# Lower Duwamish Waterway
# RM 1.0 to 1.3 West
# (Kellogg Island to Lafarge)

# Source Control Action Plan

## June 2011

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# (Kellogg Island to Lafarge)

# Source Control Action Plan


Produced by:

Toxics Cleanup Program
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# Executive Summary

The purpose of this Source Control Action Plan (SCAP) is to describe potential sources of contaminants to sediments along the Lower Duwamish Waterway (LDW) River Mile (RM) 1.0 to 1.3 West and to identify actions necessary to minimize recontamination of sediment after cleanup. This SCAP is based on a thorough review of information pertinent to sediment recontamination, as documented in *Summary of Existing Information and Identification of Data Gaps* (SAIC 2011).

The LDW, located in Seattle, Washington, was added to the National Priorities List (Superfund) by the U.S. Environmental Protection Agency (EPA) on September 13, 2001. Ecology added the site to the Washington State Hazardous Sites List on February 26, 2002. Chemicals of concern (COCs) found in waterway sediments include polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), metals, bis(2-ethylhexyl)phthalate, dioxins/furans, and organotin compounds. These COCs may pose threats to people, fish, and wildlife.

In December 2000, EPA and the Washington State Department of Ecology (Ecology) entered into an order with King County, the Port of Seattle, the City of Seattle, and The Boeing Company to perform a Remedial Investigation (RI) and Feasibility Study (FS) of sediment contamination in the waterway. EPA is the lead agency for the RI/FS. Ecology is the lead agency for controlling current sources of pollution to the site, in cooperation with the City of Seattle, King County, the Port of Seattle, the City of Tukwila, and EPA.

The RI Report (Windward 2010) used a combination of existing and newly collected data to identify potential human health and ecological risks, information needs, and high priority areas for cleanup. Seven candidate early action areas were initially identified (Windward 2003b). Ecology's *Lower Duwamish Waterway Source Control Status Report, 2003 to June 2007* (Ecology 2007a) and *Lower Duwamish Waterway Source Control Status Report, July 2007 to March 2008* (Ecology 2008a) identified another 16 areas where source control actions may be necessary. The Kellogg Island to Lafarge source control area was identified as one of these areas. One additional source control area was added by Ecology in 2010, for a total of 24 source control areas.

As part of source control efforts in the LDW, Ecology works with other members of the Source Control Work Group (SCWG) to develop SCAPs for terrestrial source control areas that are potential sources of contaminants to sediments that will or may require cleanup. The SCAP for each of these source control areas describes potential sources of sediment contaminants and the actions needed to control them, and it evaluates whether ongoing sources are present that could recontaminate sediments after cleanup. In addition, the SCAPs describe source control actions that are planned or currently underway, as well as sampling and monitoring activities that will be conducted to identify additional sources.

Sections 1 and 2 of this SCAP provide background information about the LDW site and the sediments associated with the Kellogg Island to Lafarge source control area. PCBs, PAHs, phthalates, dioxins/furans, and organotin compounds are considered to be the major COCs in sediments associated with the source control area. While this SCAP focuses on these COCs, other chemicals that could result in sediment recontamination will be addressed as sources are identified.

Section 3 contains the following: a description of potential sources of contaminants that may affect sediments associated with the Kellogg Island to Lafarge source control area, including stormwater discharges and other potential releases from the adjacent property; an evaluation of the significance of these potential sources; and an identification of the actions that are planned or underway to control potential contaminant sources. Section 4 discusses monitoring activities that will be conducted to identify additional sources and assess progress, and Section 5 describes how source control efforts will be tracked and reported. Section 6 lists documents reviewed during preparation of this SCAP.

Table ES-1 lists the source control actions that have been identified for the Kellogg Island to Lafarge source control area. This table includes a brief description of the potential contaminant sources for each property, source control activities to be conducted, parties involved in source control actions for each property or task, and milestone/target dates for completion of the identified action items. The milestones and targets are best-case scenarios based on consultation with the identified agencies or facilities. They reflect reasonably achievable schedules, and include the time required for planning, contracting, field work, laboratory analysis, and activities dependent on weather.

A removal action for sediment associated with the Kellogg Island to Lafarge source control area was not scheduled at the time this SCAP was prepared.

## Table ES-1. Source Control Actions — Kellogg Island to Lafarge Source Control Area

| Potential Sources | Action Items | Priority | Responsible Party(ies) | Status | Target Date |
|---|---|---|---|---|---|
| **Lafarge North America Inc. Seattle Outfalls** | | | | | |
| The Lafarge facility has recently made a transition from a cement manufacturing operation to cement grinding, blending, and shipping operation. Decreased demand for stormwater in the manufacturing process will require Lafarge to discharge stormwater to the LDW at a greater volume and frequency.<br><br>Additional sediment data have been collected as part of 2009 Lafarge maintenance dredging and *Surface Sediment Sampling at Outfalls in the Lower Duwamish Waterway (SAIC 2011, in preparation).*<br><br>As the plant transitions away from wet kiln production, the use of a 140,000-gallon above-ground storage tank, coal silo, and raw material storage areas remains unknown. | Request information from Lafarge regarding the status of Outfall 001/2139 and 004 from Lafarge. | Medium | Ecology | Planned | November 2011 |
| | Request information from Lafarge regarding the installation of an updated stormwater treatment system within 12 months of the NPDES permit renewal, as described in the SWPPP. | Medium | Ecology | Planned | November 2011 |
| | Ecology will review new sediment data from the 2009 Lafarge maintenance dredging and the *Surface Sediment Sampling at Outfalls in the Lower Duwamish Waterway (SAIC 2011, in preparation)* to determine if additional sediment sampling is needed for sediment characterization. | Medium | Ecology | Planned | November 2011 |
| | Conduct a follow-up business inspection of Lafarge to verify compliance with the corrective actions required by Ecology as a result of the June 2009 inspection, applicable regulations, and BMPs. | Low | Ecology | Planned | March 2012 |
| **Lafarge North America Inc. Seattle** (5400 West Marginal Way SW) | | | | | |
| Drum recycling and reclamation operations were performed at the property during World War II. This industrial activity is associated with soil and groundwater contamination at other locations in the LDW. The property was also the historical site of shipbuilding, a salvage yard, and a steel mill. Historical activities at the property may have resulted in soil and groundwater contamination. PCBs were detected at concentrations above WQC in a seep sample at the Lafarge property. Contaminants in seeps at the Lafarge property (if any) may be a source of contaminants to the LDW.<br><br>Little information was available regarding the potential presence of contamination behind the bulkhead. The potential for sediment recontamination via this pathway is unknown. | Review the response to the CERCLA Section 104(e) Supplemental Information Request sent to Lafarge. | Medium | Ecology | Planned | June 2012 |
| | Request Lafarge obtain environmental data to determine if soil and groundwater are contaminated due to historical drum recycling and reclamation activities at the Lafarge property. | Medium | Ecology | Planned | October 2012 |
| | Request Lafarge collect additional seep samples to better characterize groundwater being discharged into the LDW. Seep samples will be analyzed for sediment COCs, including PCBs. | Medium | Ecology | Planned | October 2012 |
| | Request Lafarge provide additional information about the composition of material behind the bulkhead and whether or not bulkhead repairs were completed during 2006. | Low | Ecology | Planned | November 2011 |
| | Request Lafarge provide additional information about the nature and composition of material behind the bulkhead adjacent to the LDW. | Medium | Ecology | Planned | November 2011 |

**Priority:**

High priority action item — to be completed prior to sediment cleanup
Medium priority action item — to be completed prior to or concurrent with sediment cleanup
Low priority action item — ongoing actions or actions to be completed as resources become available

BMP = best management practice
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
COC = chemical of concern
LDW = Lower Duwamish Waterway
NPDES = National Pollutant Discharge Elimination System
SWPPP = Stormwater Pollution Prevention Plan
TBD = to be determined
WQC = water quality criteria

# Acknowledgements

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# Acronyms/Abbreviations

| | |
|---|---|
| µg/L | micrograms per liter |
| 2LAET | Second Lowest Apparent Effects Threshold |
| BART | Best Available Retrofit Technology |
| BMP | best management practice |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CKD | cement kiln dust |
| COC | chemical of concern |
| CSL | Cleanup Screening Level |
| CSO | combined sewer overflow |
| DW | dry weight |
| DMMU | dredged material management unit |
| EAA | Early Action Area |
| Ecology | Washington State Department of Ecology |
| EOF | emergency overflow |
| EPA | United States Environmental Protection Agency |
| FS | Feasibility Study |
| HPAH | high molecular weight polycyclic aromatic hydrocarbon |
| LAET | Lowest Apparent Effects Threshold |
| Lafarge | Lafarge North America Inc. |
| LDW | Lower Duwamish Waterway |
| LDWG | Lower Duwamish Waterway Group |
| mg/kg | milligrams per kilogram |
| MOU | Memorandum of Understanding |
| $NO_x$ | nitrogen oxide |
| NOAA | National Oceanic and Atmospheric Administration |
| NOV | Notice of Violation |
| NPDES | National Pollutant Discharge Elimination System |
| OC | organic carbon |
| PAH | polycyclic aromatic hydrocarbon |
| PCB | polychlorinated biphenyl |
| PSCAA | Puget Sound Clean Air Agency |
| RCRA | Resource Conservation and Recovery Act |
| RI | Remedial Investigation |
| RM | river mile |
| ROD | Record of Decision |
| SAIC | Science Applications International Corporation |
| SCAP | Source Control Action Plan |
| SCWG | Source Control Work Group |
| SD | storm drain |
| SMS | Sediment Management Standards |
| $SO_2$ | sulfur dioxide |
| SQS | Sediment Quality Standard |
| SWPPP | Stormwater Pollution Prevention Plan |
| TBD | to be determined |
| TEQ | Toxic Equivalency |
| TOC | total organic carbon |

| | |
|---|---|
| TPH | total petroleum hydrocarbons |
| UST | underground storage tank |
| VOC | volatile organic compound |
| WAC | Washington Administrative Code |
| WQC | water quality criteria |

# 1.0 Introduction

This Source Control Action Plan (SCAP) describes potential sources of contaminants that may affect sediments in and adjacent to the River Mile (RM) 1.0 to 1.3 West[1] (Kellogg Island to Lafarge) Source Control Area.[2] The purpose of this plan is to evaluate the significance of these sources and to determine if actions are needed to minimize the potential for recontamination of sediment associated with the Kellogg Island to Lafarge source control area after cleanup.[3] In addition, this SCAP describes:

- Source control actions/programs that are planned or currently underway,
- Sampling and monitoring activities that will be conducted to identify additional sources and assess progress, and
- How these source control efforts will be tracked and reported.

The information in this document was obtained from various sources, including the following documents:

- *Lower Duwamish Waterway, RM 1.0 to 1.3 West (Kellogg Island to Lafarge) — Summary of Existing Information and Identification of Data Gaps,* Science Applications International Corporation (SAIC), April 2011.
- *Lower Duwamish Waterway Source Control Strategy, Washington State Department of Ecology*, January 2004, located on Ecology's website: http://www.ecy.wa.gov/biblio/0409043.html

## 1.1 Organization of Document

Section 1 of this SCAP describes the Lower Duwamish Waterway (LDW) site, the strategy for source control, and the responsibilities of the public agencies involved in source control for the LDW. Section 2 provides background information on the Kellogg Island to Lafarge source control area, including a description of the chemicals of concern (COCs) for sediments. Section 3 provides an overview of potential sources of contaminants that may affect sediments associated with the Kellogg Island to Lafarge source control area, including stormwater discharges and other potential releases from the Lafarge property, which is the only property within the Kellogg Island to Lafarge source control area. Section 3 also describes actions planned or currently underway to control potential sources of contaminants, while Sections 4 and 5 describe monitoring and tracking/reporting activities, respectively. References are listed in Section 6, and figures and tables are presented at the end of the document.

As new information about the Lafarge North America, Inc. (Lafarge) property and potential sources discussed in this document becomes available and as source control progress is made,

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[1] River miles as defined in this report are measured from the southern tip of Harbor Island.
[2] This SCAP incorporates data published through April 2011. Section 5, Tracking and Reporting of Source Control Activities, describes how newer data will be disseminated.
[3] Cleanup options for the LDW are currently being developed as part of the Feasibility Study (FS). No sediment cleanup action has been identified for the RM 1.0 to 1.3 West source control area at this time.

the Washington State Department of Ecology (Ecology) will update the information in this SCAP as needed. The status of source control actions is summarized in the LDW Source Control Status Reports (Ecology 2007a, 2008a, 2008b, 2009 and as updated).

## 1.2 Lower Duwamish Waterway Site

The LDW is the downstream portion of the Duwamish River, extending from the southern tip of Harbor Island to just south of the Norfolk combined sewer overflow (CSO) (Figure 1). It is a major shipping route for bulk and containerized cargo. Most of the upland areas adjacent to the LDW have been developed for industrial and commercial operations. These include cargo handling and storage, marine construction, boat manufacturing, marina operations, concrete manufacturing, paper and metals fabrication, food processing, and aerospace manufacturing. In addition to industry, the river is used for fishing, recreation, and wildlife habitat. Residential areas near the waterway include the South Park and Georgetown neighborhoods.

Beginning in 1913, this portion of the Duwamish River was dredged and straightened to promote navigation and industrial development, resulting in the river's current form. Shoreline features within the waterway include constructed bulkheads, piers, wharves, buildings extending over the water, and steeply sloped banks armored with riprap or other fill materials (Weston 1999). This development left intertidal habitats dispersed in relatively small patches, with the exception of Kellogg Island, which is the largest contiguous area of intertidal habitat remaining in the Duwamish River (Tanner 1991). Over the past 20 years, public agencies and volunteer organizations have worked to restore intertidal and subtidal habitat to the river. Some of the largest restoration projects are at Herring House Park/Terminal 107, Turning Basin 3, Hamm Creek, and Terminal 105.

The presence of chemical contamination in the LDW has been recognized since the 1970s (Windward 2003a). In 1988, the United States Environmental Protection Agency (EPA) investigated sediments in the LDW as part of the Elliott Bay Action Program. Problem chemicals identified by the EPA study included metals, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), phthalates, and other organic compounds. In 1999, EPA completed a study of approximately 6 miles of the waterway, from the southern tip of Harbor Island to just south of the turning basin near the Norfolk CSO (Weston 1999). This study confirmed the presence of PCBs, PAHs, phthalates, mercury, and other metals. These contaminants may pose threats to people, fish, and wildlife.

In December 2000, EPA and Ecology signed an agreement with King County, the Port of Seattle, the City of Seattle, and The Boeing Company, collectively known as the Lower Duwamish Waterway Group (LDWG). Under the agreement, the LDWG is conducting a Remedial Investigation (RI) and Feasibility Study (FS) of the LDW to assess risks to human health and the environment and to evaluate cleanup alternatives. The RI for the site was done in two phases. Results of Phase 1 were published in July 2003 (Windward 2003a). The Phase 1 RI used existing data to characterize the nature and extent of chemical distributions in LDW sediments, develop preliminary risk estimates, and identify candidate sites for early cleanup action. The final RI was published in July 2010, and presents the results of investigations conducted for the LDW study area between 2003 and 2009, including studies to assess sediment dynamics, the nature and extent of contamination in the LDW, preliminary background concentrations, ecological and human health risks, and potential chemical sources (Windward 2010). An FS, which will address cleanup options for contaminated sediments in the LDW, is currently in progress.

On September 13, 2001, EPA added the LDW to its National Priorities List. This is EPA's list of hazardous waste sites that warrant further investigation and cleanup under Superfund. Ecology added the site to the Washington State Hazardous Sites List on February 26, 2002.

An interagency Memorandum of Understanding (MOU), signed by EPA and Ecology in April 2002 and updated in April 2004, divides responsibilities for the site (EPA and Ecology 2002, 2004). EPA is the lead agency for the RI/FS, while Ecology is the lead agency for source control issues.

In June 2003, the *Technical Memorandum: Data Analysis and Candidate Site Identification* (Windward 2003b) was issued. Seven candidate sites for early action (Early Action Areas [EAAs]) were initially identified (Figure 1). The sites are:

- Area 1: Duwamish/Diagonal CSO and storm drain (SD);
- Area 2: West side of the waterway, just south of the 1st Avenue S Bridge, approximately 2.2 miles from the south end of Harbor Island;
- Area 3: Slip 4, approximately 2.8 miles from the south end of Harbor Island;
- Area 4: South of Slip 4, on the east side of the waterway, just offshore of the Boeing Plant 2 and Jorgensen Forge properties, approximately 2.9 to 3.7 miles from the south end of Harbor Island;
- Area 5: Terminal 117 and adjacent properties, approximately 3.6 miles from the south end of Harbor Island, on the west side of the waterway;
- Area 6: East side of the waterway, approximately 3.8 miles from the south end of Harbor Island; and
- Area 7: Norfolk CSO/SD, on the east side of the waterway, approximately 4.9 to 5.5 miles from the south end of Harbor Island.

Of the seven candidate EAAs, five either had sponsors to begin investigations or were already under investigation by a member or group of members of the LDWG. These five sites are: Slip 4, Terminal 117, Boeing Plant 2, Duwamish/Diagonal CSO/SD, and Norfolk CSO/SD.[4] EPA is the lead agency for managing cleanup at Terminal 117 and Slip 4. The other three early action cleanup projects were started before the current LDW RI/FS was initiated. Cleanup at Boeing Plant 2, under EPA Resource Conservation and Recovery Act (RCRA) management, is currently in progress. The Duwamish/Diagonal CSO/SD and Norfolk CSO/SD cleanups are under King County management as part of the Elliott Bay–Duwamish Restoration Program. Cleanup at Duwamish/Diagonal was partially completed in March 2004; a partial sediment cleanup was conducted at Norfolk CSO/SD in 1999. An additional sediment removal action was completed by Boeing inshore of the Norfolk CSO/SD area in September 2003. Early action cleanups may

[4] These five sites are identified as EAAs in the Draft Final FS for the Lower Duwamish Waterway, published on October 15, 2010 (AECOM 2010). The two candidate EAAs without sponsors are identified in the Draft Final FS as Areas of Potential Concern.

involve members of the LDWG or other parties as appropriate. Planning and implementation of early action cleanups is being conducted concurrently with the RI/FS.

In 2007, Ecology, in consultation with EPA, identified eight additional source control areas based on available sediment data, size of the upland basin draining to the source control area, and general knowledge about facilities operating in the basin. In February 2008, Ecology identified the areas of the LDW not covered by a SCAP or planned SCAP. Using the same criteria as in 2007, eight additional potential source control areas were added to the list (Ecology 2008a). One additional source control area was added by Ecology in 2010, for a total of 24 source control areas. The Kellogg Island to Lafarge source control area was identified as one of these areas. Subsequently, Ecology and EPA redefined the boundaries of the source control areas, generally defined by stormwater drainage basins. The seven candidate EAAs and 17 additional source control areas are shown in Figure 1. Stormwater drainage basins located in the vicinity of the Kellogg Island to Lafarge source control area are shown on Figure 2.

Further information about the LDW can be found at:
http://yosemite.epa.gov/r10/cleanup.nsf/sites/lduwamish and
http://www.ecy.wa.gov/programs/tcp/sites_brochure/lower_duwamish/lower_duwamish_hp.html

## 1.3 LDW Source Control Strategy

The LDW Source Control Strategy (Ecology 2004) describes the process for identifying source control issues and implementing effective source controls for the LDW. The plan is to identify and manage sources of potential contamination and recontamination in coordination with sediment cleanups. The goal of the strategy is to minimize the potential for recontamination of sediments to levels exceeding the LDW sediment cleanup goals and the Washington State Sediment Management Standards (SMS).[5] Existing administrative and legal authorities will be used to perform inspections and require necessary source control actions.

The strategy is being implemented through the development of a series of detailed, area-specific SCAPs that will be coordinated with sediment cleanups, beginning with the EAAs. Each SCAP will document what is known about the area, the potential sources of recontamination, actions taken to address them, and how to determine when adequate source control is achieved for an area. Because the scope of source control for each site will vary, it is necessary to adapt each plan to the specific situation at that site. The success of this strategy depends on the coordination and cooperation of all public agencies with responsibility for source control in the LDW area, as well as prompt compliance by the businesses that must make necessary changes to control releases from their properties.

The source control strategy focuses on controlling contamination that affects LDW sediments. It is based on the principles of source control for sediment sites described in EPA's *Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites* (EPA 2002), and Ecology's SMS. The first principle is to control sources early, starting with identifying all ongoing sources of contaminants to the site. EPA's Record of Decision (ROD) for the LDW will require that sources of sediment contamination to the entire LDW be evaluated, investigated, and controlled

[5] Washington Administrative Code 173-204.

as necessary. Dividing source control work into specific SCAPs and prioritizing those plans to coordinate with sediment cleanups will address the guidance and regulations and will be consistent with the selected remedial actions in the EPA ROD.

Source control priorities are divided into four tiers. Tier 1 consists of source control actions associated with EAA sediment cleanups. Tier 2 consists of source control actions associated with cleanup areas identified in Phase 2 of the RI/FS and EPA's ROD. Tier 3 consists of source control actions necessary to prevent future sediment contamination from basins that may not drain directly to an identified sediment cleanup area. Tier 4 consists of source control actions necessary to address any recontamination identified by post-cleanup sediment monitoring (Ecology 2008a). This document is a SCAP for a Tier 3 Source Control Area.

Further information about the LDW Source Control Strategy can be found at:
http://www.ecy.wa.gov/biblio/0409052.html and
http://www.ecy.wa.gov/programs/tcp/sites_brochure/lower_duwamish/lower_duwamish_hp.html

## 1.4 Source Control Work Group

The primary public agencies responsible for source control for the LDW are Ecology, the City of Seattle, King County, Port of Seattle, City of Tukwila, and EPA. Ecology and EPA are involved in the source control activities for the Kellogg Island to Lafarge source control area.

In order to coordinate among these agencies, Ecology formed the Source Control Work Group (SCWG) in January 2002. The purpose of the SCWG is to share information, discuss strategy, actively participate in developing SCAPs, jointly implement source control measures, and share progress reports on source control activities for the LDW area. The monthly SCWG meetings are chaired by Ecology. All final decisions on source control actions and completeness will be made by Ecology, in consultation with EPA, as outlined in the April 2004 Ecology/EPA LDW MOU (EPA and Ecology 2004).

Other public agencies with relevant source control responsibilities include the Washington State Department of Transportation, Puget Sound Clean Air Agency (PSCAA), and the Seattle/King County Department of Public Health. These agencies are invited to participate in source control with the SCWG as appropriate (Ecology 2004).

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# 2.0 River Mile 1.0 to 1.3 West (Kellogg Island to Lafarge)

The Kellogg Island to Lafarge source control area is located along the western side of the LDW Superfund Site between 1.0 and 1.3 miles from the southern tip of Harbor Island (Figure 1). Elevated concentrations of chemicals, including PAHs, PCBs, phthalates, dioxins/furans, and organotin compounds have been measured in sediments associated with the source control area; these may be a result of historical or ongoing sources within the source control area. Chemicals may have entered the LDW through direct discharges, spills, bank erosion, groundwater discharge, surface water runoff, atmospheric deposition, or other non-point source discharges.

The RM 1.0 to 1.3 West (Kellogg Island to Lafarge) source control area extends from RM 1.0 to approximately 150 to 200 feet south of RM 1.2 West (Figure 1). The Lafarge property is the only property located within the Kellogg Island to Lafarge source control area (Figure 3). The Kellogg Island to Lafarge source control area is bordered by West Marginal Way SW and Burlington Northern Railroad to the west, and by the LDW to the north and east.

The Chemithon Corporation is located to the southwest and Alaska Marine Lines is immediately south of the Kellogg Island to Lafarge source control area. Chemithon Corporation and Alaska Marine Lines are discussed as part of the Glacier Bay (RM 1.3 to 1.6 West) source control area.[6]

In the late 1800s and early 1900s, extensive topographic modifications were made to the Duwamish River to create a straightened channel; many of the current side slips are remnants of old river meanders. The site consists of several feet of manmade hydraulic fill underlain by silt, sand, and clay deposits (Shannon and Wilson 1965). Historically, the source control area was marsh and intertidal land until it was filled in 1921 during channel construction (Harper-Owes 1985). Groundwater in the Duwamish Valley alluvium is typically encountered within about 3 meters (10 feet) of the ground surface and under unconfined conditions (Windward 2010). The general direction of groundwater flow is toward the LDW, although the direction may vary locally depending on the nature of the subsurface material, and temporally, based on proximity to the LDW and the influence of tidal action.

LDW sediments in the vicinity of the Kellogg Island to Lafarge source control area range from greater than 80 percent fines near RM 1.0 West to 45–75 percent fines at the upstream end of the source control area, with isolated patches of finer and coarser material. Total organic carbon (TOC) ranges from 0.09–4.12 percent (Windward 2003a).

Four active outfalls, four abandoned outfalls, and two seeps were identified along the shoreline within the Kellogg Island to Lafarge source control area (Figure 3) (Windward 2010).

[6] A SCAP was published for the Glacier Bay source control area in November 2007 (Ecology 2007b).

## 2.1 Chemicals of Concern in Sediment

Several environmental investigations have included the collection of sediment associated with the Kellogg Island to Lafarge source control area (Figure 4), including the following:

- Eight surface samples were collected as part of a National Oceanic and Atmospheric Administration (NOAA) sediment characterization of the Duwamish River in 1997 (NOAA 1998);
- Nine surface sediment samples were collected during an EPA Site Inspection in 1998 (Weston 1999);
- Six surface sediment samples were collected near the source control area during Rounds 1,2, and 3 of the LDW Phase 2 RI during January and March 2005, and October 2006 (Windward 2005a, 2005b, 2007b); and
- Twenty samples from three subsurface sediment cores were collected near the source control area during February 2006 (Windward 2007a).
- Thirteen samples from twelve subsurface sediment cores were collected as part of the Lafarge Phase 2 Maintenance Dredging[7] during October 2009 (Gathard 2010).
- Five surface sediment samples in the vicinity of the Lafarge property as part of the *Surface Sediment Sampling at Outfalls in the Lower Duwamish Waterway* during March 2011 (SAIC 2011, in preparation). Validated sampling results were not available during the preparation of this SCAP.

Sediment data associated with the Kellogg Island to Lafarge source control area are detailed in the *Summary of Existing Information and Identification of Data Gaps* (SAIC 2011a), referred to in this document as the Kellogg Island to Lafarge Data Gaps Report. Chemical data were compared to the SMS, which include both the Sediment Quality Standards (SQS) and Cleanup Screening Levels (CSLs) criteria of the SMS (Washington Administrative Code [WAC] 173-204). The results of this comparison are provided in Tables 1 and 2. Sediments with chemical concentrations below the SQS criteria have a low likelihood of adverse effects on sediment-dwelling biological resources. However, an exceedance of the SQS numerical criteria does not necessarily indicate adverse effects or toxicity, and the degree of SQS exceedance does not correspond to the level of sediment toxicity. The CSL criteria are greater than or equal to the SQS criteria and represent a higher level of risk to benthic organisms than the SQS. The SQS and CSL criteria provide a basis for identifying sediments that may pose a risk to some ecological receptors. The SMS for most organic chemicals are based on total organic carbon (OC)-normalized concentrations.

Dioxins and furans data were compared to the background concentrations of dioxins and furans as described in the *Lower Duwamish Waterway Remedial Investigation Report* (Windward 2010). The results of this comparison are provided in Tables 1 and 2.

[7] Twelve sediment cores from six dredged material management units (DMMU) were collected adjacent to Lafarge's east wharf. Two cores per DMMU were composited to form samples S1-CS through S6-CS. The Z layer from the two cores in each DMMU were composited to form samples S1-CSZ through S6-CSZ (Figure 4). A duplicate sample was collected from DMMU 3 for data validation (Gathard 2010).

As described above, COCs were identified based on the results of surface sediment sampling conducted between 1997 and 2006 in the vicinity of the Kellogg Island to Lafarge source control area. Chemicals that exceeded the SQS in at least one surface or subsurface sediment sample are considered COCs for the Kellogg Island to Lafarge source control area. Metals exceeded the SQS at three subsurface composite sample locations. The greatest exceedance was found in composite sample S5-CS, collected between Outfall 005 and 006. PAHs exceeded the SQS and CSL in surface sample DR050, located downstream of Outfall 004. Total PCBs exceeded the SQS in surface samples DR050 and LDW-SS322, collected near Outfall 004. Total PCBs exceeded the SQS at nine subsurface coring locations; with the greatest exceedance found at coring location LDW-SC19 at a depth of 6 to 7 feet below ground surface (Figure 4). Mammalian dioxin/furan toxic equivalency (TEQs) exceeded background concentrations in four surface samples and one subsurface sample. The greatest exceedance was found at surface sample location LDW-SS36 and subsurface sample location LDW-SC19 at a depth of 0 to 1 foot below ground surface (Figure 4).

Additional information on SQS/CSL exceedances is provided in the Kellogg Island to Lafarge Data Gaps Report (SAIC 2011).

The following chemicals are considered to be COCs in sediment for the Kellogg Island to Lafarge source control area:

| Chemicals Detected at Concentrations above the SQS/CSL | Surface Sediment | | | Subsurface Sediment | | |
|---|---|---|---|---|---|---|
| | >SQS | >CSL | >LDW Background | >SQS | >CSL | >LDW Background |
| Metals | | | | | | |
| Arsenic | | | | ● | ● | |
| Mercury | | | | ● | | |
| Zinc | | | | ● | | |
| PAHs | | | | | | |
| Benzo(a)anthracene | ● | | | | | |
| Chrysene | ● | | | | | |
| Fluoranthene | ● | ● | | | | |
| Pyrene | ● | ● | | | | |
| Total HPAH | ● | ● | | | | |
| PCBs | | | | | | |
| Total PCBs | ● | | | ● | ● | |
| Phthalate | | | | | | |
| Bis(2-ethylhexyl)phthalate | ● | | | | | |
| Dioxin/Furan TEQ | | | ● | | | ● |

HPAH = high molecular weight polycyclic aromatic hydrocarbon

In addition, although no sediment quality standards have been promulgated, pesticides and organotin compounds are also considered to be COCs at the Kellogg Island to Lafarge source control area. Composite subsurface samples collected during Lafarge maintenance dredging were compared to the Puget Sound Dredged Disposal Analysis (PSDDA) screening level for dichlorodiphenyltrichloroethane (DDT) (6.9 milligrams per kilogram [mg/kg] dry weight [DW]). Total DDT ranged from 11 to 51 mg/kg DW (Gathard 2010). Organotin compounds were detected at six surface sampling locations, with concentrations ranging from 0.0079 mg/kg DW to 0.17 mg/kg DW.

## 2.2 Potential Pathways to Sediment

Potential sources of COCs to sediments near the RM 1.0 to 1.3 West source control area include SD discharges, atmospheric deposition, historical soil and groundwater contamination, and sediment transport from upstream sources.

Transport pathways that could potentially contribute to the recontamination of sediments near the Kellogg Island to Lafarge source control area following remedial activities (if any) include direct discharges via outfalls, surface runoff (sheet flow), groundwater discharge, bank erosion, atmospheric deposition, and spills directly to the LDW. These pathways are described below and are discussed in more specific detail in Section 3.

### 2.2.1 Direct Discharges from Outfalls

SDs entering the LDW carry runoff generated by rain and snow. A wide range of chemicals may become dissolved or suspended in runoff as rainwater flows over the land. Urban areas may accumulate particulates, dust, oil, asphalt, rust, rubber, metals, pesticides, detergents, or other materials as a result of urban activities. These can be flushed into SDs during wet weather. SDs can also convey materials from businesses with permitted discharges (i.e., National Pollutant Discharge Elimination System [NPDES] industrial stormwater permits), vehicle washing, runoff from landscaped areas, erosion of contaminated soil, groundwater infiltration, and materials illegally dumped into the SD system.

Direct discharges may occur from public or private SD systems, CSOs, and emergency overflows (EOFs). As noted above, four active private outfalls and four abandoned outfalls are present in the Kellogg Island to Lafarge source control area (Figure 3) and are discussed in Section 3. One of the active outfalls (007) is owned by Chemithon (Lafarge 2010b) and was addressed in the SCAP for the Glacier Bay source control area (Ecology 2007b). The 1997 to 2006 sediment sampling locations near these outfalls are shown in Figure 4.

Contaminants discharged via these outfalls could directly affect waterway sediments. There are no CSO, EOF, or public outfalls within the Kellogg Island to Lafarge source control area.

### 2.2.2 Surface Runoff (Sheet Flow)

In areas lacking collection systems, spills or leaks on properties adjacent to the LDW could flow directly over impervious surfaces or through creeks and ditches to the waterway. Current operational practices at adjacent properties could potentially contribute to the movement of contaminants to the LDW via surface runoff. The Lafarge property has an extensive stormwater collection system for the treatment of stormwater before discharge (Figure 5). If the stormwater system exceeds capacity, surface runoff may result in transport of contaminants to sediment.

### 2.2.3 Groundwater Discharges

Contaminants in soil resulting from spills and releases to adjacent properties may be transported to groundwater and subsequently be released to the LDW. Approximately 90 percent of the Lafarge property is covered in pavement, buildings, or other structures.

Two seeps, one of which was sampled, were identified along the northern boundary of the Lafarge property (Figure 4) (Windward 2004). The total PCB concentration in the sample LDW-SP-64 was 0.46 micrograms per liter (µg/L), which exceeds the marine chronic water quality criterion (WQC) for PCBs (0.014 µg/L).

### 2.2.4 Bank Erosion

The banks of the LDW shoreline are susceptible to erosion by wind and surface water, particularly in areas where banks are steep. Shoreline armoring and the presence of vegetation reduce the potential for bank erosion. Contaminants in soils along the banks of the LDW, if present, could be released directly to sediments via erosion.

In 2006, the gravel sub grade behind Lafarge's bulkhead was washed away (Ortiz De Anaya 2009). Lafarge was granted a Joint Aquatic Resource permit to repair the damaged bulkhead (Army 2006). During a reconnaissance survey of the LDW in February 2011, it was observed that the Lafarge facility's banks were lined with bulkheads, pilings, and wharves. No soil was visible at the time of the survey.

### 2.2.5 Atmospheric Deposition

Atmospheric deposition occurs when air pollutants enter the LDW directly or through stormwater. Air pollutants may be generated from point or non-point sources. Point sources include industrial facilities, and air pollutants may be generated from painting, sandblasting, loading/unloading of raw materials, and other activities, or through industrial smokestacks. Non-point sources include dispersed sources such as vehicle emissions, aircraft exhaust, and off-gassing from common materials such as plastics. Air pollutants may be transported over long distances by wind, and can be deposited to land and water surfaces by precipitation or particle deposition.

Contaminants originating from nearby properties and streets may be transported through the air and deposited at RM 1.0 to 1.3 West or in areas that drain to the LDW. Although chemical deposition from air directly to the LDW probably occurs, this mechanism is not likely to result in sediment concentrations above local background levels. Secondary impacts of air sources on the stormwater pathway to receiving waters and sediment are not well understood; additional information is needed. Recent and ongoing atmospheric deposition studies in the LDW area are summarized in the LDW Source Control Status Report (Ecology 2007a and subsequent updates). Ecology plans to conduct an air deposition scoping study to inventory known point sources and make recommendations on how to address air deposition for source control. Historically, the Lafarge facility was regulated as a point source of air emissions under the federal Clean Air Act. In January 2010, EPA and Lafarge entered a consent decree settlement to address alleged violations of the Clean Air Act at operations across the United States. Several states and agencies, including Washington State and the PSCAA, joined in the settlement. The consent decree required Lafarge to enhance the cement kiln at the Seattle facility to reduce emissions of nitrogen oxides, sulfur dioxide, and particulate matter if operations were to continue (EPA 2010c). Enhancements were not made to the kiln due to the high costs of capital investment and decreased market demand for cement. The kiln was to be put into a care and maintenance mode at the end of 2010 (Lafarge 2010a).

The Lafarge air permit did not address sediment-specific contaminants in the LDW and the enforcement action did not indicate the ways in which reduced emissions of particulate matter, sulfur, or nitrogen oxides would affect sediment or water quality in the LDW.

### 2.2.6 Spills to the LDW

Near-water and over-water activities have the potential to impact adjacent sediment from spills of material containing COCs. The Lafarge facility conducts dock operations for the loading and unloading of materials. Accidental spills to the LDW during loading/unloading operations at the Lafarge facility may result in transport of contaminants.

# 3.0 Potential Sources of Sediment Recontamination

Potential sources of sediment recontamination are described in detail in the Kellogg Island to Lafarge Data Gaps Report (SAIC 2011). This section summarizes the information on private outfalls (Section 3.1) and the Lafarge facility (Section 3.2).

## 3.1 Outfalls

SDs convey stormwater runoff collected from streets, parking lots, roof drains, and residential, commercial, and industrial properties to the LDW. SDs entering the LDW carry runoff generated by rain and snow. A wide range of chemicals may become dissolved or suspended in runoff as rainwater flows over the land. Urban areas generally accumulate particulates, dust, oil, asphalt, rust, rubber, metals, pesticides, detergents, or other materials as a result of human activities throughout the drainage basin.

Human activities include landscaping, spills, illegal dumping, vehicle maintenance (fueling, washing), and vehicle use (wear on roads, tires, brakes, fluid leaks, and emissions). These materials can be flushed into SDs during wet weather and are then conveyed to the waterway, mainly through the stormwater system. In addition, contaminants in soil or groundwater could enter the SD system through cracks or gaps in the stormwater piping.

There are no public outfalls located within the Kellogg Island to Lafarge source control area. The Lafarge property, which comprises the Kellogg Island to Lafarge source control area, is approximately 19.4 acres and about 90 percent covered with pavement, buildings, or other structures (Figure 3).

Eight outfalls are present on the Lafarge facility (Holnam 1994):

| Outfall No.[1] | Diameter/Material | Outfall Type | Active |
|---|---|---|---|
| 001/2139 | 8 inches cast iron | Recycled water | Y |
| 002/2138 | 6 inches cast iron | Non-contact cooling water | N |
| 003 | Unknown | Non-contact cooling water | N |
| 004 | Unknown | Dock trench and plant drainage | Y |
| 005 | Unknown | Dock trench drainage | N |
| 006 | Unknown | Dock trench drainage | N |
| 007 | 36 inches | Chemithon outfall | Y |
| 008/2137 | Unknown | Recycled water | Y |

[1]Outfalls from Holnam/Lafarge documents (Outfalls 001, 002, and 008) have been cross-referenced with outfall locations found during the LDW Remedial Investigation (RI) (Windward 2010).

### 3.1.1 Lafarge Outfalls and Storm Drain System

Lafarge has incorporated many changes related to stormwater management over the years. These are summarized in Section II.A. of Ecology's NPDES permit fact sheet (Ecology 2011). The primary improvements were nearly doubling storage capacity for collected water and installing a series of lift stations and pumps to improve routing and flow management for recycling.

Historically, the stormwater at the facility was treated and recycled in the cement manufacturing process. Even with collection and reuse in the manufacturing process, stormwater occasionally needed to be discharged when there was more rain than the collection system and recycling pumps could manage. Untreated stormwater was discharged from Outfalls 001/2139 and 004, although it is important to note that no discharges of this kind have occurred since 2007. Now that the kiln is no longer in use, stormwater continues to be collected and, if storage capacity is exceeded, the water is treated and discharged through Outfall 008/2137 (Ecology 2011). The stormwater collection system has the capacity to contain a 10-year, 24-hour storm.

The kiln shutdown has made complete stormwater recycling at historical levels an unsustainable practice. The periodic discharge of excess stormwater is now necessary. To adjust to the shift in operation, Lafarge planned to install an approved electro-coagulation system with pH adjustment, settling, and sand filtration capabilities in fall 2010. Lafarge planned to decommission Outfalls 001/2139 and 004 in November 2010, and discharge stormwater solely from Outfall 008/2137 (Aquarius 2010). A diagram of the stormwater collection system is presented in Figure 5. The new NPDES permit, which became effective on January 1, 2011, requires Lafarge to evaluate operations of the final installation and provide an Engineering Report Addendum for review and approval by Ecology (Ecology 2010b).

### 3.1.2 Potential for Future Releases to LDW Sediments

Historically, stormwater at the facility was treated and recycled in the cement manufacturing process. The Lafarge facility has recently made a transition from a cement manufacturing operation to a cement grinding, blending, and shipping operation. Decreased demand for stormwater in the manufacturing process will require Lafarge to discharge stormwater to the LDW at a greater volume and frequency. The potential for sediment recontamination associated with the stormwater pathway is unknown and depends on the frequency of discharges to the LDW and the potential concentrations of sediment COCs, if any, in discharges originating from this property.

### 3.1.3 Source Control Actions

Information needed to assess the potential for sediment recontamination associated with the private outfalls was summarized in the Kellogg Island to Lafarge Data Gaps Report. The following source control actions will be conducted to fill the identified data gaps and reduce the potential for recontamination of sediments associated with the Kellogg Island to Lafarge source control area:

- Ecology will request Lafarge provide information regarding the status of Outfalls 001/2139 and 004.
- Ecology will request Lafarge provide information regarding the installation of an updated stormwater treatment system within 12 months of the NPDES permit renewal, as described in the Stormwater Pollution Prevention Plan (SWPPP).

- Ecology will conduct a follow-up business inspection of Lafarge to verify compliance with Ecology's recommendations, applicable regulations, and best management practices (BMPs) to prevent the release of contaminants to the LDW.
- Ecology will review new sediment data from the 2009 Lafarge maintenance dredging (Gathard 2010) and the *Surface Sediment Sampling at Outfalls in the Lower Duwamish Waterway* (SAIC 2011, in preparation) to determine if additional sediment sampling is needed for sediment characterization.

## 3.2 Lafarge North America Inc. Seattle

| | |
|---|---|
| **Current Operations** | Cement grinding, blending, and shipping |
| **Historical Operations** | Historical drum reclamation during World War II<br>Wet kiln cement manufacturing from 1967 until 2010 |
| **Address** | 5400 West Marginal Way SW |
| **Facility/Site ID** | 2132 |
| **NPDES Permit** | WA-000223-2 |
| **Chemicals of Concern** | PCBs, PAHs, phthalates, dioxins/furans, organotin compounds |
| **Media Affected** | Stormwater; additional information needed |

The Lafarge facility comprises Parcel 9003. Lafarge is bordered to the north and east by the LDW and by West Marginal Way SW to the west (Figure 3). Chemithon Corporation and Alaska Marine Lines border the Lafarge facility on the southern boundary and are discussed as part of the Glacier Bay source control area (SAIC 2007b). The Lafarge facility was built in 1967 and has remained relatively unchanged since its original construction. One aggregated building with a footprint of 141,125 square feet is present on the property. Almost the entire property is paved, except for a grassy area near the front entrance and unpaved ground beneath the limestone and gypsum outdoor storage areas (Figure 5) (Lafarge 2010b).

### 3.2.1 Historical Operations

Kroll maps reviewed by EPA from 1930, 1939, and 1950 indicate several industries operated on and/or near the Lafarge property prior to 1960 including Seattle Brick Company, Siler Mill Company, West Waterway Shipyards, Seabell Shipbuilding Company, and Pacific Metal and Salvage Company (Maas 2011).

The United States Army implemented a 55-gallon steel drum reclamation program from June 1944 to March 1946 at five sites along the LDW. The Northwest Drum Company performed drum reclamation for the Army at the location that is now occupied by Lafarge. The plant had the capacity to reclaim 4,500 drums every 24 hours. Drum reclamation was terminated in September 1945 and all surplus drums were shipped off site by March 1946 (McKnight 1946). Historical activities at the property may have resulted in soil and groundwater contamination. Ideal Basic Industries (Ideal) and Holnam, Inc. (Holnam) are historical names/owners for the facility. Ideal submitted an application to the U.S. Army Corps of Engineers, Seattle District, to begin plant construction in 1960 (Army 1960). Ideal began cement production at the site in 1967. On March 7, 1990, Ideal merged with its parent company, Holnam (Ideal 1990). Lafarge purchased the

Holnam facility in the fall of 1998 (Lafarge 1998). Wet kiln cement production has been the only operation to take place at the facility since its construction in 1967 (Ecology 2011). Additional information regarding historical activities at the property was provided in the Kellogg Island to Lafarge Data Gaps Report (SAIC 2011).

### 3.2.2 Current Operations

On April 30, 2010, Lafarge issued a press release stating that the recent economic downturn and upcoming federal air quality regulations caused a shift in operations and production at the facility. The kiln was to be placed in a care and maintenance mode for an indefinite period. The facility has transitioned into a cement grinding/blending operation, and will no longer manufacture cement (Lafarge 2010a). As the plant transitions away from production, the use of a 140,000-gallon above-ground storage tank, coal silo, and raw material storage areas remains unknown. Granulated slag will continue to be imported and ground. It is not known if Lafarge will import clinker to make Portland cement. Lafarge will offer formulations of limestone, slag, and gypsum to customers (Ecology 2010b). The facility will continue to use a marine fleet to conduct shipping operations. Stormwater that was previously recycled into cement manufacturing will now need to be treated and discharged to the LDW or King County sanitary sewer.

In November 1992, two underground storage tanks (USTs), a 2,000-gallon diesel UST, and 1,000-gallon gasoline UST were installed on the property in approximately the same location as three historical USTs (Section 3.2.4, Figure 5) (Ecology 1992). These USTs are used for vehicle fueling (Lafarge 2010b).

The press release indicated that the plant transition was set to occur towards the end of 2010. Additional information on the facility transition was not available at the time this SCAP was prepared.

### 3.2.3 Regulatory History

Ecology integrated stormwater discharge requirements into the Holnam's NPDES permit renewal in November 1994. Ecology modified the permit on October 16, 1998, to transfer the permit to Lafarge North America, Inc. (Ecology 2011).

Ecology renewed the NPDES permit for the facility on June 30, 2006. Ecology staff conducted two non-sampling compliance inspections since the June 2006 permit issuance, determining Lafarge to be in compliance with permit conditions.

A Notice of Violation (NOV) was issued to Lafarge in September 2009, following a joint inspection by Ecology and EPA in June 2009. Violations included (Ecology 2011):

- Stormwater discharges that occurred when the stormwater system was below the 10-year, 24-hour design storm capacity;
- Discharges of process wastewater;
- Discharge of polluting matter into waters of the state;

- Failure to provide proper operation and maintenance for all systems of treatment and control;
- Failure to provide map and accurate depiction of the stormwater drainage on site as required by the SWPPP;
- Failure to provide adequate cover and secondary containment for a large red tank of Chemical Grinding Aid; and
- Failure to implement source control BMPs.

In addition, Ecology issued a Follow-up Order and Agreed Order in November 2009. The Follow-up Order required Lafarge to correct the violations noted in the NOV. The Agreed Order listed actions Lafarge was required to take during plant shutdown periods to allow the discharge of stormwater above and beyond the permit discharge limits. Lafarge agreed to treat all stormwater for turbidity and pH and to implement the following corrective actions (Ecology 2011):

- Proper covering and storage of contaminated piles of fine granular solids,
- Employing good housekeeping techniques and sweeping schedules,
- Monitoring of stormwater discharges, and
- Complying with all other provisions of the permit.

Ecology issued an updated NPDES permit to Lafarge on December 30, 2010. The permit maintains limits on turbidity, oil and grease, and pH. The updated permit will set water quality-based effluent limits for other pollutants once adequate sampling information indicates reasonable potential to violate water criteria (Ecology 2010b).

EPA sent a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 104(e) Request for Information letter to Lafarge on August 23, 2007. SAIC reviewed the response from Lafarge (Kohl 2007) and has incorporated relevant information into this report. EPA sent a Supplemental Request for Information on September 17, 2010 (EPA 2010d). The response to the supplemental request was not available for review at the time this SCAP was prepared.

## Air Emissions

On January 21, 2010, the USEPA filed a Clean Air Act settlement requiring all 13 U.S. plants owned by Lafarge to implement pollution control upgrades, acceptance of enforceable emission limits, and payment of civil penalties. The controls under the consent decree will be fully implemented by 2014 (EPA 2010a). As a result of the settlement, the Seattle plant has been required to install and operate dry absorbent addition systems to control sulfur dioxide ($SO_2$) as well as install and operate selective non-catalytic reduction systems to control nitrogen oxide ($NO_x$) (EPA 2010b). Lafarge has agreed to pay civil penalties to PSCAA and Ecology (EPA 2010c).

Ecology issued a Compliance Order (No. 7841) to Lafarge on July 28, 2010. The order was based on an October 2008 determination that Best Available Retrofit Technology (BART) was required to reduce regional haze impacts of emissions from Lafarge (Ecology 2010a).

### 3.2.4 Environmental Investigations and Cleanups

#### Underground Storage Tank Removal (1992)

In October 1992, three 1,000-gallon USTs storing leaded gasoline, unleaded gasoline, and diesel fuel, were removed from the Lafarge facility. The USTs were located west of the existing fuel dispenser and southeast of the main office building, in approximately the same location as the current USTs (Figure 5). Soil samples from tank excavation pits provided evidence of petroleum-contaminated soil under and around all three tanks. Four test pits were excavated to establish the extent of contamination. One of four test pits had visual evidence of contamination. Approximately 295 cubic yards of contaminated material was excavated on September 21, 1992, and October 1, 1992. The contaminated material was stored at the facility prior to disposal. Twelve samples were analyzed for total petroleum hydrocarbons (TPHs), volatile organic compounds (VOCs), and total lead; no analytes were detected at concentrations exceeding Ecology cleanup levels. No groundwater was encountered during the excavation (Bison 1992).

#### Washington State Dioxin Source Assessment (1998)

In 1998, Ecology published the Washington State Dioxin Source Assessment. The report evaluated cement kilns, along with other Washington State industries as potential sources of dioxins to the environment. Holnam was included in the study. Holnam produced cement kiln dust (CKD), a fine cement-like material captured by the electrostatic precipitator from the kiln exhaust. Holnam conducted stack tests between 1994 and 1996. Ecology determined that the CKD dioxin load from Holnam was quite small, with an average air emission load of 1.26 mg TEQ/day. An average load to land of 0.055 mg TEQ/day was calculated for Holnam's CKD. Holnam's CKD was used in the agricultural industry, waste stabilization, and road construction. Loads from the Holnam facility appeared to be well characterized, assuming that there were no major changes in fuels, raw materials, or operations at the kiln (Ecology 1998).

### 3.2.5 Potential for Sediment Recontamination

The potential for sediment contamination associated with the Kellogg Island to Lafarge source control area is summarized below:

- Drum recycling and reclamation operations were performed at this facility during World War II. Drum recycling and reclamation activities have been associated with soil and groundwater contamination at Industrial Container Services (within EAA-2), where drum recycling has occurred since the early 1940s (SAIC 2007a). Contaminants in groundwater at the Lafarge property (if any) resulting from historical drum recycling/reclamation may be a source of contaminants to LDW sediments.
- PCBs were detected at concentrations above the WQC in a seep sample at the Lafarge property. Seeps at the Lafarge property may be a source of contaminants to the LDW.
- Little information was available regarding the potential presence of contamination behind the bulkhead adjacent to the LDW. The potential for sediment recontamination via this pathway is unknown.

- Raw material stockpiles exposed to wind and rain have the potential to enter the stormwater system. Although limestone, slag, and gypsum are not considered sediment COCs, spills of these materials may potentially harm the river environment. The facility is adjacent to the LDW; therefore, surface runoff and spills have the potential to reach the LDW. COCs, if present in surface runoff or spilled materials, may reach LDW sediments.

### 3.2.6 Source Control Actions

Information needed to assess the potential for sediment recontamination associated with current or historical operations at the Lafarge facility was summarized in the Kellogg Island to Lafarge Data Gaps Report (SAIC 2011). The following source control actions will be conducted to fill the identified data gaps and reduce the potential for recontamination of sediments:

- Ecology will review the response to the CERCLA Section 104(e) Supplemental Information Request sent to Lafarge.
- Ecology will request Lafarge collect environmental data to determine if soil and groundwater are contaminated due to historical drum recycling and reclamation activities at the Lafarge property.
- Ecology will request Lafarge collect additional seep samples to better characterize groundwater being discharged into the LDW. Seep samples should be analyzed for sediment COCs, including PCBs.
- Ecology will request Lafarge provide additional information about the composition of material behind the bulkhead and whether or not bulkhead repairs were completed during 2006.
- As stated in Section 3.1.2, Ecology will conduct a follow-up business inspection of Lafarge to verify compliance with the corrective actions required by Ecology as a result of the June 2009 inspection, applicable regulations, and BMPs, such as covering stockpiled materials, to prevent the release of contaminants to the LDW.

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# 4.0 Monitoring

Monitoring efforts by Ecology and Lafarge will continue to assist in identifying and tracing ongoing sources of COCs present in LDW sediments or in upland media. This information will be used to focus source control efforts on specific problem areas within the Kellogg Island to Lafarge source control area and to track the progress of the source control program. The following types of samples may be collected:

- Stormwater discharge grab samples,
- Seep samples, and
- Soil and groundwater samples as necessary.

If monitoring data indicate the presence of additional sources that could result in recontamination of sediments associated with the Kellogg Island to Lafarge source control area, then Ecology will identify source control activities as appropriate.

Because source control is an iterative process, monitoring is necessary to identify trends in concentrations of COCs. Monitoring is anticipated to continue for some years. Any decisions to discontinue monitoring will be made jointly by Ecology and EPA, based on the best available information. At this time, Ecology plans to review the progress and data associated with source control action items for each SCAP at least annually, and to summarize this information in the LDW Source Control Status Reports, which are scheduled for publication periodically. In addition, Ecology may prepare Technical Memoranda to update the Data Gaps reports and SCAPs, as needed.

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# 5.0 Tracking and Reporting of Source Control Activities

Ecology is the lead for tracking, documenting, and reporting the status of source control to EPA and the public. Each agency involved in source control will document its source control activities and provide regular updates to Ecology. Ecology will prepare periodic LDW Source Control Status Reports that summarize recent activities for each source control area and the overall status of source control in the LDW.

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# Figures

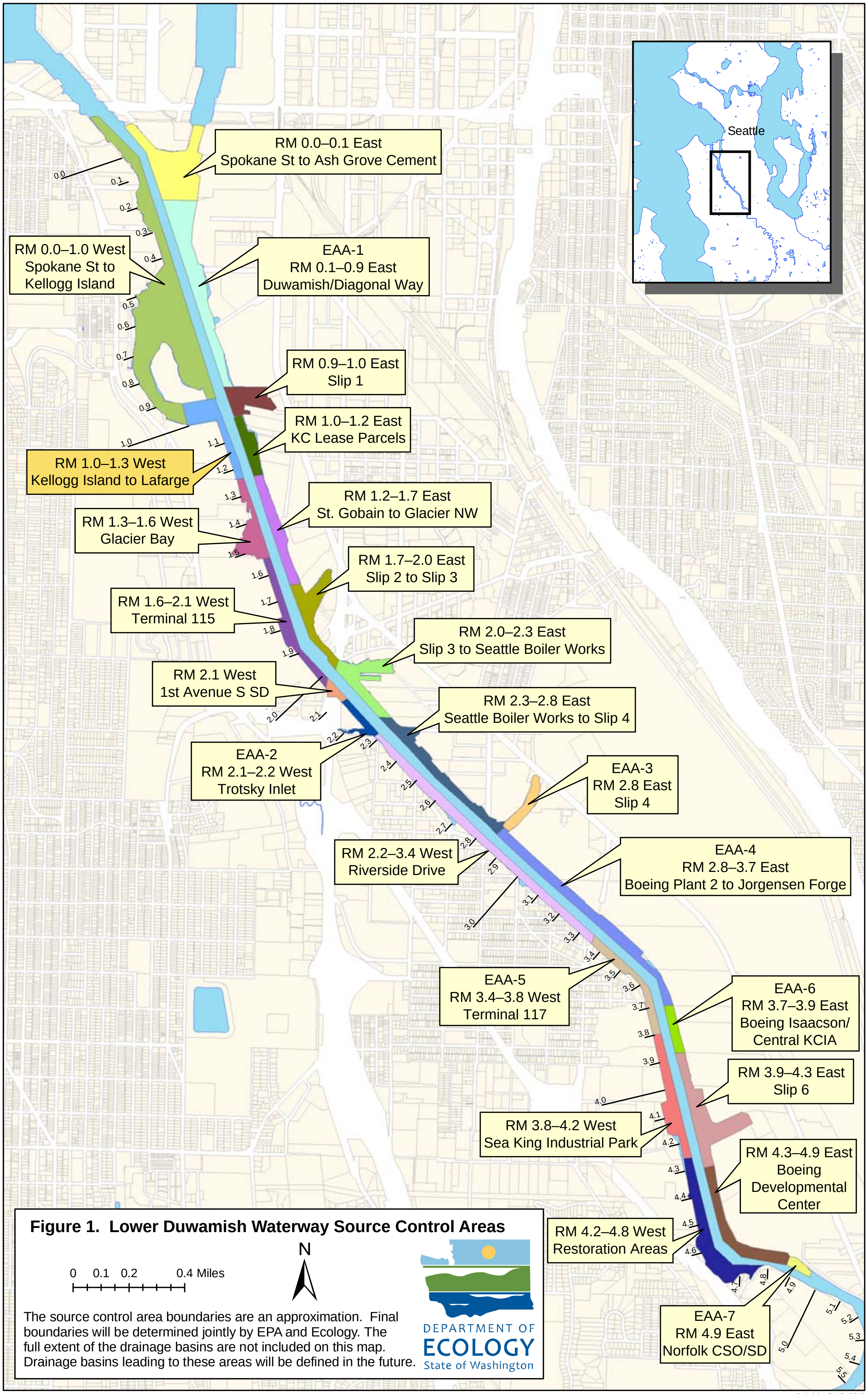


**Figure 1. Lower Duwamish Waterway Source Control Areas**

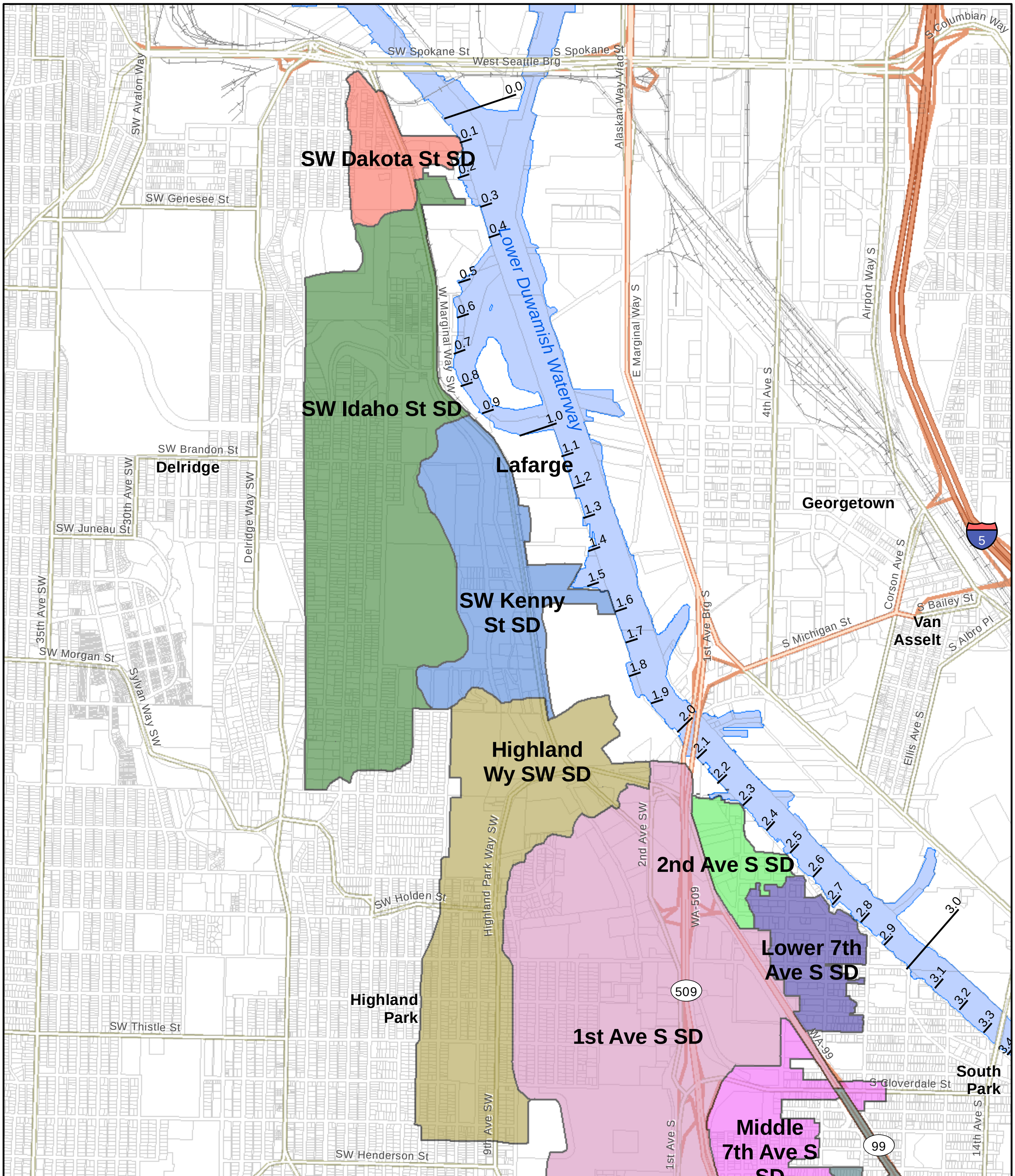


**Figure 2. Lower Duwamish Waterway Storm Drain Basins — West Side**

0 1,400 2,800 Feet

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Coordinate System:
NAD 1983 StatePlane Washington North FIPS 4601 Feet
Prepared By: apw
File: figure-2_StormDrainBasinMap_overview.mxd
Illustrative purposes only.

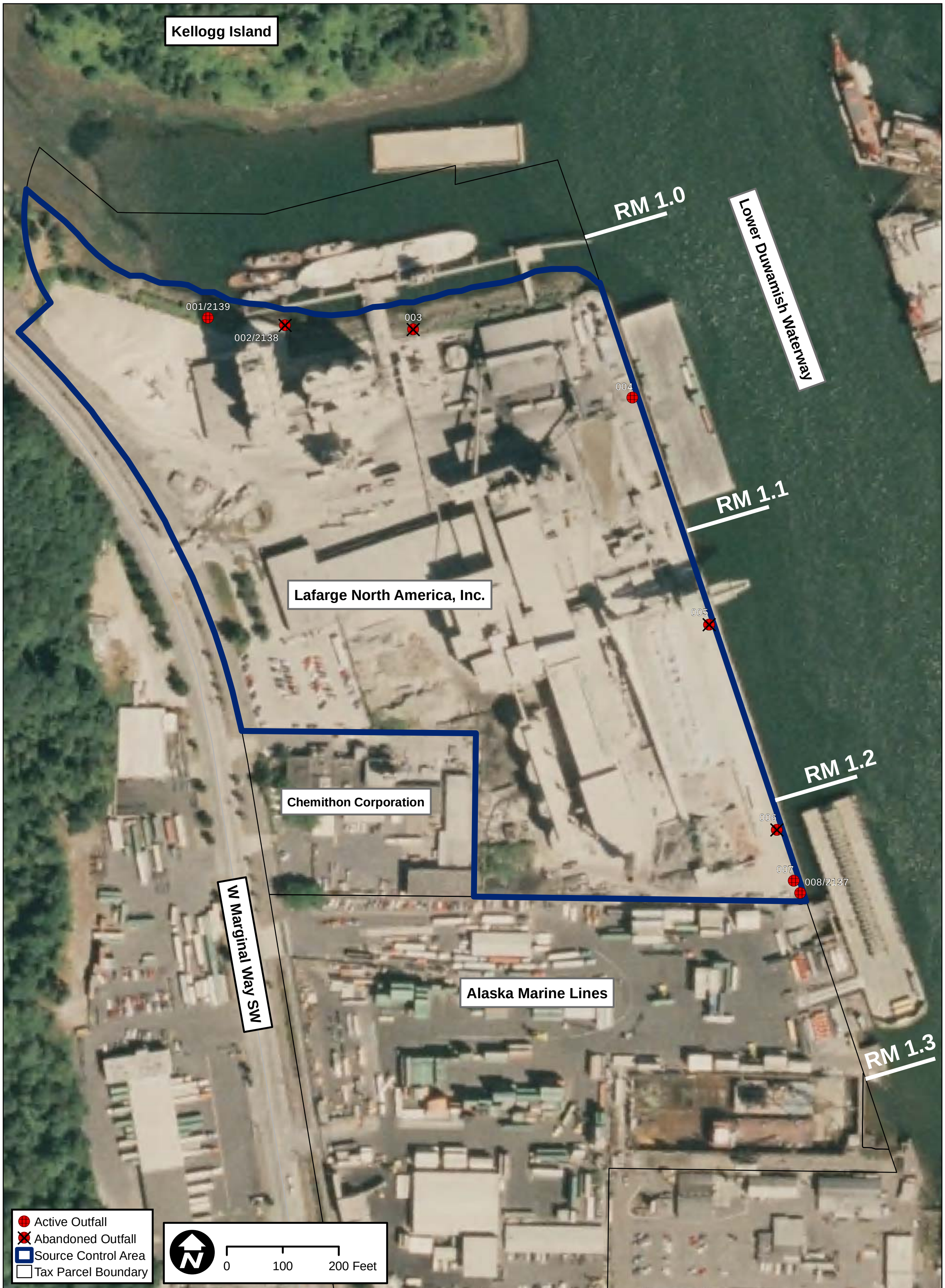


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**Figure 3. RM 1.0–1.3 West (Kellogg Island to Lafarge) Source Control Area**

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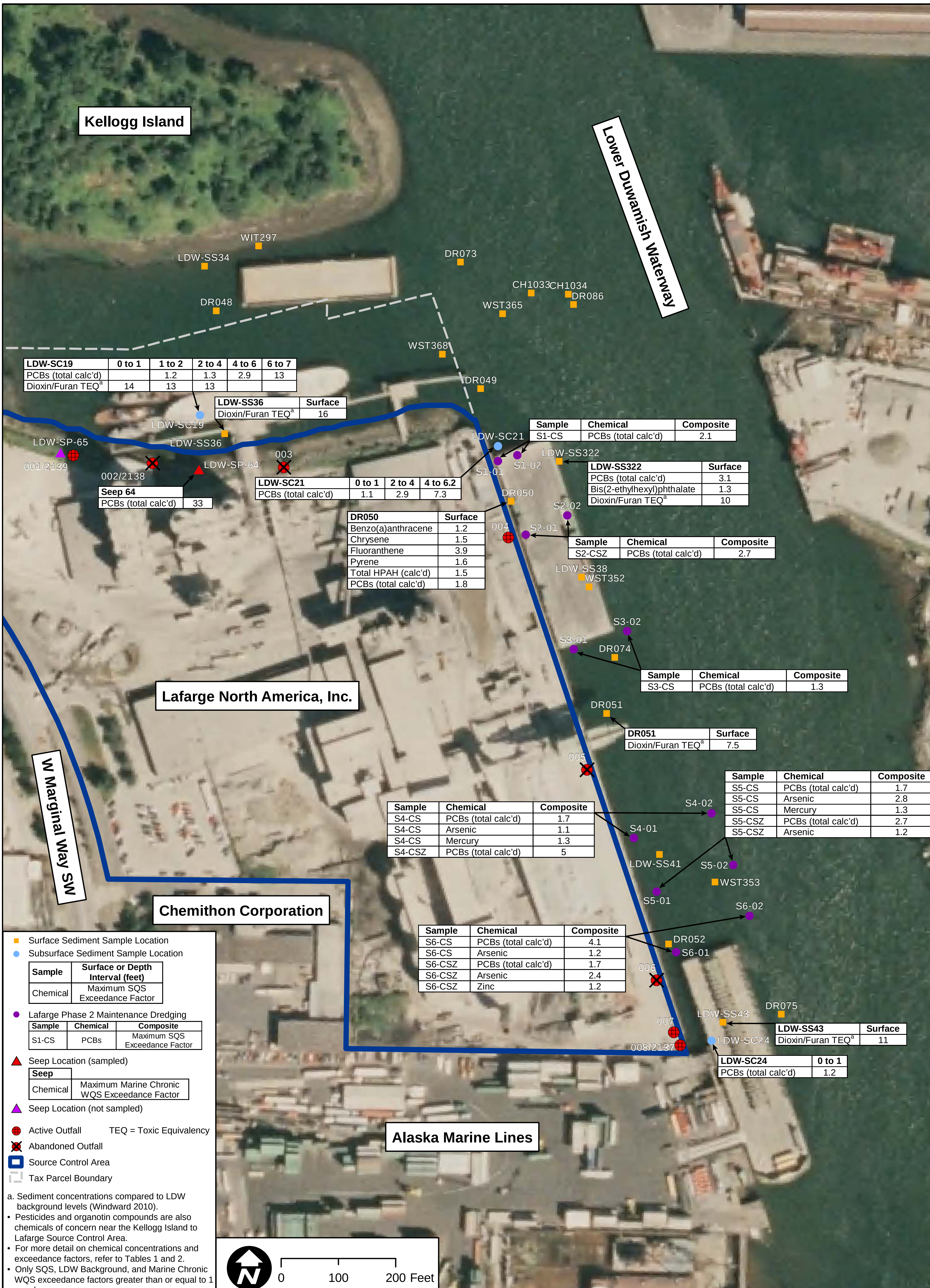


| LDW-SC19 | 0 to 1 | 1 to 2 | 2 to 4 | 4 to 6 | 6 to 7 |
|---|---|---|---|---|---|
| PCBs (total calc'd) | | 1.2 | 1.3 | 2.9 | 13 |
| Dioxin/Furan TEQ[a] | 14 | 13 | 13 | | |

| LDW-SS36 | Surface |
|---|---|
| Dioxin/Furan TEQ[a] | 16 |

| Seep 64 | |
|---|---|
| PCBs (total calc'd) | 33 |

| LDW-SC21 | 0 to 1 | 2 to 4 | 4 to 6.2 |
|---|---|---|---|
| PCBs (total calc'd) | 1.1 | 2.9 | 7.3 |

| DR050 | Surface |
|---|---|
| Benzo(a)anthracene | 1.2 |
| Chrysene | 1.5 |
| Fluoranthene | 3.9 |
| Pyrene | 1.6 |
| Total HPAH (calc'd) | 1.5 |
| PCBs (total calc'd) | 1.8 |

| Sample | Chemical | Composite |
|---|---|---|
| S1-CS | PCBs (total calc'd) | 2.1 |

| LDW-SS322 | Surface |
|---|---|
| PCBs (total calc'd) | 3.1 |
| Bis(2-ethylhexyl)phthalate | 1.3 |
| Dioxin/Furan TEQ[a] | 10 |

| Sample | Chemical | Composite |
|---|---|---|
| S2-CSZ | PCBs (total calc'd) | 2.7 |

| Sample | Chemical | Composite |
|---|---|---|
| S3-CS | PCBs (total calc'd) | 1.3 |

| DR051 | Surface |
|---|---|
| Dioxin/Furan TEQ[a] | 7.5 |

| Sample | Chemical | Composite |
|---|---|---|
| S5-CS | PCBs (total calc'd) | 1.7 |
| S5-CS | Arsenic | 2.8 |
| S5-CS | Mercury | 1.3 |
| S5-CSZ | PCBs (total calc'd) | 2.7 |
| S5-CSZ | Arsenic | 1.2 |

| Sample | Chemical | Composite |
|---|---|---|
| S4-CS | PCBs (total calc'd) | 1.7 |
| S4-CS | Arsenic | 1.1 |
| S4-CS | Mercury | 1.3 |
| S4-CSZ | PCBs (total calc'd) | 5 |

| Sample | Chemical | Composite |
|---|---|---|
| S6-CS | PCBs (total calc'd) | 4.1 |
| S6-CS | Arsenic | 1.2 |
| S6-CSZ | PCBs (total calc'd) | 1.7 |
| S6-CSZ | Arsenic | 2.4 |
| S6-CSZ | Zinc | 1.2 |

| LDW-SS43 | Surface |
|---|---|
| Dioxin/Furan TEQ[a] | 11 |

| LDW-SC24 | 0 to 1 |
|---|---|
| PCBs (total calc'd) | 1.2 |

Legend:

| Sample | Surface or Depth Interval (feet) |
|---|---|
| Chemical | Maximum SQS Exceedance Factor |

| Sample | Chemical | Composite |
|---|---|---|
| S1-CS | PCBs | Maximum SQS Exceedance Factor |

| Seep | |
|---|---|
| Chemical | Maximum Marine Chronic WQS Exceedance Factor |

a. Sediment concentrations compared to LDW background levels (Windward 2010).
- Pesticides and organotin compounds are also chemicals of concern near the Kellogg Island to Lafarge Source Control Area.
- For more detail on chemical concentrations and exceedance factors, refer to Tables 1 and 2.
- Only SQS, LDW Background, and Marine Chronic WQS exceedance factors greater than or equal to 1 are shown.

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**Figure 4. RM 1.0–1.3 West (Kellogg Island to Lafarge) Sediment and Seep Sampling Locations**

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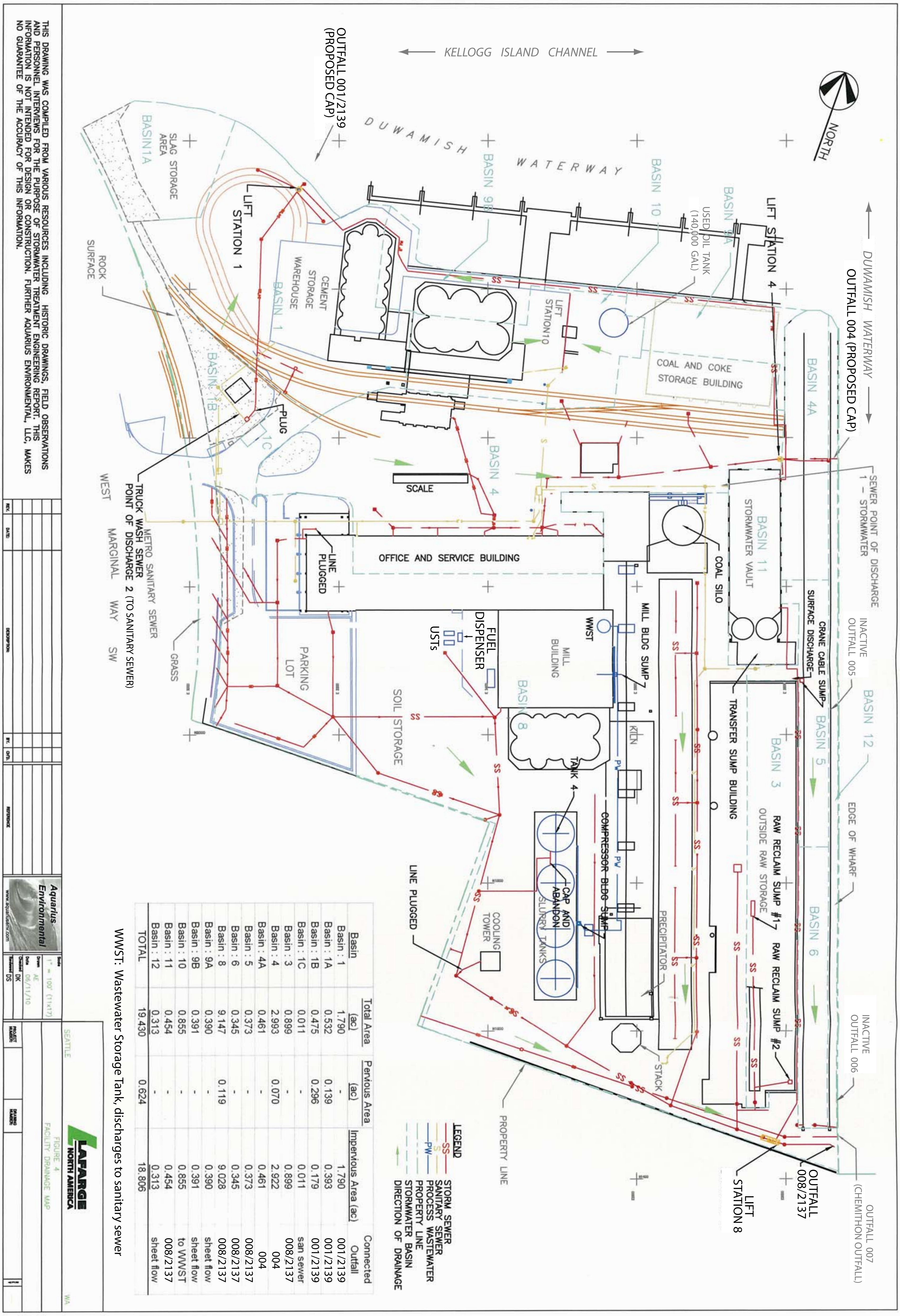


| Basin | Total Area (ac) | Pervious Area (ac) | Impervious Area (ac) | Connected Outfall |
|---|---|---|---|---|
| Basin : 1 | 1.790 | - | 1.790 | 001/2139 |
| Basin : 1A | 0.532 | 0.139 | 0.393 | 001/2139 |
| Basin : 1B | 0.475 | 0.296 | 0.179 | 001/2139 |
| Basin : 1C | 0.011 | - | 0.011 | san sewer |
| Basin : 3 | 0.899 | - | 0.899 | 008/2137 |
| Basin : 4 | 2.993 | 0.070 | 2.922 | 004 |
| Basin : 4A | 0.461 | - | 0.461 | 004 |
| Basin : 5 | 0.373 | - | 0.373 | 008/2137 |
| Basin : 6 | 0.345 | - | 0.345 | 008/2137 |
| Basin : 8 | 9.147 | 0.119 | 9.028 | 008/2137 |
| Basin : 9A | 0.390 | - | 0.390 | sheet flow |
| Basin : 9B | 0.391 | - | 0.391 | sheet flow |
| Basin : 10 | 0.855 | - | 0.855 | to WWST |
| Basin : 11 | 0.454 | - | 0.454 | 008/2137 |
| Basin : 12 | 0.313 | - | 0.313 | sheet flow |
| TOTAL | 19.430 | 0.624 | 18.806 | |

Source: Adapted from Lafarge 2010b. Note: SAIC did not perform an independent verification of content.

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**Figure 5. Lafarge Facility Drainage Map**

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# Tables

## Table 1
## Chemicals Detected Above Screening Levels in Surface Sediment Samples
## Near the Kellogg Island to Lafarge Source Control Area

| Event Name | Location Name | Date Collected | Chemical | Conc'n (mg/kg DW) | TOC % | Conc'n (mg/kg OC) | SQS/ LAET | CSL/ 2LAET | LDW Background | Units | SQS Exceedance | CSL Exceedance | LDW Background Exceedance |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PAHs** | | | | | | | | | | | | | |
| EPA SI | DR050[a] | 8/31/1998 | Benzo(a)anthracene | 1.6 | 4.12 | | 1.3 | 1.6 | | mg/kg DW | 1.2 | 1 | |
| EPA SI | DR050[a] | 8/31/1998 | Chrysene | 2.1 | 4.12 | | 1.4 | 2.8 | | mg/kg DW | 1.5 | <1 | |
| EPA SI | DR050[a] | 8/31/1998 | Fluoranthene | 6.7 | 4.12 | | 1.7 | 2.5 | | mg/kg DW | 3.9 | 2.7 | |
| EPA SI | DR050[a] | 8/31/1998 | Pyrene | 4.2 | 4.12 | | 2.6 | 3.3 | | mg/kg DW | 1.6 | 1.3 | |
| EPA SI | DR050[a] | 8/31/1998 | Total HPAH (calc'd) | 18.2 | 4.12 | | 12 | 17 | | mg/kg DW | 1.5 | 1.1 | |
| **Phthalate** | | | | | | | | | | | | | |
| LDW RI Phase 2 Round 3 | LDW-SS322 | 10/4/2006 | Bis(2-ethylhexyl) phthalate | 0.45 | 0.77 | 59 | 47 | 78 | | mg/kg OC | 1.3 | <1 | |
| **PCBs** | | | | | | | | | | | | | |
| EPA SI | DR050[a] | 8/31/1998 | PCBs (total calc'd) | 0.24 J | 4.12 | | 0.13 | 1.0 | | mg/kg DW | 1.8 | <1 | |
| LDW RI Phase 2 Round 3 | LDW-SS322 | 10/4/2006 | PCBs (total calc'd) | 0.28 J | 0.77 | 37 J | 12 | 65 | | mg/kg OC | 3.1 | <1 | |
| **Dioxin and Furan TEQ** | | | | | | | | | | | | | |
| EPA SI | DR051 | 8/12/1998 | Dioxin/furan TEQ | 1.20E-05 J | | | | | 1.60E-06 | mg/kg DW | | | 7.5 |
| LDW RI Phase 2 Round 1 | LDW-SS43 | 1/21/2005 | Dioxin/furan TEQ | 1.73E-05 J | | | | | 1.60E-06 | mg/kg DW | | | 11 |
| LDW RI Phase 2 Round 1 | LDW-SS36 | 1/24/2005 | Dioxin/furan TEQ | 2.60E-05 J | | | | | 1.60E-06 | mg/kg DW | | | 16 |
| LDW RI Phase 2 Round 3 | LDW-SS322 | 10/4/2006 | Dioxin/furan TEQ | 1.64E-05 J | | | | | 1.60E-06 | mg/kg DW | | | 10 |

mg/kg = milligrams per kilogram
DW = dry weight
TOC = total organic carbon
OC = organic carbon normalized
SQS = SMS Sediment Quality Standard
CSL = SMS Cleanup Screening Level
LDW = Lower Duwamish Waterway
TEQ = Toxic Equivalency

SMS = Sediment Management Standard (Washington Administrative Code 173-204)
PAH = polycyclic aromatic hydrocarbon
Total HPAH = total high molecular weight PAH
PCB = polychlorinated biphenyl
J = Estimated value between the method detection limit and the laboratory reporting limit
[a] Due to the high TOC in this sample, results were compared to the Lowest Apparent Effects Threshold (LAET) and the second LAET (2LAET) value rather than the SQS and CSL. The LAET is functionally equivalent to the SQS and the 2LAET is functionally equivalent to the CSL.

Table presents detected chemicals only.
Exceedance factors are the ratio of the detected concentrations to the CSL, SQS, or LDW Background; exceedance factors are shown only if they are greater than 1.

**Table 2**
**Chemicals Detected Above Screening Levels in Subsurface Sediment Samples**
**Near the Kellogg Island to Lafarge Source Control Area**

| Event Name | Location Name | Date Collected | Sample Depth (feet) | Chemical | Conc,n (mg/kg DW) | TOC % | Conc'n (mg/kg OC) | SQS | CSL | LDW Background | Units | SQS Exceedance | CSL Exceedance | LDW Background Exceedance |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Metals** | | | | | | | | | | | | | | |
| Lafarge Dredging Phase 2 | S4-CS | 10/29/2009 | C | Arsenic | 65 | | | 57 | 93 | | mg/kg DW | 1.1 | <1 | |
| Lafarge Dredging Phase 2 | S5-CS | 10/28/2009 | C | Arsenic | 162 | | | 57 | 93 | | mg/kg DW | 2.8 | 1.7 | |
| Lafarge Dredging Phase 2 | S5-CSZ | 10/28/2009 | C | Arsenic | 68 | | | 57 | 93 | | mg/kg DW | 1.2 | <1 | |
| Lafarge Dredging Phase 2 | S6-CS | 10/28/2009 | C | Arsenic | 71 | | | 57 | 93 | | mg/kg DW | 1.2 | <1 | |
| Lafarge Dredging Phase 2 | S6-CSZ | 10/28/2009 | C | Arsenic | 136 | | | 57 | 93 | | mg/kg DW | 2.4 | 1.5 | |
| Lafarge Dredging Phase 2 | S4-CS | 10/29/2009 | C | Mercury | 0.53 | | | 0.41 | 0.59 | | mg/kg DW | 1.3 | <1 | |
| Lafarge Dredging Phase 2 | S5-CS | 10/28/2009 | C | Zinc | 539 | | | 410 | 960 | | mg/kg DW | 1.3 | <1 | |
| Lafarge Dredging Phase 2 | S6-CSZ | 10/28/2009 | C | Zinc | 491 | | | 410 | 960 | | mg/kg DW | 1.2 | <1 | |
| **PCBs** | | | | | | | | | | | | | | |
| LDW Subsurface Sediment 2006 | LDW-SC19 | 2/24/2006 | 6 - 7 | PCBs (total calc'd) | 2.4 | 1.54 | 160 | 12 | 65 | | mg/kg OC | 13 | 2.5 | |
| LDW Subsurface Sediment 2006 | LDW-SC19 | 2/24/2006 | 4 - 6 | PCBs (total calc'd) | 0.44 | 1.26 | 35 | 12 | 65 | | mg/kg OC | 2.9 | <1 | |
| LDW Subsurface Sediment 2006 | LDW-SC19 | 2/24/2006 | 2 - 4 | PCBs (total calc'd) | 0.25 | 1.56 | 16 | 12 | 65 | | mg/kg OC | 1.3 | <1 | |
| LDW Subsurface Sediment 2006 | LDW-SC19 | 2/24/2006 | 1 - 2 | PCBs (total calc'd) | 0.23 | 1.7 | 14 | 12 | 65 | | mg/kg OC | 1.2 | <1 | |
| LDW Subsurface Sediment 2006 | LDW-SC21 | 2/14/2006 | 4 - 6.2 | PCBs (total calc'd) | 1.68 | 1.94 | 87 | 12 | 65 | | mg/kg OC | 7.3 | 1.3 | |
| LDW Subsurface Sediment 2006 | LDW-SC21 | 2/14/2006 | 2 - 4 | PCBs (total calc'd) | 0.38 J | 1.64 | 23 | 12 | 65 | | mg/kg OC | 1.9 | <1 | |
| LDW Subsurface Sediment 2006 | LDW-SC21 | 2/14/2006 | 0 - 1 | PCBs (total calc'd) | 0.25 | 1.98 | 13 | 12 | 65 | | mg/kg OC | 1.1 | <1 | |
| LDW Subsurface Sediment 2006 | LDW-SC24 | 2/17/2006 | 0 - 1 | PCBs (total calc'd) | 0.28 | 1.99 | 14 | 12 | 65 | | mg/kg OC | 1.2 | <1 | |
| Lafarge Dredging Phase 2[a] | S1-CS | 10/29/2009 | C | PCBs (total calc'd) | | | 25 | 12 | 65 | | mg/kg OC | 2.1 | <1 | |
| Lafarge Dredging Phase 2[a] | S2-CSZ | 10/29/2009 | C | PCBs (total calc'd) | | | 33 | 12 | 65 | | mg/kg OC | 2.7 | <1 | |
| Lafarge Dredging Phase 2[a] | S3-CS | 10/29/2009 | C | PCBs (total calc'd) | | | 15 | 12 | 65 | | mg/kg OC | 1.3 | <1 | |
| Lafarge Dredging Phase 2[a] | S4-CS | 10/29/2009 | C | PCBs (total calc'd) | | | 20 J | 12 | 65 | | mg/kg OC | 1.7 | <1 | |
| Lafarge Dredging Phase 2[a] | S4-CSZ | 10/29/2009 | C | PCBs (total calc'd) | | | 59 | 12 | 65 | | mg/kg OC | 5.0 | <1 | |
| Lafarge Dredging Phase 2[a] | S5-CS | 10/28/2009 | C | PCBs (total calc'd) | | | 21 | 12 | 65 | | mg/kg OC | 1.7 | <1 | |
| Lafarge Dredging Phase 2[a] | S5-CSZ | 10/28/2009 | C | PCBs (total calc'd) | | | 33 J | 12 | 65 | | mg/kg OC | 2.7 | <1 | |
| Lafarge Dredging Phase 2[a] | S6-CS | 10/28/2009 | C | PCBs (total calc'd) | | | 49 | 12 | 65 | | mg/kg OC | 4.1 | <1 | |
| Lafarge Dredging Phase 2[a] | S6-CSZ | 10/28/2009 | C | PCBs (total calc'd) | | | 20 | 12 | 65 | | mg/kg OC | 1.7 | <1 | |
| **Dioxin and Furan TEQ** | | | | | | | | | | | | | | |
| LDW Subsurface Sediment 2006 | LDW-SC19 | 2/24/2006 | 0 - 1 | Dioxin/furan TEQ | 2.28E-05 J | | | | | 1.60E-06 | mg/kg DW | | | 14 |
| LDW Subsurface Sediment 2006 | LDW-SC19 | 2/24/2006 | 1 - 2 | Dioxin/furan TEQ | 2.01E-05 J | | | | | 1.60E-06 | mg/kg DW | | | 13 |
| LDW Subsurface Sediment 2006 | LDW-SC19 | 2/24/2006 | 2 - 4 | Dioxin/furan TEQ | 2.05E-05 J | | | | | 1.60E-06 | mg/kg DW | | | 13 |

[a] PCB concentrations reported in mg/kg OC only

mg/kg = milligrams per kilogram
DW = dry weight
TOC = total organic carbon
OC = organic carbon normalized
SQS = SMS Sediment Quality Standard
CSL = SMS Cleanup Screening Level
LDW = Lower Duwamish Waterway
SMS = Sediment Management Standard (Washington Administrative Code 173-204)
PCB = polychlorinated biphenyl
J = Estimated value between the method detection limit and the laboratory reporting limit
TEQ = Toxic Equivalency
C = Composite Sample

Table presents detected chemicals only.
Exceedance factors are the ratio of the detected concentrations to the CSL or SQS; exceedance factors are shown only if they are greater than 1.