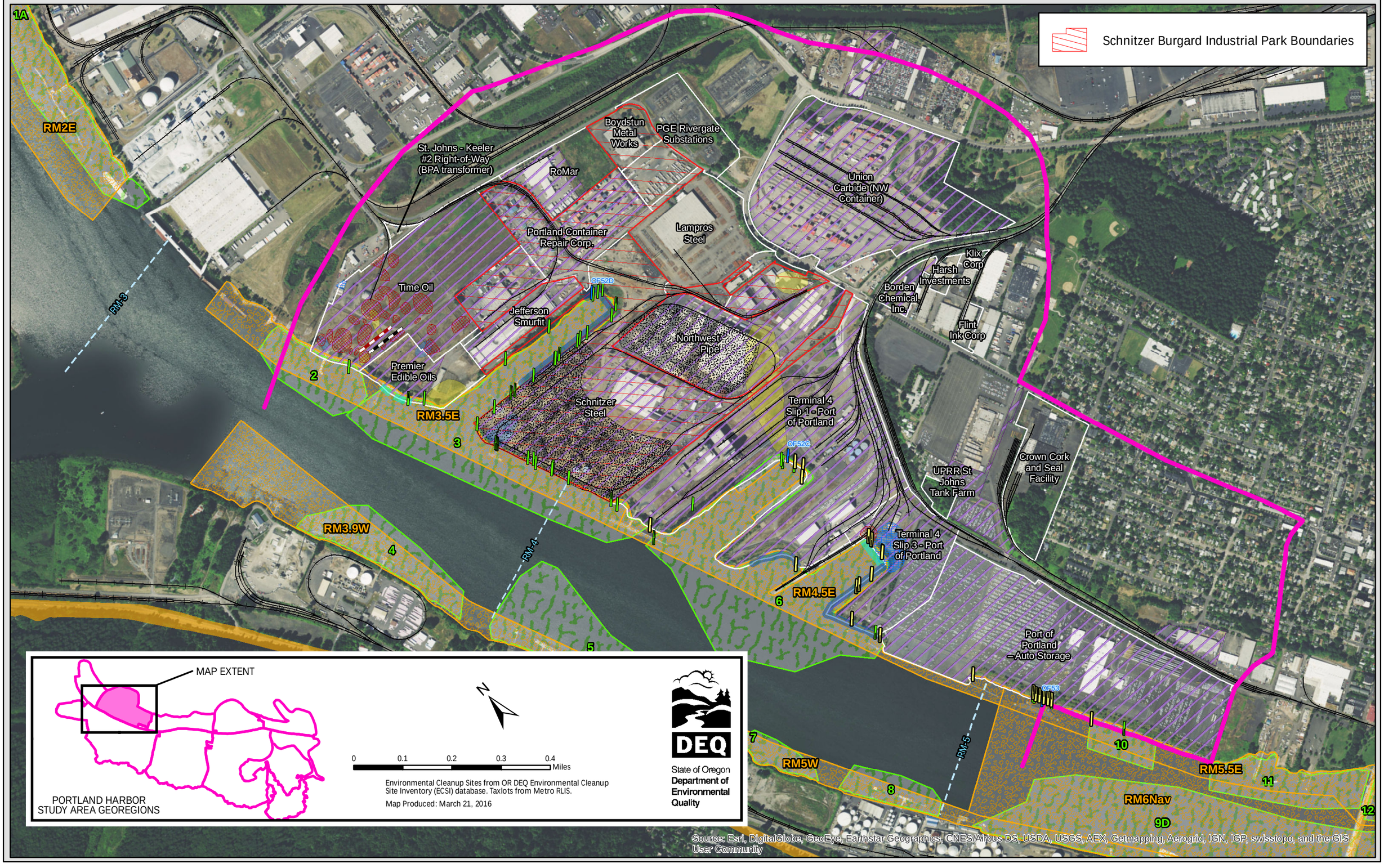
DOANE LAKE/WILLBRIDGE GEOGRAPHIC REGION

Figure 4.6.6



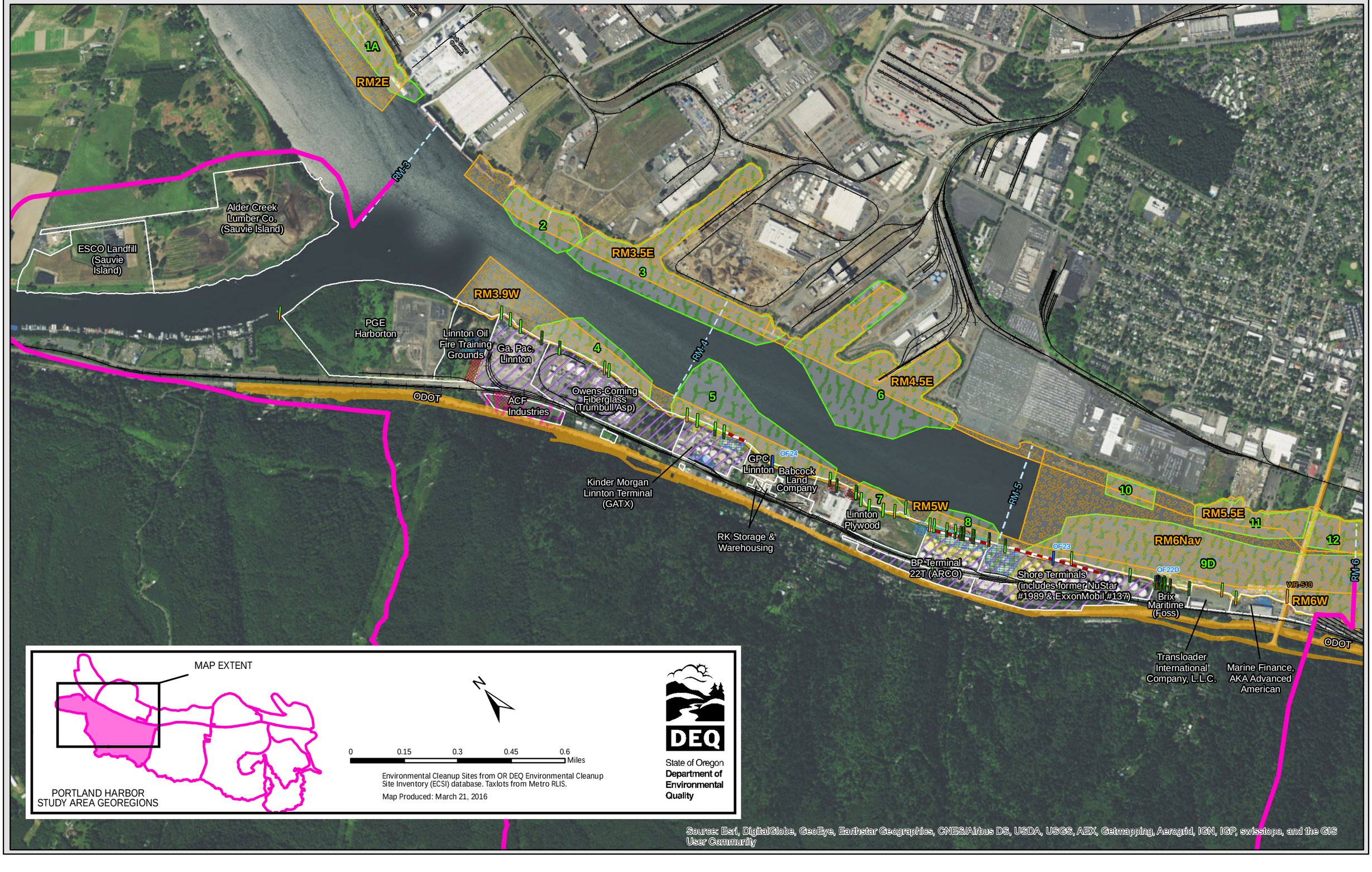
T-4 / INTERNATIONAL SLIP GEOGRAPHIC REGION

Figure 4.6.7



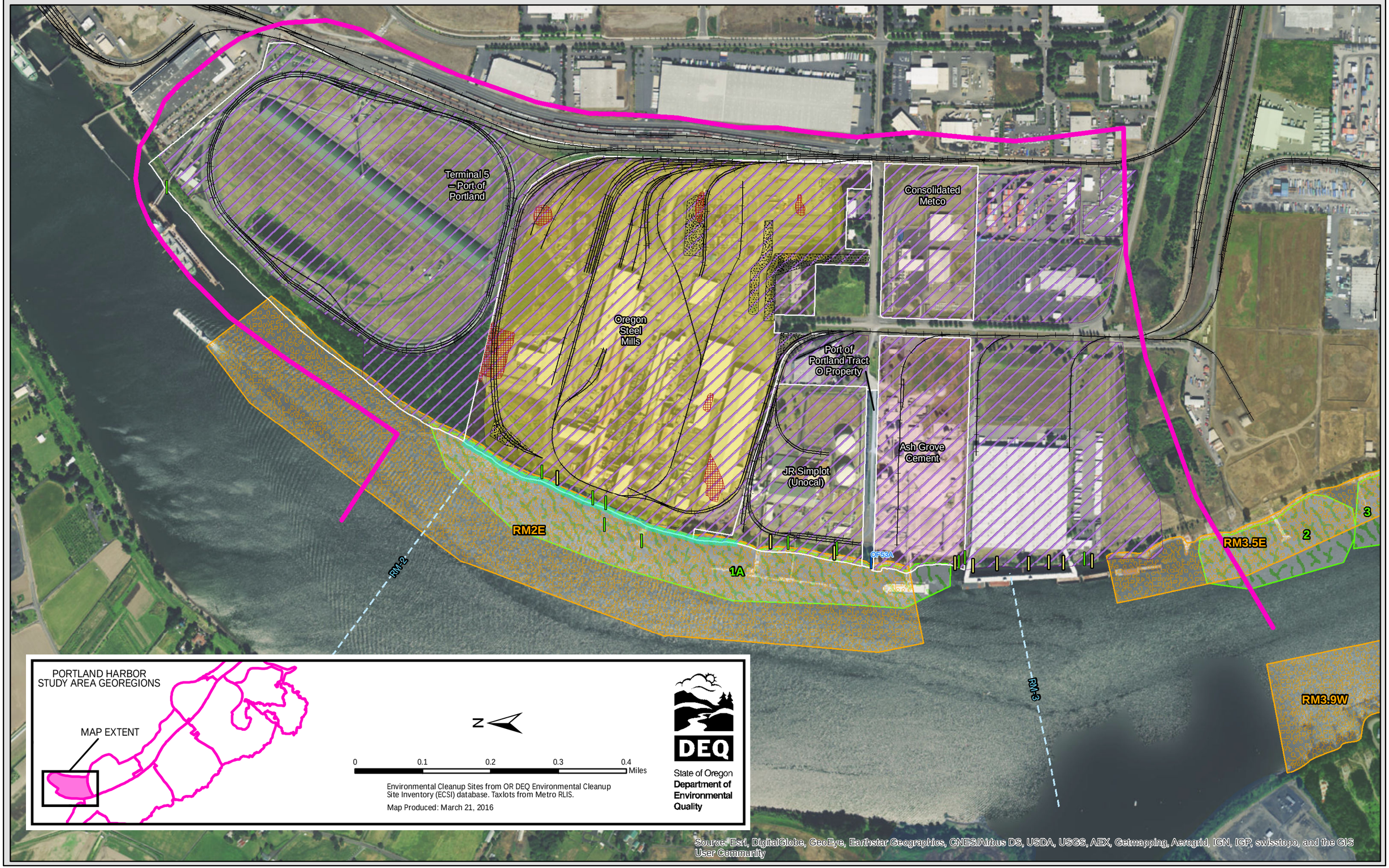
LINNTON AREA GEOGRAPHIC REGION

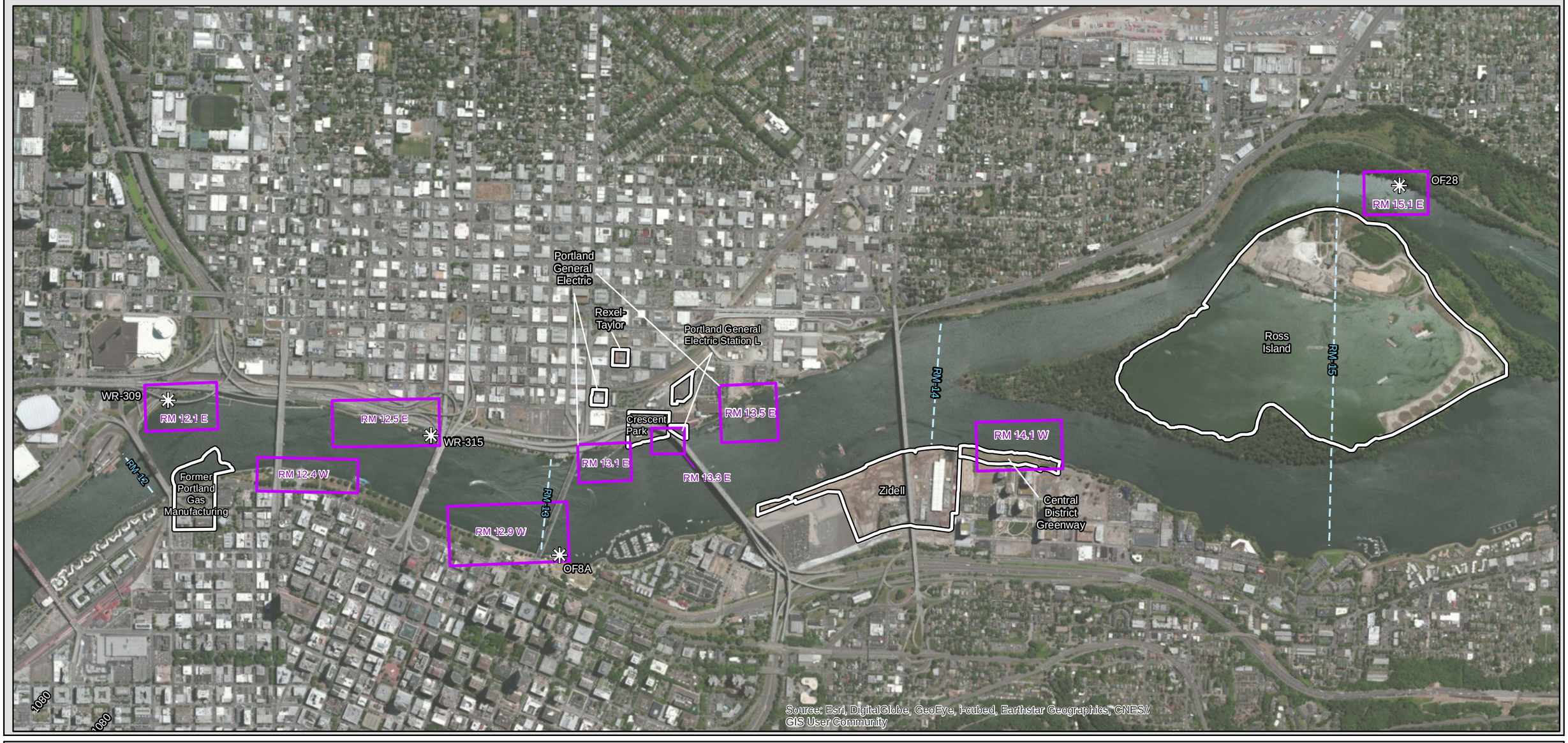
Figure 4.6.8



RIVERGATE GEOGRAPHIC REGION

Figure 4.6.9





UPSTREAM SEDIMENT AND UPLAND SITES

DEQ
State of Oregon
Department of Environmental Quality

Downtown Reach Sediment Investigation Focus Areas

Site Boundary

Outfall Location

N

0 0.1 0.2 0.3 0.4 0.5 Miles

Environmental Cleanup Sites from OR DEQ Environmental Cleanup Site Inventory (ECSI) database. Taxlots from Metro RLIS. Outfalls from City of Portland BES.
Map Produced: November 19, 2014