Lower Duwamish Waterway
RM 0.9-1.0 East
(Slip 1)

Source Control Action Plan

May 2009

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Lower Duwamish Waterway
RM 0.9-1.0 East
(Slip 1)

Source Control Action Plan

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Executive Summary

The purpose of this Source Control Action Plan (SCAP) is to identify potential contaminant sources to sediments associated with the Lower Duwamish Waterway (LDW) River Mile (RM) 0.9-1.0 East (Slip 1) source control area, and to identify the actions necessary to prevent recontamination of sediment after cleanup. This SCAP is based on a through review of information pertinent to sediment recontamination, as documented in *Summary of Existing Information and Identification of Data Gaps* (SAIC 2008).

The LDW, located in Seattle, Washington, was added to the National Priorities List (Superfund) by the United States Environmental Protection Agency (EPA or USEPA) on September 13, 2001. Chemicals of concern (COCs) found in waterway sediments include polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), mercury and other metals, and phthalates. 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.

Phase 1 of the RI/FS used existing data to identify potential human health and ecological risks, information needs, and high priority areas for cleanup. Seven candidate early action areas (or "Tier 1" sites) were identified. Data collected during Phase 2 of the RI were used to identify additional sites where long-term cleanup actions may be necessary. The RM 0.9-1.0 East (Slip 1) source control area was identified as one of these "Tier 2" sites.

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

Sections 1 and 2 of this SCAP provide background information about the LDW site and the Slip 1 source control area. PCBs, PAHs, metals, phthalates, and other semi-volatile organic compounds (SVOCs) are considered to be the major COCs in sediments associated with the Slip 1 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 describes potential sources of contamination that may affect sediments associated with the Slip 1 source control area, including outfalls, spills to the waterway, and releases from adjacent properties; evaluates the significance of these potential sources; and identifies 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. Section 5 describes how source control efforts will be tracked and reported.

Table ES-1 lists the source control actions that have been identified for the Slip 1 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 sediments associated with the Slip 1 source control area was not scheduled at the time this SCAP was prepared.

Table ES-1. RM 0.9-1.0 East (Slip 1) Source Control Actions

Potential Sources	Action Items	Priority	Responsible Party(ies)	Status	Target Date
Federal Center South					
Potential historical source: Soil and groundwater have not been investigated near three 30,000-gallon petroleum underground storage tanks (USTs) on the property near Slip 1. Contaminated groundwater associated with these USTs (if any) would discharge to Slip 1.	Review historical property files for information regarding the status and contents of three 30,000-gallon USTs; determine if sediment COCs may be present in soil and groundwater in this area.	Medium	Ecology	Planned	February 2010
	If the file review indicates that sediment COCs may be present in soil and groundwater, require the property owner/operator to perform an environmental assessment of soil and groundwater around the 30,000-gallon UST area to verify the presence or absence of sediment COCs and to determine if concentrations exceed applicable regulatory and/or screening levels.	Medium	EPA	Planned	January 2011
	Conduct a visual bank survey; collect and analyze bank soil samples for sediment COCs to evaluate the potential for sediment recontamination from bank erosion.	Medium	Ecology, property owner/operator	Planned	June 2010
Potential ongoing source: There are seven or more outfalls on the Federal Center South property. Based on a 1976 General Services Administration (GSA) utility map, stormwater from approximately three-fourths of the Federal Center South property discharges to Slip 1. Many of the yard and roof drains shown on the map discharge directly to Slip 1. Previous facility inspections have noted deficiencies related to waste storage and labeling and housekeeping/repair of facility storm drains. An outdoor drum storage area with inadequate secondary containment may be in use at the property. Spills from the storage area may have the potential to reach Slip 1. The property is adjacent to Slip 1, so contaminants (if any) suspended in surface runoff have the potential to reach Slip 1.	Perform Site Hazard Assessment (SHA) at Federal Center South.	High	Ecology	Planned	July 2009
	Conduct a follow-up stormwater inspection at the facility to verify completion of corrective actions requested in June 2004, and to collect information on current site operations/conditions as specified in Section 3.1.5.	High	Ecology, EPA, SPU	Planned	December 2009
	Determine if Federal Center South must apply for coverage under the general industrial stormwater permit and continue to review and update NPDES permits as needed.	Medium	EPA, Ecology	Planned	December 2009

Potential Sources	Action Items	Priority	Responsible Party(ies)	Status	Target Date
Former Snopac Products Property					
Potential historical source: Data from LDW surface and subsurface sediment sampling near the former Snopac facility indicated the presence of arsenic, zinc, PAHs, and PCBs at concentrations above the SQS. Seep 76, near the southeast corner of Slip 1, was sampled by the LDWG in 2004. Arsenic, copper, lead, mercury, and zinc exceeded the marine chronic Water Quality Standard (WQS) and the draft groundwater-to-sediment screening levels. Arsenic concentrations reported in this seep were the highest reported in any LDW seeps sampled in 2004. Former shipyard operations at this property may represent a historical contaminant source.	Review responses to EPA's Request for Information 104(e) Letter sent to Unimar in July 2008. Obtain and evaluate information regarding the materials used and wastes generated at this facility, the time period of use/generation, and a description of how these materials and wastes were handled to determine if there is potential for historical release(s) of arsenic or other sediment COCs to soil and groundwater beneath this property.	Medium	Ecology	Planned	December 2009
	If there is potential for historical releases of arsenic or other sediment COCs, require the property owner/operator to collect soil and groundwater samples and analyze them for sediment COCs. If sediment COCs are present at concentrations above MTCA cleanup levels and/or screening levels, require the property owner/operator to prepare and implement a plan to remediate soil and/or groundwater, as needed.	Medium	Ecology	Planned	2010
	If EPA sends a 104(e) Request for Information Letter to Snopac Products, review responses for relevant information on potential sources of contaminants to Slip 1.	Medium	Ecology	Planned	TBD
	Collect additional samples from Seep 76 to determine if the arsenic concentration reported in 2004 was an anomaly. Analyze sample for all sediment COCs.	High	Ecology	Planned	June 2010
	Conduct a visual bank survey during low tide conditions; collect and analyze bank soil samples for sediment COCs to evaluate the potential for sediment recontamination from bank erosion and leaching. Reconnaissance cores should be collected along the top and bottom of the bank to determine "as is" conditions.	Medium	Ecology	Planned	June 2010
Potential ongoing source: Due to the property's proximity to Slip 1, contaminants (if any) suspended in surface runoff have the potential to reach Slip 1. Little information was available on the construction of banks in this area and the potential for sediment recontamination via this pathway. Contaminants in soils along the banks of the LDW could be released directly to sediments via erosion. The dock adjacent to this parcel appears to be abandoned and left to decompose in Slip 1. Chemicals may be present in the treated pilings or other materials used to build the dock. The apparent loss of the dock may also increase the potential for bank erosion.	Obtain information from Snopac or other historical property owners regarding the construction of the dock adjacent to the property. If no information is available, perform an evaluation of the materials used to construct the dock.	Medium	Ecology	Planned	December 2009
	Perform an inspection at the facility when or if a new business occupies the property to ensure compliance with applicable regulations and stormwater BMPs.	Medium	Ecology, SPU, King County	Planned	TBD

Potential Sources	Action Items	Priority	Responsible Party(ies)	Status	Target Date
Manson Construction Company					
Potential historical source: Past facility operations resulted in soil contamination. Notes from a 2002 facility inspection performed by Ecology indicate that soil remediation has been performed on the property. Data from LDW sediment sampling near the Manson Construction facility indicated the presence of arsenic, zinc, PAHs, and PCBs at concentrations above the SQS. Seep 76, near the southeast corner of Slip 1, was sampled by the LDWG in 2004. Arsenic, copper, lead, mercury, and zinc exceeded the WQS and the draft groundwater-to-sediment screening level. Arsenic concentrations reported in this seep were the highest reported in any LDW seeps sampled in 2004.	Obtain laboratory data and site plans from historical site assessment(s) and remediation performed at the property. Confirm that satisfactory completion of soil cleanup activities was achieved to eliminate groundwater discharge as a potential sediment recontamination pathway. Determine if arsenic or other sediment COCs may be present in soil and groundwater beneath the facility at concentrations that may have the potential to recontaminate sediments.	High	Ecology	Planned	September 2009
	If satisfactory soil cleanup was not achieved, require the property owner/operator to conduct a site assessment to determine residual concentrations of sediment COCs in soil and groundwater beneath the property in order to evaluate the potential for sediment recontamination via groundwater discharge.	High	Ecology	Planned	2010
	Collect additional samples from Seep 76 to determine if the arsenic concentration reported in 2004 was an anomaly. Analyze sample for all sediment COCs.	High	Ecology	Planned	June 2010
	Conduct a visual bank survey during low tide conditions, collect and analyze bank soil samples for COCs to evaluate the potential for sediment recontamination via bank erosion and leaching pathways. Reconnaissance cores should be collected along the top and bottom of the bank to determine “as is” conditions.	Medium	Ecology	Planned	June 2010
Potential ongoing source: Previous operations at the facility have resulted in spills to Slip 1. Due to the property’s proximity to Slip 1, surface runoff and spills may be conveyed to the slip. Over-water loading activities and truck/equipment washing activities may occur at the property. Spills or runoff from these activities may reach Slip 1.	Review responses to EPA’s General Notice 107(e) and Request for Information 104(e) letters sent to Manson Construction in July 2008.	Medium	Ecology	Planned	December 2009
	Inspect the facility to verify that stormwater is discharged to the sanitary sewer and to ensure that operations at the facility are in compliance with applicable regulations and BMPs to prevent the release of contaminants to the LDW.	Medium	SPU, Ecology, King County	Planned	July 2009

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

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Acronyms/Abbreviations

BEHP	bis(2-ethylhexyl)phthalate
BIA	Bureau of Indian Affairs
BMP	best management practice
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	chemical of concern
CSL	Cleanup Screening Level
CSO	combined sewer overflow
DOI	Department of the Interior
EAA	Early Action Area
Ecology	Washington State Department of Ecology
EOF	emergency overflow
EPA	United States Environmental Protection Agency
FBI	Federal Bureau of Investigation
FS	Feasibility Study
GSA	U.S. General Services Administration
HPAH	high molecular weight PAH
ISIS	Integrated Site Information System
LDW	Lower Duwamish Waterway
LDWG	LDW Group
LPAH	low molecular weight PAH
MTCA	Washington State Model Toxics Control Act
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PID	photoionization detector
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
SHA	Site Hazard Assessment
SKCDPH	Seattle/King County Department of Public Health
SMC	Seattle Municipal Code
SMS	Sediment Management Standards
SPU	Seattle Public Utilities
SQS	Sediment Quality Standards
SVOC	semi-volatile organic compound
TBT	tributyltin
TOC	total organic carbon
USACE	U.S. Army Corps of Engineers

Acronyms/Abbreviations (continued)

USAF	U.S. Air Force
USEPA	U.S. Environmental Protection Agency
UST	underground storage tank
VOC	volatile organic compound
WQS	Water Quality Standards
WSDOT	Washington State Department of Transportation

1.0 Introduction

The Lower Duwamish Waterway (LDW), located in Seattle, Washington, was added to the National Priorities List (Superfund) by the United States Environmental Protection Agency (EPA or USEPA) on September 13, 2001. This Source Control Action Plan (SCAP) describes potential sources of contamination that may affect sediments in and adjacent to the River Mile (RM) 0.9-1.0 East (Slip 1) source control area of the LDW (Figure 1).[1] 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 sediments associated with the Slip 1 source control area after cleanup. 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 a variety of sources, including the following documents:

- *Lower Duwamish Waterway, RM 0.9-1.0 East (Slip 1) Summary of Existing Information and Identification of Data Gaps*, Science Applications International Corporation (SAIC), August 2008, located on the Washington State Department of Ecology's (Ecology) website: http://www.ecy.wa.gov/programs/tcp/sites/lower_duwamish/sites/slip1_%20RM%200.9-1.0%20East/slip1_hp.html
- *Lower Duwamish Waterway Source Control Strategy*, Washington State Department of Ecology, January 2004, located on Ecology's website: http://www.ecy.wa.gov/pubs/0409043.pdf

1.1 Organization of Document

Section 1 of this SCAP describes the 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 sediments associated with the Slip 1 source control area, including a description of the sediment chemicals of concern (COCs). Section 3 provides an overview of potential sources of contaminants that may affect sediments associated with the Slip 1 source control area, including outfalls, spills, and properties adjacent to Slip 1. 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 are presented at the end of the document.

As new information about the sites and potential sources discussed in this document becomes available and as source control progress is made, Ecology will update the information in this SCAP by publishing Technical Memoranda or by including updates in the LDW Source Control

[1] This SCAP incorporates data published through March 31, 2009. Section 5, Tracking and Reporting of Source Control Activities, describes how newer data will be disseminated.

Status Reports, as appropriate. The current status of source control actions is summarized in the LDW Source Control Status Reports (Ecology 2007, 2008a, 2008b, 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 Turning Basin 3 (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 airplane parts 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, 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 combined sewer overflow (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 a feasibility study (FS) of the LDW to assess potential risks to human health and the environment and to evaluate cleanup alternatives. The RI for the site is being done in two phases. Results of Phase 1 were published in July 2003 (Windward 2003a). The Phase 1 RI used existing data to provide an understanding of the nature and extent of chemical distributions in LDW sediments, develop preliminary risk estimates, and identify candidates for early cleanup action. The Phase 2 RI is currently underway and is designed to fill critical data gaps identified in Phase 1. Based on the results of the Phase 2 RI, additional areas for cleanup may be identified. During Phase 2, an FS is being conducted that will address cleanup options for contaminated sediments in the LDW.

On September 13, 2001, EPA added the LDW to the 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, signed by EPA and Ecology in April 2002 and updated in April 2004, divides responsibilities for the site (USEPA and Ecology 2002, USEPA and Ecology 2004). EPA is the lead for the RI/FS, while Ecology is the lead for source control issues.

In June 2003, the *Technical Memorandum: Data Analysis and Candidate Site Identification* (Windward 2003b) was published. Seven candidate sites for early action (Early Action Areas [EAAs]) were recommended (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 First 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
- 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 recommended 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. EPA is the lead for managing cleanup at Terminal 117 and Slip 4. The other three early action cleanup projects were begun 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 the planning stage. The Duwamish/Diagonal 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. Early action cleanups may involve members of the LDWG or other parties as appropriate. Planning and implementation of early action cleanups is being conducted concurrently with the Phase 2 investigation.

In 2007, Ecology, in consultation with EPA, identified eight other 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. The Slip 1 source control area is one of these eight source control areas. In February 2008, Ecology identified the subdrainage basins for the areas of the LDW that were not already included in 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). The seven EAAs and 16 additional source control areas are shown in Figure 1.

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/lower_duwamish/lower_duwamish_hp.html.

1.3 LDW Source Control Strategy

The LDW Source Control Strategy (Ecology 2004a) 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).[2]

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 area will vary, it will be necessary to adapt each plan to the specific situation at that area. Existing administrative and legal authorities will be used to perform inspections and require necessary source control actions. 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; February 12, 2002* (USEPA 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 site will require that sources of sediment contamination to the entire site be evaluated, investigated, and controlled 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 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 necessary to address any recontamination identified by post-cleanup sediment monitoring (Ecology 2008a). This document is a SCAP for a Tier 2 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/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.

[2] Washington Administrative Code 173-204

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 Memorandum of Understanding (USEPA and Ecology 2004).

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

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2.0 RM 0.9-1.0 East (Slip 1)

Slip 1 is located along the eastern side of the LDW Superfund Site, at approximately RM 0.9 to 1.0, as measured from the southern tip of Harbor Island (Figure 1). Sediments associated with the Slip 1 source control area have accumulated chemical contaminants from several sources, both historical and potentially ongoing. These chemicals may have entered the LDW through direct discharges, spills, bank erosion, groundwater discharges, surface water runoff, atmospheric deposition, or other non-point source discharges.

Slip 1 is located adjacent to a former tidal marsh area that was reclaimed when the Duwamish River was straightened and channelized to form the current LDW in the late 1800s and early 1900s. Available information indicates that a meander of the Duwamish River once flowed in a south-to-north direction over the U.S. General Services Administration (GSA) Federal Center South property (Figure 2). Portions of the properties adjacent to the present-day Slip 1 were once part of the river bed (Windward 2007c). Extensive dredge and fill efforts in the early 1900s straightened the LDW channel and created Slip 1 in its present position between RM 0.9 and 1.0.

The Slip 1 source control area includes three properties that are located directly adjacent to the LDW: Federal Center South, former Snopac Products, Inc. (Snopac), and Manson Construction Company (Manson Construction). To the east of these properties are East Marginal Way S and other industrial facilities. To the north of Federal Center South are Diagonal Way and Port of Seattle Terminal 108, and to the south of Manson Construction are Cadman Cement and Lehigh NW Cement (Figure 2).

Groundwater in the Duwamish Valley alluvium is typically encountered within about 3 meters (10 feet) of the ground surface and under unconfined conditions (Windward 2003a). 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. High tides can cause temporary groundwater flow reversals, generally within 100 to 150 meters (300 to 500 feet) of the LDW (Booth and Herman 1998). Groundwater flow in the vicinity of Slip 1 is generally to the west-southwest, toward the LDW and Slip 1.

On September 13, 1974, approximately 255 to 265 gallons of near-pure PCB (Aroclor 1242) spilled when an electrical transformer being loaded onto a barge was dropped and broken on the north pier of Slip 1 (KCDNRP 2002, USEPA 1975, USACE 2000, Windward 2008). Divers observed pools of free PCB at the bottom of the slip (Willman et al., 1976). Initial cleanup efforts, using hand dredges, recovered approximately 70 to 90 gallons of the 255-gallon spill (USACE 2000, KCDNR et al. 2001). A treatment facility, consisting of dredge pumps, mobile treatment plant, holding tanks for dredged material, and a clarifier, was established on the southern portion of the Federal Center South property adjacent to Slip 1 (Windward 2008).

During the winter of 1975/1976, a “20-year-flood” contributed to the dispersal of the remaining material in Slip1 and the river channel (KCDNRP 2002). In 1976, the U.S. Army Corp of Engineers (USACE) conducted a second dredging of PCBs at the northwest corner of Slip 1, using a hydraulic dredge to pipe the approximately 10 million gallons of PCB-contaminated sludge overland to settling ponds on the Chiyoda property (currently known as Terminal 108, located within the EAA-1 source control area) (Ecology 2004b). USACE estimated that an

additional 170 gallons of the original PCB spill were removed during this second cleanup effort (KCNDRP 2002).

Estimates of total PCB recovery range from 80 to 98 percent (USACE 2000, KCDNRP 2002, USEPA 1975). Post-spill sediment concentrations of Aroclor 1242 ranged from 0.06 to 2,400 mg/kg in the vicinity of the spill; post-dredge (1976) sediment concentrations ranged from 0.03 to 140 mg/kg Aroclor 1242, with the highest concentration at the remediated spill site (KCDNRP 2002). Slip 1 has not been dredged since 1976 (Windward 2007c).

Sediment samples collected by the LDWG in 2005 and 2006 showed the presence of PCBs at concentrations exceeding the SMS in surface and subsurface sediments within Slip 1 and upstream and downstream of Slip 1 (Windward 2005a, 2005b, 2007a, 2007b).

2.1 Chemicals of Concern in Sediment

Several environmental investigations have included the collection of sediment data near Slip 1, including a National Oceanic and Atmospheric Administration (NOAA) sediment characterization of the Duwamish River (NOAA 1998), an EPA Site Inspection (Weston 1999), Lehigh Northwest sediment sampling (MCS 2004, as cited in Windward 2007c), and the LDW Phase 2 RI (Windward 2005a, 2005b, 2007a, 2007b, 2007c).

Sediment data are detailed in *Summary of Existing Information and Identification of Data Gaps* for RM 0.9-1.0 East (Slip 1) (SAIC 2008), referred to in this document as the Slip 1 Data Gaps Report. Chemical data were compared to the Washington State SMS, which include both the Sediment Quality Standards (SQS) and Cleanup Screening Levels (CSLs).[3] Sediments that meet 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 is greater than or equal to the SQS and represents a higher level of risk to benthic organisms than SQS levels. The SQS and CSL values 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 (TOC)-normalized concentrations.

As described in the Slip 1 Data Gaps Report, surveys conducted during 1998 and 1999 included collection of surface sediment samples at 17 locations. Sediment sampling conducted in 2003 included collection of subsurface sediment samples at two coring locations (Windward 2003a). More recently, sediment sampling conducted as part of the Phase 2 RI included eleven surface sediment samples collected during three rounds of surface sediment sampling in 2005/2006 and 19 samples collected from five coring locations in 2006 (Windward 2005a, 2005b, 2007a). Sediment sampling locations are shown in Figure 3.

COCs were identified based on the results of sediment sampling conducted near Slip 1. Chemicals that exceeded the SQS in at least one surface or subsurface sediment sample offshore of the Slip 1 source control area are considered COCs.

Concentrations of contaminants in soil and groundwater in the Slip 1 source control area were compared to regulatory criteria and/or draft soil-to-sediment or groundwater-to-sediment screening levels (SAIC 2006). These screening levels were developed to assist in the

[3] Washington Administrative Code 173-204

identification of upland properties that may pose a potential risk of recontamination of sediments at Slip 4. The screening levels incorporate a number of conservative assumptions, including the absence of contaminant dilution and ample time for contaminant concentrations in soil, sediment, and groundwater to achieve equilibrium. In addition, the screening levels do not address issues of contaminant mass flux from upland to sediments, nor do they address the area or volume of sediment that might be affected by upland contaminants.

Because of these assumptions and uncertainties, these screening levels are most appropriately used for one-sided comparisons. If contaminant concentrations in upland soil or groundwater are below these screening levels, then it is unlikely that they will lead to exceedance of marine sediment CSLs. However, upland concentrations that exceed these screening levels *may or may not* pose a threat to marine sediments; additional site-specific information must be considered in order to make such an assessment. While not currently considered COCs in sediment, these chemicals may warrant further investigation, depending on site-specific conditions, to evaluate the likelihood that they will lead to exceedances of the SMS.

In general, COCs were present in sediment samples at concentrations only slightly above the SQS or CSL values; the greatest exceedances were observed for arsenic at location B3b (surface sediment), acenaphthene, fluorene, and dibenzofuran at location LDW-SS35 (surface sediment), PCBs at locations LDW-SS37 (surface sediment) and DR021, LDW-SC16, and LDW-SC20 (subsurface sediment), and zinc at location LDW-SC17 (subsurface sediment) (Figure 3). Arsenic concentrations detected in sediment samples collected near the head of Slip 1 are some of the highest reported in the LDW; arsenic concentrations exceeding the CSL have been reported in only two other locations along the LDW.

The following chemicals are considered to be COCs at the Slip 1 source control area with regard to potential sediment recontamination:

Chemical of Concern (COC)	Surface Sediment	Subsurface Sediment
Metals:		
Arsenic	●	●
Cadmium		●
Chromium		●
Copper	●	
Lead		●
Mercury	●	●
Zinc	●	●
PAHs:		
2-Methylnaphthalene	●	
Acenaphthene	●	●
Benzo(a)anthracene	●	
Benzo(a)pyrene	●	
Benzo(g,h,i)perylene	●	
Benzofluoranthenes (total)	●	
Chrysene	●	
Dibenzo(a,h)anthracene	●	
Fluoranthene	●	●
Fluorene	●	●
Indeno(1,2,3-cd)pyrene	●	
Naphthalene	●	
Phenanthrene	●	●

Chemical of Concern (COC)	Surface Sediment	Subsurface Sediment
Total HPAH	●	●
Total LPAH	●	
Phthalates:		
Bis(2-ethylhexyl)phthalate (BEHP)		●
Other SVOCs:		
1,2,4-Trichlorobenzene		●
Benzoic acid	●	●
Dibenzofuran	●	●
PCBs:		
PCBs (total)	●	●

HPAH – total high molecular weight PAH
LPAH – total low molecular weight PAH

2.2 Potential Pathways to Sediment

Transport pathways that could contribute to the recontamination of Slip 1 sediments following remedial activities include direct discharges via outfalls, surface runoff (sheet flow) from adjacent properties, bank erosion, groundwater discharges, air 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 Discharges via Outfalls

Discharges to the LDW may occur from public or private storm drain systems, CSOs, and emergency overflows (EOFs).

The LDW area is served by a combination of separated storm drain and sanitary sewer, and combined sewer systems. Storm drains convey stormwater runoff collected from streets, parking lots, roof drains, and residential, commercial, and industrial properties to the waterway. In the LDW, there are both public and private storm drain systems. Most of the waterfront properties are served by privately-owned systems that discharge directly to the waterway. The other upland areas are served by a combination of privately- and publicly-owned systems.

Storm drains 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 storm drains during wet weather. Storm drains 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 system.

Seven private outfalls are present in the Slip 1 source control area. Contaminants discharged via these outfalls could affect waterway sediments. There are no municipally-owned outfalls within the Slip 1 source control area,[4] and no facilities that are currently covered under an NPDES permit.

[4] The Diagonal CSO is located to the north of RM 0.9-1.0 East and the Brandon Street CSO is located at approximately RM 1.1.

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. A 1976 utility survey map indicates that the Federal Center South property is served by a stormwater drainage system. It is not clear whether the former Snopac property and Manson Construction are also served by stormwater drainage systems (Figure 4). Based on aerial photographs, it appears that all adjacent properties are paved, with the exception of an approximately 1-acre, triangular-shaped area, approximately on the western shoreline of the Federal Center South parcel, and a rectangular-shaped area at the southwest corner of the Manson Construction property.

Surface runoff is a potential pathway for transport of COCs to the LDW and Slip 1.

2.2.3 Spills to the LDW

Near-water and over-water activities have the potential to impact adjacent sediments from spills of material containing contaminants of concern. Over-water activities are currently conducted at Manson Construction and possibly Federal Center South. Near-water spills at the properties adjacent to Slip 1 may flow directly to the slip.

2.2.4 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 and Slip 1. Contaminated groundwater has been documented at adjacent properties with groundwater flow directions toward Slip 1.

Many seeps have been observed along RM 0.9-1.0 East (Windward 2004). Arsenic, copper, lead, and zinc have been detected in one seep (Seep 76) sampled within Slip 1, adjacent to Manson Construction, at concentrations above the chronic Water Quality Standards (WQS). The arsenic concentration reported for Seep 76 (253 μg/L-filtered, 287 μg/L-unfiltered) was the highest arsenic concentration in any seep sample collected during the LDWG's 2004 survey along the LDW; these concentrations are about 4 times greater than the next highest arsenic concentration. The average concentrations of arsenic detected in LDW seeps during the 2004 seep sampling event (excluding the two highest arsenic concentrations) were 1.3 μg/L-filtered and 1.2 μg/L-unfiltered. Copper was also detected above the WQS in Seep 75, located adjacent to the Federal Center South property (Windward 2004).

Groundwater discharge is therefore a potential pathway for transport of COCs to the LDW and Slip 1.

2.2.5 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 reduces the potential for bank erosion. Contaminants in soils along the banks of Slip 1 could be released directly to sediments via erosion.

Based on a review of oblique aerial photographs, it appears that wharfs have been built into Slip 1, over the banks (SAIC 2008, Appendix B). Few areas of natural shoreline exist within the Slip 1 source control area. These include a triangular-shaped area just north of Slip 1 on the Federal

Center South property and a rectangular-shaped area at the southwest corner of the Manson Construction property.

2.2.6 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. None of the properties within the RM 0.9-1.0 East source control area are currently regulated as point sources of air emissions. Additional information on recent and ongoing atmospheric deposition studies in the LDW is summarized in the LDW Source Control Status Reports (Ecology 2007, 2008a, 2008b, and subsequent updates); Ecology will continue to monitor these efforts.

3.0 Potential Sources of Sediment Recontamination

Potential sources of sediment recontamination are described in detail in the Slip 1 Data Gaps Report (SAIC 2008). Three properties located adjacent to the LDW and were identified as potential sources of contaminants to sediments associated with the Slip 1 source control area (Figure 2):

- Federal Center South (Section 3.1),
- Former Snopac Products (historical location of Marine Power & Equipment/United Marine Shipbuilding) (Section 3.2), and
- Manson Construction (Section 3.3).

These properties may contribute contaminants to Slip 1 sediments through stormwater discharge, discharge of contaminated groundwater, bank erosion/leaching, and surface runoff/spills.

Private outfalls are present on the Federal Center South property; information regarding these outfalls is included in Section 3.1. There are no municipally-owned outfalls located within the Slip 1 source control area.

3.1 Federal Center South

The Federal Center South parcel is the northern-most parcel adjacent to RM 0.9-1.0 East and Slip 1 (Figure 5). The 32.99-acre parcel, located at 4645 East Marginal Way S, is zoned for industrial use.[5] It is bordered on the north by Diagonal Avenue S., on the west by the LDW, on the south by Slip 1 and the former Snopac property, and on the east by East Marginal Way S.

SPU's 2003 outfall survey (Herrera 2004) identified seven private outfalls on the Federal Center South parcel, and GSA maps indicate that there may be two other stormwater outfalls serving the paved storage area on the west side of the property (see Figure 4); none of these outfalls are covered under an NPDES permit. Four of the outfalls identified during the survey are located adjacent to Slip 1 or the LDW.

Outfall No.	Diameter/Material
2004	8-inch/concrete
2005	8-inch/concrete
2245	32-inch/steel
2246	8-inch/concrete
2247	8-inch/concrete
5000	32-inch/steel
5001	32-inch/steel

[5] King County GIS Center Parcel Viewer: http://www.kingcounty.gov/operations/GIS/PropResearch/ParcelViewer.aspx

3.1.1 Current Site Use

The Federal Center South houses several government agencies, including USACE, the Department of the Interior (DOI) Bureau of Indian Affairs (BIA), the U.S Air Force (USAF) Waterport Logistics office, and the Federal Bureau of Investigation (FBI). A federal motor pool and daycare reportedly also operate on the property.

An undated Spill Prevention Control and Countermeasure Plan, prepared for the Open Fuel Storage area of the USAF Waterport Logistics Office, indicates that a 90-foot by 105-foot concrete slab was installed to temporarily store fuel drums in transit to other facilities. The area was designed to prevent an accidental release from entering the stormwater system. Stormwater flowed through an oil/water separator prior to entering the stormwater system. In the event of a spill, the plan indicates that fuel oil will be cleaned from the storage facilities prior to discharge of stormwater into the stormwater system. The plan indicates that stormwater from the containment area discharges to one of the private outfalls (possibly 2245, 5000, or 5001) located on the northern shore of Slip 1 (USAF, date unknown). The drum storage facility was operating north of Building 1201 in 1993, at the approximate location shown on Figure 6 (Ecology 1993).

In 2001, Herrera located three 30,000-gallon underground storage tanks (USTs) adjacent to the northern side of Building 1206 (Figure 6). The tanks were pumped dry with some sludge remaining. Herrera did not report the contents of the tanks, but it was assumed to be petroleum used in boilers located in a nearby building (Herrera 2001).

The facility was subject to a joint Ecology/SPU inspection in June 2004 as part of the LDW Source Control Program (SPU and King County 2005). According to SPU, stormwater from this facility drains to the Diagonal CSO. The following corrective actions were requested at the FBI Shop:

- Clean facility storm drains.
- Replace/repair missing or damaged components to facility storm drains.
- Properly dispose of waste.
- Properly store product/waste.
- Properly label containers.

The following corrective actions were requested at Federal Center South:

- Improve or purchase adequate spill response materials.
- Clean facility storm drains.
- Replace/repair missing or damaged components to facility storm drains.
- Properly store product/waste.

No records of follow-up inspections were found in the files reviewed by SAIC.

According to Ecology's Integrated Site Information System (ISIS) database, which was last updated in April 2007, the facility status is "awaiting SHA [Site Hazard Assessment]."

3.1.2 Past Site Use

Federal Center South was constructed between 1930 and 1932 as a Ford Motor Company Assembly Plant. The U.S. Army added Building 1202 in 1941. USACE constructed warehouses, depots, offices, and clinics on the property from the early 1940s until 1956. Building 1203 was built between 1946 and 1956, according to Herrera's aerial photograph review (Herrera 2003). From 1957 to 1970, The Boeing Company's Missile Production Center occupied the former Ford Plant. The U.S. Government adopted the facilities for use as the Federal Center South in approximately 1973 (Historic Federal Buildings website, GSA 2009).

Building 1203 was used as a motor pool building for fleet maintenance during the 1960s and 1970s (Herrera 2003).

According to Foster's 1945 report detailing sources of pollution to the LDW, the U.S. Army Quartermaster Depot was located on this property and the facility was connected to the city sewer. However, Foster notes that sanitary sewage from about 115 workers was directed to the LDW (Foster 1945). The Quartermaster Depot repaired 55-gallon petroleum product drums and procured coal for use in Alaska. A food analysis and bacteriology laboratory, a coffee roasting and grinding plant, and a medical supply unit were operated at the Depot. The Repairs and Utilities Division maintained carpentry, paint, electrical, and mechanical shops at the Depot (Headquarters Seattle Army Service Forces Depot 1945).

Following the 1974 PCB spill into Slip 1, a treatment facility for contaminated sediment and sludge was established on the southern portion of the property adjacent to Slip 1. Dredged material was held in tanks prior to being treated at a mobile treatment plant. The USAF warehouse (Building 1202, Figure 6) was used to temporarily store 215 barrels of contaminated sludge (USEPA 1975, as cited in Windward 2008).

3.1.3 Environmental Investigations and Cleanups

Several environmental investigations related to USTs containing petroleum products have been conducted at Federal Center South. Historical operations at this facility resulted in releases of petroleum hydrocarbons to soil and groundwater beneath the property.

The majority of the affected area is west of the Slip 1 source control area, with the exceptions of the Tank T1 and T6 areas (Figure 6). Excavations were performed to remove contaminated soils. No groundwater samples were collected in the vicinity of Tanks T1 and T6.

3.1.4 Potential for Future Releases to Slip 1

Activities at Federal Center South may have resulted in releases of contaminants to the waterway. Federal Center South is a potential source of COCs that may contribute to recontamination of sediments associated with the Slip 1 source control area for the following reasons:

- **COCs have been detected above the SQS values in LDW sediments adjacent to the property.**

Data from LDW sediment sampling indicated the presence of mercury, zinc, and PCBs at concentrations exceeding the SQS in sediment samples collected near the southern boundary of

Federal Center South. PCBs in sediment may be residual contamination from the 1974 PCB spill at this location. The presence of mercury and zinc in sediment *may or may not* be related to historical or current operations at the property.

- **Outfalls and yard drains may be discharging directly to Slip 1.**

Contaminants in stormwater from the Federal Center South property may be discharged to the LDW through private outfalls located at the southern boundary of the property. The locations of these outfalls were confirmed during the SPU outfall survey conducted in 2003 (Herrera 2004). No recent inline stormwater solids sampling has been conducted (SAIC 2008).

In addition, according to a 1976 GSA utility map, stormwater from this facility is discharged to Slip 1 through yard drains located at the southern boundary of the parcel. No recent information about these drains is available, and it is not known if they are still present. Based on the 1976 map, it appears that stormwater from approximately three-fourths of the property drains to Slip 1 (GSA 1976).

The potential for sediment recontamination via this pathway is low to medium, depending on the operational status of the outfalls, storm drain lines, and yard drains. If these drainage features are in use and discharge to Slip 1, then they represent a potential pathway for contaminants to reach Slip 1.

- **Due to the facility's proximity to Slip 1, contaminants in surface runoff and spills may be transported directly to Slip 1.**

Based on Ecology's 1993 facility inspection, an outdoor drum storage area is present on the property. Ecology indicated that the secondary containment for this area was inadequate. The area may be connected to storm drain lines that discharge to Slip 1. If so, then spills from this area could reach Slip 1 via the storm drain lines. It is not known if the storage area is still in use.

Due to the property's proximity to Slip 1, contaminants (if any) suspended in surface runoff have the potential to reach Slip 1. As stated above, a 1976 GSA utility map indicates the presence of yard drains near the southern boundary of the property. If they are still present, runoff and spills could be discharged directly to Slip 1.

Historical operations at the facility include loading and unloading of materials and equipment at the wharf, which extends from the southern property boundary to Slip 1. In 1974, a PCB transformer was damaged and released 255 gallons of PCBs to the slip. It is not known if over-water loading and unloading operations are still performed at the property.

- **Petroleum hydrocarbons have been released to soil and groundwater beneath the property; no groundwater samples have been collected.**

Excavations were performed to remove contaminated soils associated with Tanks T1 and T6. No groundwater samples were collected in the vicinity of Tanks T1 and T6; however, the area of contaminated soil associated with Tank T1 is approximately 100 feet northeast of Slip 1 and the area of contaminated soil associated with Tank T6 is approximately 800 feet north of Slip 1. Therefore, the potential for sediment recontamination in Slip 1 via soil and groundwater pathways associated with Tanks T1 and T6 is considered to be low.

Soil and groundwater have not been investigated near the three 30,000-gallon petroleum USTs identified by Herrera in 2001. These USTs are adjacent to the northern side of Building 1206 (Figure 6). Contaminated groundwater associated with these USTs (if any) would discharge to Slip 1. The potential for sediment recontamination in Slip 1 via soil and groundwater pathways associated with the three 30,000-gallon USTs is unknown.

3.1.5 Source Control Actions

Information needed to assess the potential for sediment recontamination associated with current or historical operations at Federal Center South was summarized in the Slip 1 Data Gaps Report (SAIC 2008).

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 Slip 1 source control area:

- Ecology will obtain and review historical property files for information regarding the status and contents of the three 30,000-gallon USTs and determine if sediment COCs may be present in soil and groundwater in this area.
- If the file review indicates that sediment COCs may be present in soil and groundwater, EPA will require the property owner/operator to perform an environmental assessment of the soil and groundwater around the 30,000-gallon UST area to verify the presence or absence of sediment COCs and to determine if concentrations exceed applicable regulatory and/or draft soil-to-sediment or groundwater-to-sediment screening levels.
- Ecology will perform the SHA for Federal Center South.
- Ecology and/or EPA will conduct a follow-up stormwater inspection at Federal Center South to verify completion of the corrective actions requested in June 2004. Issues that will be addressed during the inspection include:
    - Determine whether over-water loading and unloading operations continue to be performed at the property;
    - Determine the operational status and location of the outdoor drum storage area;
    - Determine if secondary containment for the outdoor storage area is adequate;
    - Determine if spills from the outdoor drum storage area have the potential to reach Slip 1;
    - Obtain maps of the site drainage system and inspect catch basins to determine whether they need to be cleaned, and collect sediment sample(s) if appropriate.
- EPA and/or Ecology will determine if Federal Center South must apply for NPDES permit coverage.
- Ecology will evaluate the potential for bank erosion at this property. If bank erosion is likely and soil or groundwater contamination is present, bank soil samples will be collected and analyzed for sediment COCs.

In addition, Ecology will continue to conduct source control inspections at Federal Center South as needed.

3.2 Former Snopac Products, Inc.

Until recently, Snopac Products, Inc. (Snopac) was located at 5053 East Marginal Way S. (Figure 2). The property is bordered on the north by the Federal Center South, on the west by Slip 1, on the south by Manson Construction, and on the east by East Marginal Way S. (Figure 5).

The property is owned by Gregory and Tammy Blakey. The 1.33-acre parcel is zoned for industrial use. According to tax records, there is one building on the property, a 24,617 sq ft warehouse built in 1932.

From aerial photographs it appears that a portion of the property is built out over the head of Slip 1. It appears that a dock adjacent to this facility was abandoned or decommissioned in approximately 1990. From 2004 aerial photographs, it appears the dock is in disrepair and is likely unusable (SAIC 2008).

3.2.1 Current Site Use

Snopac moved from the East Marginal Way S. location in mid-February 2008, to its current location at 6118 12th Avenue S., Seattle (Snopac 2008). Based on field reconnaissance performed by SAIC in April 2008, the East Marginal Way facility building is currently vacant and for sale.

3.2.2 Past Site Use

Snopac was established in 1983 and is one of relatively few independently-owned and family operated fish processing companies (Snopac 2009). A source control inspection conducted by SPU on November 17, 2003 found the facility to be in compliance with local stormwater, industrial pretreatment, and hazardous waste regulations (Ecology 2007).

No additional information regarding Snopac was available in the files reviewed during preparation of the Slip 1 Data Gaps Report.

Marine Power & Equipment Company previously operated at this location. Marine Power & Equipment was established in 1946; it grew rapidly and became a significant shipbuilder by 1978, constructing fishing vessels, tugboats, barges, and six ferries (ShipbuildingHistory.com 2009). The company went bankrupt in 1985. It emerged from bankruptcy in 1988 as United Marine Shipbuilding, or Unimar, which cut back its operations to a limited amount of repair work (AltLaw.org 2009). United Marine Shipbuilding closed in 1993, and filed for bankruptcy in 1994.

In July 2008, EPA sent General Notice 107(e) and Request for Information 104(e) letters under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to Unimar International, Inc.

3.2.3 Environmental Investigations and Cleanups

Three USTs containing diesel fuel were removed from the former Snopac property in 1989. Documentation of the UST removal process indicates that site assessments were completed for each of the three tank removals and no associated contamination was identified (Snopac 1990). Since collecting soil samples for laboratory analysis from UST excavations did not become an

enforceable requirement until 1991 (Wietfeld 2008), it is assumed that the assessment for contamination within these UST excavations was limited to visual and field screening inspections of the soil (e.g. screening for volatile organic compounds [VOCs] using a photoionization detector [PID]).

3.2.4 Potential for Future Releases to Slip 1

Activities at this property may have resulted in releases of contaminants to the waterway. The property is a potential source of COCs that may contribute to recontamination of sediments associated with the Slip 1 source control area for the following reasons:

- **COCs have been detected above the SQS values in LDW sediments and seeps adjacent to the property.**

Data from LDW surface sediment sampling near the former Snopac facility indicated the presence of arsenic, benzo(a)anthracene, benzo(g,h,i)perylene, chrysene, copper, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, PCBs, total HPAH, and zinc at concentrations that exceeded the SQS. Acenaphthene, arsenic, benzoic acid, cadmium, chromium, dibenzofuran, fluoranthene, fluorene, lead, mercury, PCB, phenanthrene, and zinc exceeded the SQS in subsurface sediment samples.

Seep 76, near the southeast corner of Slip 1, was sampled by the LDWG in 2004. Arsenic, copper, lead, mercury, and zinc were detected in the seep water sample at concentrations above the marine chronic WQS and the draft groundwater-to-sediment screening level. The arsenic concentration reported for this seep was the highest arsenic concentration reported for LDW seeps sampled in 2004 (Windward 2004).

The presence of these COCs in seeps and sediment *may or may not* be related to historical operations at the Snopac property.

- **Shipbuilding activities were conducted at this property during the 1970s and 1980s.**

Hazardous substances potentially associated with shipyard operations include arsenic, copper, lead, mercury, tributyltin (TBT), zinc, PCBs, and PAHs; many of these chemicals have been detected in Slip 1 sediments near this property at concentrations above the SQS. Chemical concentrations are typically higher in subsurface sediments in this area (Figure 3), indicating that a historical source of contaminants may have been present.

- **The dock adjacent to this parcel appears to be abandoned and left to decompose in Slip 1.**

Chemicals may be present in the treated pilings or other materials used to build the dock. These chemicals, if present, have the potential to recontaminate sediments in Slip 1. The decomposition of the dock may also increase the potential for bank erosion.

3.2.5 Source Control Actions

Information needed to assess the potential for sediment recontamination associated with current or historical operations at the former Snopac property was summarized in the Slip 1 Data Gaps Report (SAIC 2008).

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 Slip 1 source control area:

- Ecology will review responses submitted by Unimar International, Inc. to EPA's 104(e) Request For Information letter of July 2008, to obtain additional information regarding materials used and wastes generated at United Marine Shipbuilding and Marine Power & Equipment, the time period of use/generation, and a description of how these materials and wastes were handled. Ecology will evaluate this information to determine if there is a potential for historical release(s) of arsenic and other sediment COCs to soil and groundwater beneath this facility.
- If there is potential for historical releases of arsenic and other sediment COCs, Ecology will require the property owner/operator to collect soil and groundwater samples from the property and analyze them for sediment COCs. If COCs are present in soil and groundwater at concentrations above MTCA cleanup levels and/or soil-to-sediment or groundwater-to-sediment screening levels, Ecology will require the property owner/operator to prepare and implement a plan to remediate soil and/or groundwater.
- If EPA sends a 104(e) Request for Information letter to Snopac Products in the future, Ecology will review the responses for relevant information on potential sources of contaminants to the Slip 1 source control area.
- Ecology will collect additional samples from Seep 76 to determine if the arsenic concentration reported in 2004 was an anomaly. Samples will be analyzed for all sediment COCs.
- Ecology will conduct a visual bank survey. If bank erosion is likely, Ecology will collect and analyze bank soil samples for sediment COCs to evaluate the potential for contaminants to enter the LDW via bank erosion and leaching. Reconnaissance cores should be collected along the top and bottom of the bank to determine "as is" conditions.
- Ecology will obtain information (if any) from Snopac or other historical property owners regarding the construction of the dock adjacent to the property. If no historical information regarding the dock construction is available, Ecology will perform an evaluation of the materials used to construct the dock in order to evaluate the potential for sediment recontamination.
- Snopac no longer occupies this property. SPU and/or Ecology will perform an inspection at the property when or if a new business occupies the site to ensure compliance with applicable regulations and best management practices (BMPs). SPU and/or Ecology will: request a facility plan showing locations of catch basins and storm drains (if any); obtain and evaluate an inventory of materials used and wastes generated; and evaluate facility grading and stormwater/runoff collection and containment systems to determine if improvements are needed.

Ecology will conduct source control inspections as needed to ensure compliance with NPDES permit requirements (if applicable) and stormwater BMPs to prevent the release of contaminants to the LDW.

3.3 Manson Construction Company

King County leases two adjacent parcels to Manson Construction. Manson Construction uses 5209 East Marginal Way S. as its operating address (Figure 4). The larger of the two parcels

(9041) has two buildings erected on the property. The buildings are an 8,460 square foot warehouse built in 1946 and a 9,196 square foot office built in 1953. The smaller parcel (9067) encompasses most of Slip 1 with a small land area at the head of the slip. There are no buildings erected on the property.

Manson Construction is bordered by Slip 1 and the former Snopac parcel to the north, East Marginal Way S. to the east, Lehigh NW and Cadman Cement (both owned by Heidelberg Cement), to the south, and the LDW to the west (Figure 2).

Based on aerial photographs, it appears the parcel is mostly paved. A wharf that extends from the northern property line into Slip 1 was built in approximately 1946. A rectangular-shaped area at the southwestern edge of the property appears to be unpaved and may consist of native shoreline. Between 1977 and 1990, it appears that Manson Construction expanded their operations to a portion of Parcel 9070, the parcel adjacent to the south (SAIC 2008).

3.3.1 Current Site Use

Manson Construction has been operating at this location for an unknown duration. Manson Construction has been conducting marine construction projects since 1905, including wharf, pier, terminal, marina, and bridge development and maintenance dredging, channel cutting, and beach nourishment. Their headquarters office (5209 East Marginal Way S.) serves as a staging location to perform projects along the west coast and Alaska (Manson 2009). Based on 2002 aerial photos, Manson Construction stores heavy equipment and associated machinery at this location.

Activities performed at the property include fueling operations, loading and unloading of liquid and solid materials, liquid storage in stationary above ground tanks, outside portable container storage of dangerous wastes, and outside manufacturing activities. Some loading and unloading operations take place over water in Slip 1.

Manson Construction obtained two RCRA hazardous waste permits and one UST permit under EPA ID No. WAD007942824. However, all are currently inactive according to Ecology's Facility/Site Database.

In July 2008, EPA sent General Notice 107(e) and Request for Information 104(e) letters to Manson Construction.

3.3.2 Past Site Use

Although Manson Construction began operations in 1905, files reviewed by SAIC did not indicate when the company began leasing these parcels from King County or identify previous facilities operated at either of these locations.

Glacier Gravel Company was a previous occupant of this property (Foster 1945).

3.3.3 Environmental Investigations and Cleanups

A 500-gallon gasoline UST was removed from the Manson Construction property on November 15, 1988. The UST was inspected in 1986 and records indicate it was one to two years old at the time of the inspection. According to a memo from Manson Construction, as of January 26, 1989, there are no USTs remaining on site (Manson Construction 1989). Since collecting soil samples

for laboratory analysis from UST excavations did not become an enforceable requirement until 1991 (Wietfeld 2008), it is assumed that the assessment for contamination within these UST excavation was limited to visual and field screening inspections of the soil (e.g. screening for VOCs using a PID).

Field notes collected by an Ecology inspector during a 2002 facility inspection indicate that soil remediation had been conducted under a building, designed and constructed by Manson Construction, which serves as secondary containment for dangerous waste (Yelton 2002). No records of soil laboratory results associated with this cleanup or any other remediation efforts were found in the files reviewed by SAIC.

3.3.4 Potential for Future Releases to Slip 1

Manson Construction is a potential source of COCs that may contribute to recontamination of sediments associated with the Slip 1 source control area for the following reasons:

- **COCs have been detected above the SQS values in LDW sediments and seeps adjacent to the property.**

Data from LDW surface sediment sampling near the Manson Construction facility indicated the presence of 2-methylnaphthalene, acenaphthene, benzo(a)anthracene, benzo(a)pyrene, benzofluoranthenes, chrysene, dibenzofuran, fluoranthene, fluorene, mercury, naphthalene, phenanthrene, total HPAH and LPAH, PCBs, and zinc at concentrations that exceeded the SQS. Concentrations of 1,2,4-trichlorobenzene, acenaphthene, BEHP, fluoranthene, mercury, PCBs, total HPAH, and zinc exceeded the SQS in subsurface sediment samples. The presence of these COCs in sediment *may or may not* be related to historical or current operations at the Manson Construction property.

Seep 76, near the southeast corner of Slip 1, was sampled by the LDWG in 2004. Arsenic, copper, lead, mercury, and zinc concentrations in the seep water sample exceeded the marine chronic WQS and the groundwater-to-sediment screening level. The arsenic concentration reported for the seep was the highest arsenic concentration reported for LDW seeps sampled in 2004 (Windward 2004). The presence of metals in the seep sample *may or may not* be related to historical or current operations at the Manson Construction Property.

- **Soil remediation has been conducted at this property, however no information regarding soil investigation or remediation activities was identified.**

A 2002 facility inspection report indicates that soil remediation was performed at the property; however, no additional information (e.g., site assessment report or laboratory data) regarding the remediation activities was available for review by SAIC. It is not known if satisfactory cleanup was achieved. The potential for sediment recontamination via this pathway is low to high depending on the levels of residual contamination in soil and groundwater beneath the facility.

It is not known whether the metals detected in Seep 76, near the southeast corner of Slip 1, are related to historical soil contamination at the Manson Construction property.

- **No inspection has been conducted at this facility since 2002.**

Little information was available about current operations at this facility. Based on SPU maps, it appears that stormwater from this facility is conveyed to the sanitary sewer. Due to the facility's proximity to Slip 1, however, contaminants (if any) suspended in surface runoff have the potential to reach Slip 1. In addition, little information was available on the construction of banks in this area and the potential for sediment recontamination via erosion.

3.3.5 Source Control Actions

Information needed to assess the potential for sediment recontamination associated with current or historical operations at Manson Construction was summarized in the Slip 1 Data Gaps Report (SAIC 2008).

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 Slip 1 source control area:

- Ecology will review responses to EPA's General Notice 107(e) and Request for Information 104(e) letters sent to Manson Construction.
- Ecology will request laboratory data and site plans from historical site assessment(s) and remediation performed at the property. Ecology will confirm that satisfactory completion of soil cleanup activities was achieved to eliminate groundwater discharge as a potential sediment recontamination pathway. Additionally, Ecology will evaluate if arsenic and other sediment COCs may be present in soil and groundwater at concentrations that may have the potential to re-contaminate Slip 1 sediments.
- If Ecology determines that satisfactory soil cleanup was not achieved, Ecology will require the property owner/operator to conduct a site assessment to determine residual concentrations of arsenic and other sediment COCs in soil and groundwater beneath the property in order to evaluate the potential for sediment recontamination via groundwater discharge.
- SPU and/or Ecology will conduct an inspection at Manson Construction to verify that stormwater is discharged to the sanitary sewer and to ensure that operations at the facility are in compliance with applicable regulations and BMPs. SPU and/or Ecology will: obtain a facility plan showing locations of catch basins and storm drains (if any); request information regarding facility grading and runoff water collection/containment systems; evaluate the slope of impervious surfaces and associated surface water collection and/or discharge points to evaluate the potential for contaminant transport to the LDW via surface runoff.
- Ecology will collect additional samples from Seep 76 to determine if the arsenic concentration reported in 2004 was an anomaly.
- Ecology will conduct a visual bank survey. If bank erosion is likely, Ecology will collect bank soil samples, and analyze them for sediment COCs to evaluate the potential for contaminants to enter the LDW via bank erosion and leaching. Reconnaissance cores should be collected along the top and bottom of the bank to determine "as is" conditions.

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4.0 Monitoring

Monitoring efforts by SPU, Ecology, King County, and the PSCAA will continue to assist in identifying and tracing ongoing sources of COCs present in LDW sediments. This information is being used to focus source control efforts on specific problem areas within the Slip 1 drainage basin and to track the progress of the source control program. The following types of samples will continue to be collected:

- Inline sediment trap samples from storm drain systems,
- Right-of-way and onsite catch basin sediment samples, and
- Soil and groundwater samples as necessary.

If monitoring data indicate that additional sources of sediment recontamination are present, then Ecology will identify additional 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 evidence. At this time, Ecology plans to review the progress and data associated with the source control action items for each SCAP annually, and to summarize this information in the LDW Source Control Status Reports, which are scheduled for publication twice a year. 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 prepares semiannual LDW Source Control Status Reports that summarize recent activities for each source control area and the overall status of source control in the LDW. Updates to SCAPs and source control recommendations will be recorded as appropriate in Ecology's LDW Source Control Status Reports, as well as in technical memoranda or decision documents as needed to update Ecology's or EPA's records concerning potential contaminant sources.

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6.0 References

AltLaw.org Website. 2009. United Marine Shipbuilding, Inc., United States Court of Appeals for the Ninth Circuit, June 26, 1998. http://www.altlaw.org/v1/cases/1092112. Website accessed on May 9, 2009.

Booth and Herman. 1998. Duwamish Coalition: Duwamish basin groundwater pathways conceptual model report. City of Seattle Office of Economic Development and King County Office of Budget and Strategic Planning, Seattle, WA. As cited in Windward 2003a.

Ecology. 1993. Hazardous Waste Compliance Inspection Report, United States General Services Administration, Seattle Federal Center South. February 9 and 11, 1993.

Ecology. 2004a. Lower Duwamish Waterway Source Control Strategy. Publication No. 04-09-043. Prepared by Washington State Department of Ecology, Northwest Regional Office, Toxics Cleanup Program. January 2004.

Ecology. 2004b. Lower Duwamish Waterway Source Control Action Plan for the Duwamish/Diagonal Way Early Action Cleanup. Publication No. 04-09-003. Prepared by Washington State Department of Ecology, Northwest Regional Office, Toxics Cleanup Program. December 2004.

Ecology. 2007. Lower Duwamish Waterway Source Control Status Report, 2003 to June 2007. Publication No. 07-09-064. Prepared by Washington State Department of Ecology, Northwest Regional Office, Toxics Cleanup Program. July 2007.

Ecology. 2008a. Lower Duwamish Waterway Source Control Status Report, July 2007 to March 2008. Publication No. 08-09-063. Prepared by Washington State Department of Ecology, Northwest Regional Office, Toxics Cleanup Program. May 2008.

Ecology. 2008b. Lower Duwamish Waterway Source Control Status Report, April 2008 through August 2008. Publication No. 08-09-068. Prepared by Washington State Department of Ecology, Northwest Regional Office, Toxics Cleanup Program. October 2008.

Foster, R.F. 1945. Sources of Pollution in the Duwamish-Green River Drainage Area. Prepared by Richard F. Foster. December 6, 1945.

General Services Administration (GSA). 1976. General Services Administration Utility Survey – Federal Center South. Figure Numbers 6 and 8. July 27, 1976.

GSA. 2009. Historic Federal Buildings: Federal Center South, Building No. 1201, 4735 East Marginal Way, Seattle, WA, 98134. http://w3.gsa.gov/web/p/interaia_save.nsf/1fd3e688294c3a74852563d3004975f4/cbc2d7abf7e2300b852565d90053a192?OpenDocument. Website accessed May 12, 2009.

Headquarters Seattle Army Service Forces Depot. 1945. Seattle Army Service Forces Depot, Information and Notes of Interest about the Pacific Northwest's Quartermaster and Medical Supply Installation, Scope of Mission and Activities, Receiving, Storage and Shipping Operations, Procurement and Inspection of Supplies, Organization and Management, and Historical Background of the Depot. June 1945.

Herrera. 2001. Phase 1 Environmental Site Assessment, Federal Center South, Seattle Washington. Prepared for U.S. General Services Administration, Auburn, Washington. July 2001.

Herrera. 2003. Independent Remediation Action Report, Federal Center South. Prepared for US General Services Administration by Herrera Environmental Consultants, Inc. July 17, 2003.

Herrera. 2004. Summary Report, Lower Duwamish Waterway Outfall Survey. Prepared for Seattle Public Utilities by Herrera Environmental Consultants, Inc. Seattle, WA. January 2004.

KCDNR (King County Department of Natural Resources), Anchor Environmental, LLC and EcoChem, Inc. 2001. Draft Duwamish/Diagonal CSO/SD Cleanup Study Report, Elliot Bay/Duwamish Restoration Program. Prepared for the Elliot Bay/Duwamish Restoration Program Panel. December 2001.

KCNRP (King County Department of Natural Resources and Parks). 2002. Source Control Summary for the Duwamish Diagonal Cleanup Project Addendum. Elliot Bay/Duwamish Restoration Program. Prepared for the Elliott Bay/Duwamish Restoration Program Panel. April 2002.

Manson Construction (Manson Construction Company). 1989. Memo from Patrick McGarry, Manson Construction, RE: UST Removal. January 26, 1989.

Manson. 2009. Manson Construction Company website (accessed May 11, 2009): http://www.mansonconstruction.com

MCS (MCS Environmental, Inc.) 2004. Puget Sound Dredged Disposal Analysis for the Lehigh Northwest Duwamish Waterway Facility, Seattle, Washington. Full PSDDA Characterization. Prepared for Lehigh Northwest, Inc. As cited in Windward 2007c.

NOAA. 1998. Duwamish Waterway Sediment Characterization Study Report. National Oceanic and Atmospheric Administration, Seattle, WA.

SAIC (Science Applications International Corporation). 2006. Soil and Groundwater Screening Criteria, Source Control Action Plan, Slip 4, Lower Duwamish Waterway. Draft. Prepared for Washington State Department of Ecology by SAIC, Bothell, WA. August 2006.

SAIC. 2008. Summary of Existing Information and Identification of Data Gaps, Lower Duwamish Waterway, RM 0.9-1.0 East, Slip 1. Prepared for Washington State Department of Ecology by SAIC, Bothell, WA. August 2008.

ShipBuildingHistory.com Website. 2009. Marine Power & Equipment Company, Seattle, WA (later Unimar). http://shipbuildinghistory.com/history/shipyards/5small/inactive/marinepower.htm. Website accessed May 9, 2009.

Snopac (Snopac Products, Inc.). 1990. Letter from Stewart Terry, Snopac Products, Inc., to Ecology. Re: Closure of UST at 5055 East Marginal Way South. January 8, 2008.

Snopac. 2008. Personal communication between Snopac customer service representative, and Megan Gay, Geologist, SAIC, re: current location of Snopac operations. May 21, 2008.

Snopac. 2009. Snopac Products website: http://www.snopac.net/ Website accessed May 11, 2009.

SPU (Seattle Public Utilities) and King County. 2005. King County and Seattle Public Utilities Source control Program for the Lower Duwamish Waterway, June 2005 Progress Report. Prepared for U.S. Environmental Protection Agency, Region 10 and Washington State Department of Ecology by Seattle Public Utilities and King County Industrial Waste. June 2005.

Tanner, C. 1991. Potential Intertidal Habitat Restoration Sites in the Duwamish River Estuary. EPA 910/9-91-050. Prepared for Port of Seattle Engineering Department and U.S. Environmental Protection Agency, Seattle, WA.

USACE (U.S. Army Corps of Engineers). 2000. P.C.B. Cleanup Operations, Duwamish Waterway, Seattle Harbor, Washington. Prepared by Seattle District, U.S. Army Corps of Engineers.

USAF (U.S. Air Force). Unknown. Spill Prevention Control and Countermeasure Plan, Open Fuel Storage for Waterport Logistics Office, Federal Center South. Unknown.

USEPA (U.S. Environmental Protection Agency). 1975. Region 10 On-Scene Coordinator's Report on the Duwamish Waterway PCB spill on September 13, 1974. U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

USEPA. 2002. Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites. OSWER Directive 9285.6-08. U.S. Environmental Protection Agency. February 12, 2002.

USEPA and Ecology. 2002. Lower Duwamish Waterway Site Memorandum of Understanding Between the United States Environmental Protection Agency and the Washington State Department of Ecology. April 2002.

USEPA and Ecology. 2004. Lower Duwamish Waterway Site Memorandum of Understanding Between the United States Environmental Protection Agency and the Washington State Department of Ecology. April 2004.

Weston (Roy F. Weston, Inc.). 1999. Site inspection report: Lower Duwamish River. RM 2.5-11.5. Volume 1 – Report and appendices. Prepared by Roy F. Weston, Inc. for U.S. Environmental Protection Agency Region 10, Seattle, WA.

Wietfeld, John. 2008. Personal communication between John Wietfeld (Ecology Toxics Cleanup Unit) and Megan Gay (SAIC) regarding soil sampling requirements for UST removals and excavations. August 21, 2008.

Willman, J.C., Blazevich, J., and Snyder, H.J. 1976. PCB Spill in the Duwamish-Seattle, WA. Control of Hazardous Material Spills: Proceedings of the 1976 National Conference on Control of Hazardous Material Spills, U.S. Environmental Protection Agency and Oil Spill Control Association of America. New Orleans, LA. April 25-28, 1976. Pp. 351-355. As cited in Swedish Coast Guard website: http://kustbevakningen.se/ra/volume2/annex3accidents/pcb.htm, accessed May 9, 2009.

Windward (Windward Environmental LLC). 2003a. Phase 1 Remedial Investigation Report. Final. Prepared by Windward Environmental LLC for the Lower Duwamish Waterway Group. July 3, 2003.

Windward. 2003b. Task 5: Identification of candidate sites for early action; Technical memorandum: Data analysis and candidate site identification. Final. Prepared by Windward Environmental LLC for the Lower Duwamish Waterway Group. June 12, 2003.

Windward. 2004. Data Report: Survey and Sampling of Lower Duwamish Waterway Seeps. Final. Prepared by Windward Environmental LLC for the Lower Duwamish Waterway Group. November 18, 2004.

Windward. 2005a. Data Report: Round 1 Surface Sediment Sampling for Chemical Analyses and Toxicity Testing. Final. Prepared by Windward Environmental LLC for the Lower Duwamish Waterway Group. October 21, 2005.

Windward. 2005b. Data Report: Round 2 Surface Sediment Sampling for Chemical Analyses and Toxicity Testing. Final. Prepared by Windward Environmental LLC for the Lower Duwamish Waterway Group. December 9, 2005.

Windward. 2007a. Data Report: Subsurface Sediment Sampling for Chemical Analyses. Final. Prepared by Windward Environmental LLC and RETEC for the Lower Duwamish Waterway Group. January 29, 2007.

Windward. 2007b. Data Report: Round 3 Surface Sediment Sampling for Chemical Analyses. Final. Prepared by Windward Environmental LLC for the Lower Duwamish Waterway Group. March 12, 2007.

Windward. 2007c. Phase 2 Remedial Investigation Report. Draft. Prepared by Windward Environmental LLC for the Lower Duwamish Waterway Group. November 5, 2007.

Windward. 2008. Terminal 108 – Environmental Conditions Report. Draft. Prepared by Windward Environmental LLC for the Port of Seattle. July 31, 2008.

Yelton. 2002. Notes, Unannounced Compliance Inspection at Manson Construction. June 6, 2002.

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Figures

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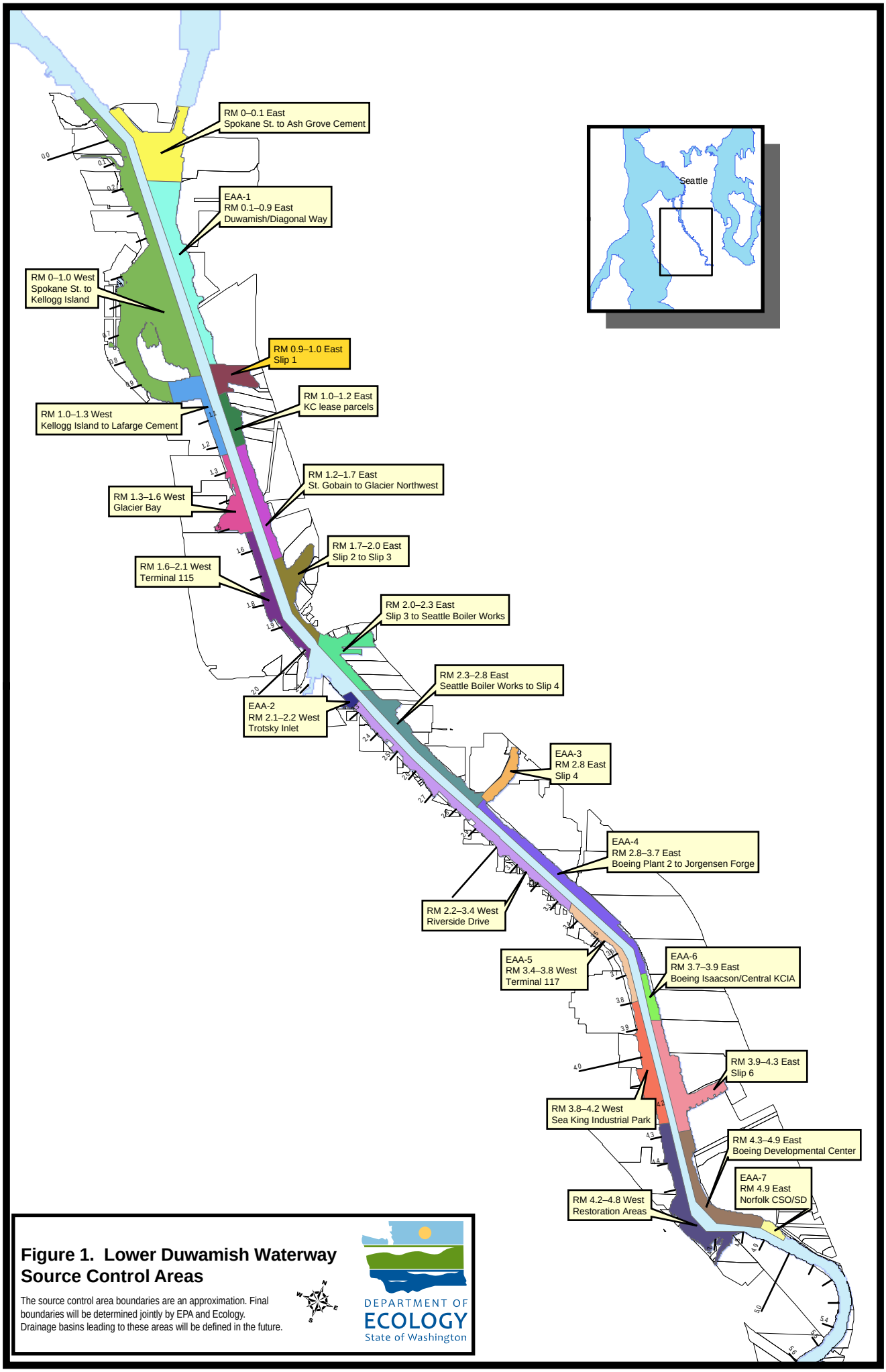

Figure 1. Lower Duwamish Waterway Source Control Areas

The source control area boundaries are an approximation. Final boundaries will be determined jointly by EPA and Ecology. Drainage basins leading to these areas will be defined in the future.

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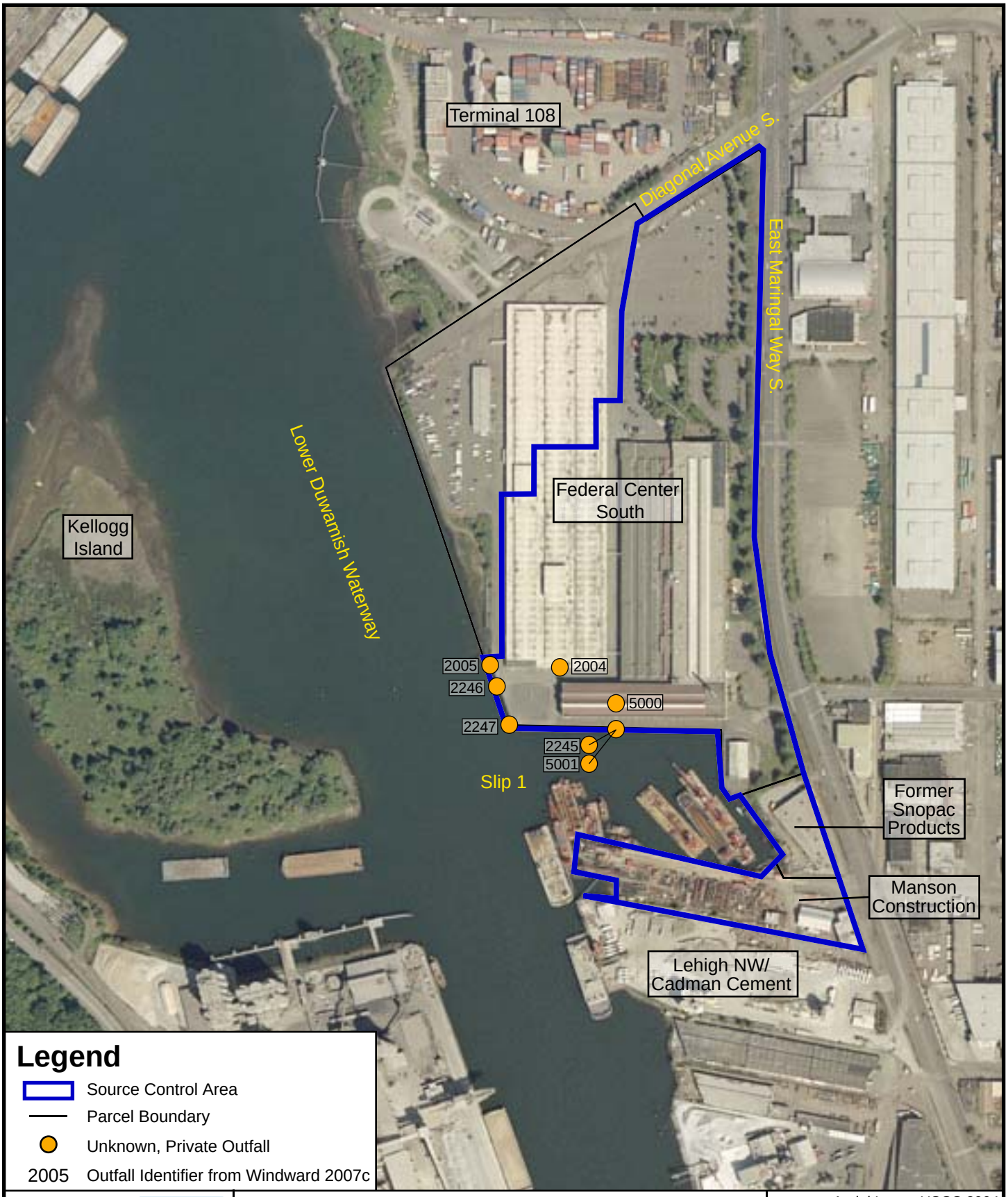

Figure 2. Slip 1 Source Control Area and Drainage Basin

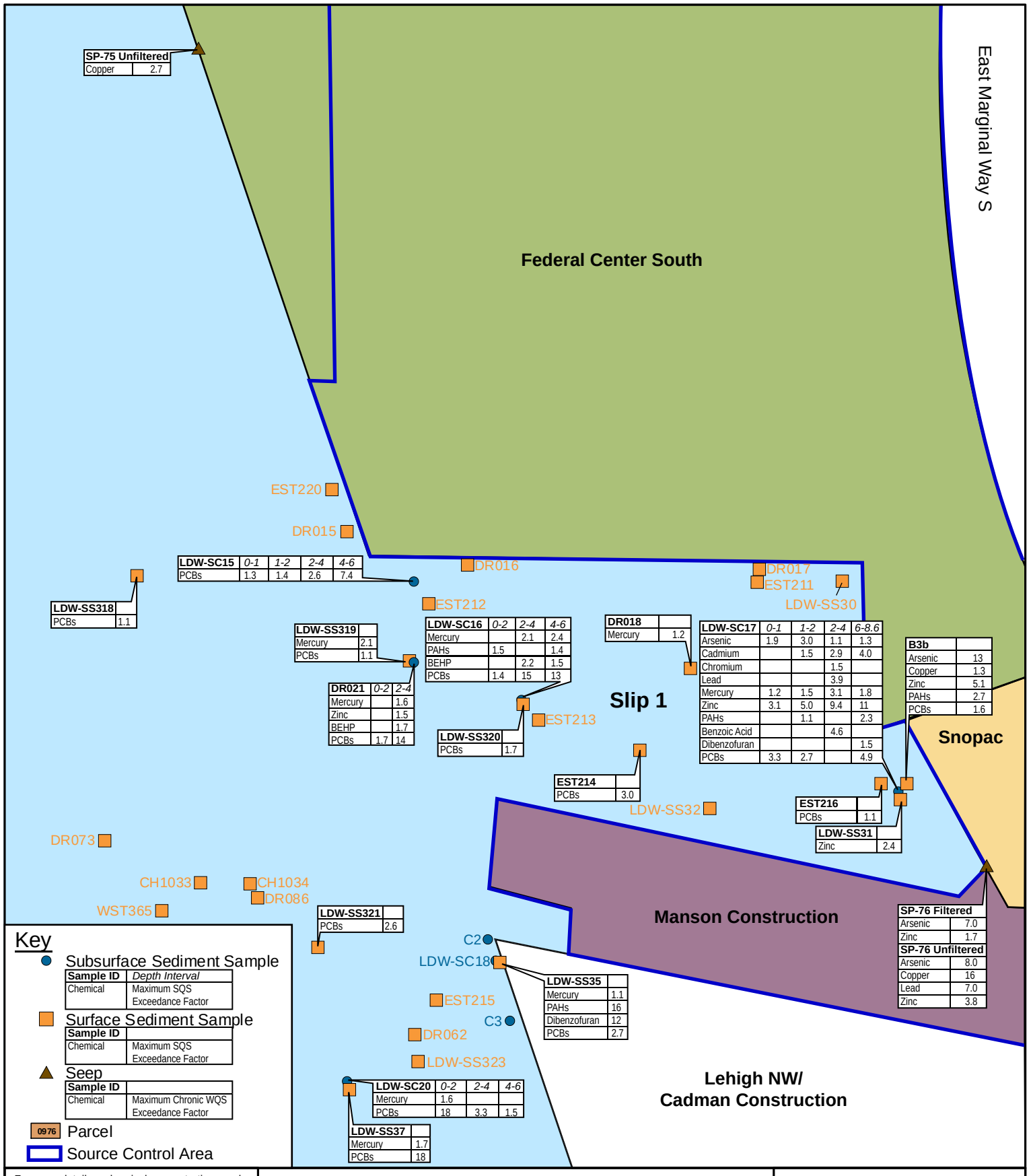
East Marginal Way S
Federal Center South
Slip 1
Snopac
Manson Construction
Lehigh NW/
Cadman Construction
SP-75 Unfiltered
Copper 2.7
EST220
DR015
DR016
DR017
EST211
LDW-SS30
EST212
LDW-SC15 0-1 1-2 2-4 4-6
PCBs 1.3 1.4 2.6 7.4
LDW-SS318
PCBs 1.1
LDW-SS319
Mercury 2.1
PCBs 1.1
LDW-SC16 0-2 2-4 4-6
Mercury 2.1 2.4
PAHs 1.5 1.4
BEHP 2.2 1.5
PCBs 1.4 15 13
DR021 0-2 2-4
Mercury 1.6
Zinc 1.5
BEHP 1.7
PCBs 1.7 14
LDW-SS320
PCBs 1.7
EST213
DR018
Mercury 1.2
LDW-SC17 0-1 1-2 2-4 6-8.6
Arsenic 1.9 3.0 1.1 1.3
Cadmium 1.5 2.9 4.0
Chromium 1.5
Lead 3.9
Mercury 1.2 1.5 3.1 1.8
Zinc 3.1 5.0 9.4 11
PAHs 1.1 2.3
Benzoic Acid 4.6
Dibenzofuran 1.5
PCBs 3.3 2.7 4.9
B3b
Arsenic 13
Copper 1.3
Zinc 5.1
PAHs 2.7
PCBs 1.6
EST214
PCBs 3.0
LDW-SS32
EST216
PCBs 1.1
LDW-SS31
Zinc 2.4
DR073
CH1033
CH1034
DR086
WST365
LDW-SS321
PCBs 2.6
C2
LDW-SC18
LDW-SS35
Mercury 1.1
PAHs 16
Dibenzofuran 12
PCBs 2.7
EST215
C3
DR062
LDW-SS323
LDW-SC20 0-2 2-4 4-6
Mercury 1.6
PCBs 18 3.3 1.5
LDW-SS37
Mercury 1.7
PCBs 18
SP-76 Filtered
Arsenic 7.0
Zinc 1.7
SP-76 Unfiltered
Arsenic 8.0
Copper 16
Lead 7.0
Zinc 3.8
Key
Subsurface Sediment Sample
Sample ID | Depth Interval
Chemical | Maximum SQS Exceedance Factor
Surface Sediment Sample
Sample ID
Chemical | Maximum SQS Exceedance Factor
Seep
Sample ID
Chemical | Maximum Chronic WQS Exceedance Factor
0976 Parcel
Source Control Area
For more detail on chemical concentrations and exceedance factors, refer to Tables 2, 3, and 4 of the Slip 1 Data Gaps report (SAIC 2008).
N
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Figure 3. RM 0.9–1.0 East (Slip 1)
Sediment and Seep Sample Locations
Feet
0 50 100 200 300 400
SAIC
From Science to Solutions
L. Delwiche, SAIC 2008

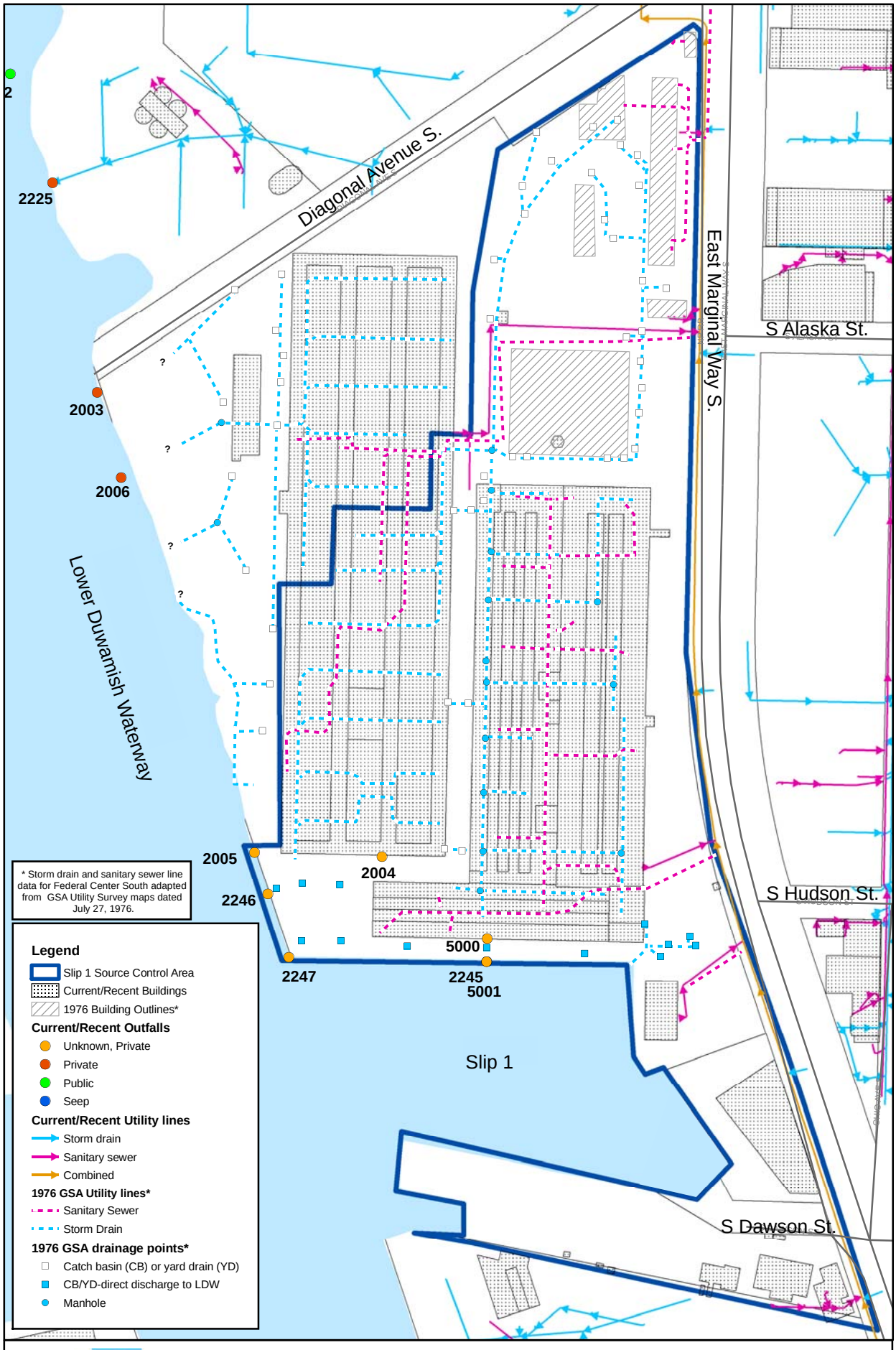

Figure 4. Slip 1 Source Control Area Utility Lines

...\GIS\projects\LDW\Basin_Data_Gaps\Slip1drainage.mxd M.Goff 7/25/08 WA State Plane NAD 83 - feet

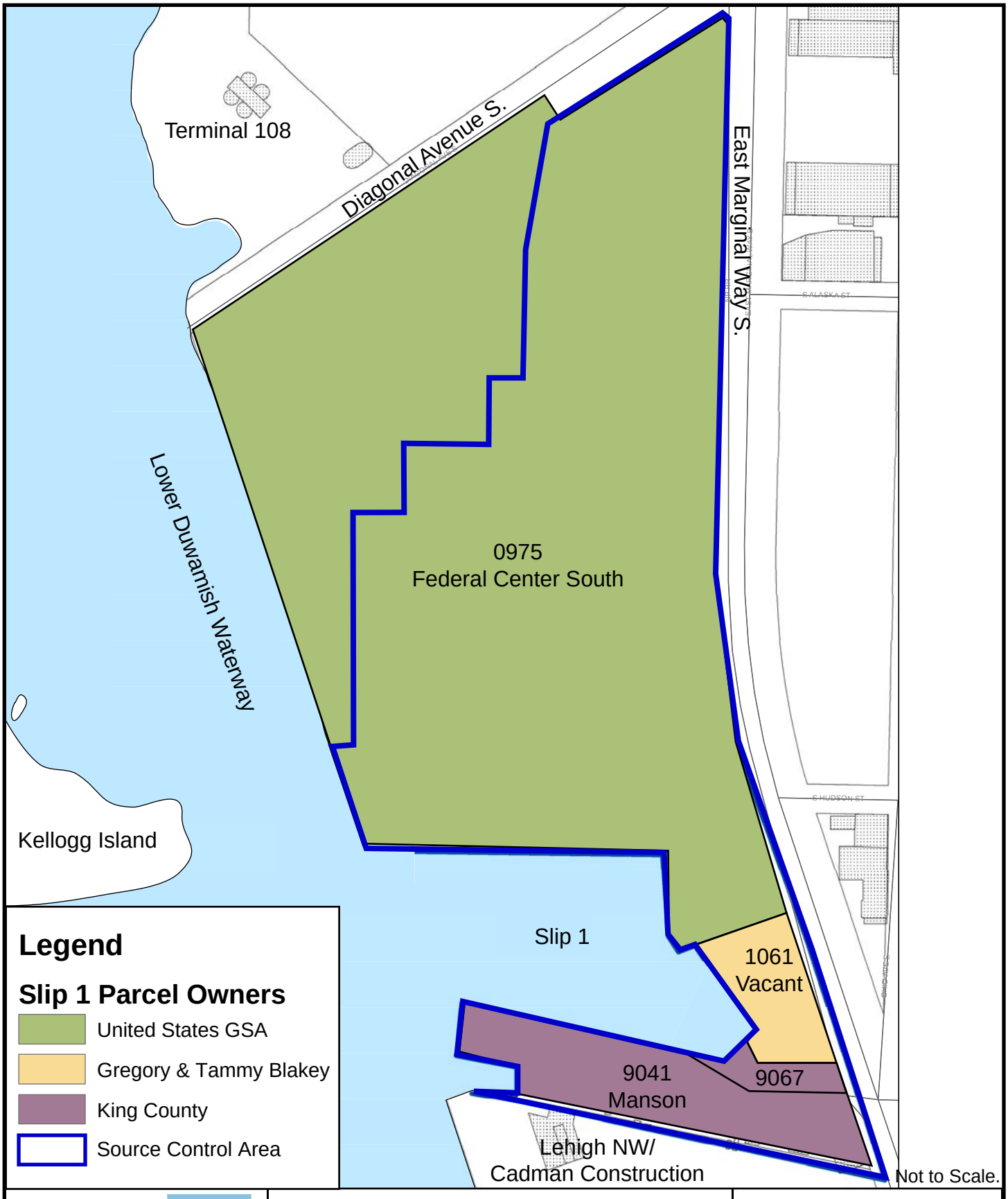

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Figure 5. Slip 1 Source Control Area Ownership and Parcel Uses

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Figure 6. Federal Center South